INFORMATION SYSTEMS FAILURE, POLITICS AND THE SOCIOLOGY OF TRANSLATION:

THE PROBLEMATIC INTRODUCTION OF AN AMERICAN COMPUTERISED RESERVATION SYSTEM AND YIELD MANAGEMENT AT FRENCH RAILWAYS

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LIST OF ACRONYMS AND ABBREVIATIONS

AA	American Airlines
AADT	American Airlines Decision Technology, an operational research subsidiary of the AMR group
AC	Agent Commercial
ACM	Agent Commercial Moniteur
ACT	Agent Commercial Train
AMR Corp.	American Airlines' parent company
AMRIS	AMR Information Services
ANACT	Agence Nationale d'Analyse des Conditions de Travail
APEX	Advance Purchase EXcursion
APV	Automate Point de Vente
ANT	Actor-Network Theory
Aristote	Amélioration de la Restitution d'Information par un Système Transactionnel Optimisé sur le Trafic d'Entreprise (*Socrate* accounting software)
BIR	Bureau Information Réservations
BR	British Rail
CAA	Civil Aviation Board
CCE	Comité Central d'Entreprise
CFDT	Confédération Française Des Travailleurs
CFTC	Confédération Française des Travailleurs Cadres
CGC	Confédération Générale des Cadres
CGT	Confédération Générale des Travailleurs
Corail	Trains Corail, 'classical' intercity trains (orange-coloured)
CRS	Computerised Reservation Systems
CRTV	Centre Renseignements Téléphoniques Voyageurs
DATAR	Direction à l'Aménagement du Territoire et à l'Action Régionale
DB	Deutsche Bähn
DCV	Direction Commerciale Voyageurs
DG	Direction Générale (SNCF)
DG	Directorate General (European Commission)
DGL	Direction Grandes Lignes
Dinamo	Dynamic Inventory and Maintenance Optimizer
EC	European Community (pre EU)
EC	European Commission
ECU	European Currency Unit (pre EURO)
EU	European Union
EPIC	Etablissement Public d'Intérêt Commercial
EPS	European Passenger Services (Eurostar Channel tunnel high speed train)
Esterel	Data network for SNCF transactions with travel agents
EWS	England, Wales and Scotland (UK rail freight company created after privatisation)
FGAAC	Fédération Générale Autonome des Agents de Conduite
FMC	Fédération des Maîtres Cadres
FNAUT	Fédération Nationale des Associations d'Usagers de Transport
FO	Force Ouvrière
DGL	Direction Grandes Lignes
GARP	Groupe d'Animation et de Réflexion sur le Projet d'Entreprise
GDS	Global Distribution Systems
GL	Grandes Lignes

HARPS	Hotel Analysis, Reporting and Planning System
Hermès	European rail data network providing access to reservations across rail companies
HST	High Speed Trains
ICE	Inter City Express (German high speed train)
IdF	Ile de France
LOTI	Loi d'Orientation des Transports Intérieurs
O-D	Origin-Destination
OPP	Obligatory Passage Point
PARS	Programmed Airlines Reservation System
PBKAL	Paris Brussels Köln Amsterdam London
PV	Point de Vente
RATP	Régie Autonome des Transports Parisiens
RER	Réseau Express Régional (Paris urban/suburban train)
RESA	First SNCF computerised reservation system, short for REServAtion
RFF	Réseau Ferré de France
Sabre	Initially Saber, Semi-Automatic Business Environment Research
Sage	Semi-Automatic Ground Environment
SDS	Système de Distribution SNCF
SDS	Sabre Development Services
SMARTS	American Airlines' Sales Management and Reporting/Tracking System
SNCF	Société Nationale des Chemins de fer Français
SNCB	Société Nationale des Chemins de fer Belges
SOC	Système d'Optimisation Commerciale
Socrate	Système Offrant à la Clientèle des Réservations d'Affaires et de Tourisme en Europe
SRV	Services Régionaux Voyageurs
TC	Technicien Commercial
TEN	Trans European Networks
TER	Trains Express Régionaux
TGV	Train à Grande Vitesse
Thalès	Traitement Heuristique Algorithmique et Logique des Espaces de Service (*Socrate* optimisation software)
TPV	Terminal Point de Vente

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ABSTRACT

This in-depth case study examines the troubled introduction of a new computerised reservation system at French Railways. *Socrate*, based on the American Airlines *Sabre* system, had a disastrous beginning. It was badly received by the French public, led to strikes and government inquiries, and had to be modified substantially. The literature on information systems failure is reviewed from functionalist to social constructivist and critical perspectives and the thesis aims to challenge beliefs and assumptions about technological success and failure. The notion of 'symmetry' from the sociology of technology emphasises that failures express the same dynamics as successes, showing how technological choices are not obvious or unproblematic.

Differences between air and rail transport, between American and European transport deregulation and between the needs of national identity, regional development and public access to transport are all reflected in the question of yield management. Yield management is a crucial component of computerised reservation systems and was first adopted during the deregulation of the US air transport industry in the early 80s. It requires complex optimisation software designed to manage passenger revenues and control demand, by manipulating the availability of full and discounted fares according to monitored demand and statistical analysis.

Latour and Callon's sociology of 'translation' helps analyse how the *Socrate* project was undertaken and interpreted as: borrowing from airline pricing, aiming to gain competitive advantage, associating *Socrate* to the success of high-speed trains, attempting to change passengers' buying and travelling behaviour, transforming the organisation and helping identify profitable market segments. A non-essentialist stance helps understand how social and technical distinctions are socially constructed and how the differentiation between what is technical and what is social, for instance in the conception and application of yield management, is a matter of power and politics. Clegg's circuits of power are used to complement the sociology of translation in examining how power and political factors contribute to information systems becoming (or not) obligatory passage points.

Politically controversial changes in French rail transport are associated with the role of computer technology in deregulated European and global electronic markets and its effects on the concept of national identity and sovereignty in transport policy-making.

CHAPTER 1

SOCRATE AS A FAILURE?

1.1 INTRODUCTION AND BACKGROUND

This thesis attempts to analyse the implementation failure of a computerised reservation system in an organisation. It is based on an intensive case study and adopts a non-essentialist stance to analyse it. Providing a rich description of micro-level, organisational and macro-level events enables us to depart from a managerialist and technicist account of the failure. The analysis draws on constructivism and the sociology of technology, more specifically actor-network theory (ANT), and an effort is made to complement its limitations and combine elements of both the global or macro and the local or micro by incorporating a more critical analysis, which includes notions of power and politics.

A very brief summary of the failure story is first given to set the scene. It is then easier to state the general area of concern. The purpose and objectives, theoretical frameworks, research questions, assumptions and limitations of the thesis are then outlined.

1.1.1 The actors and the story

SNCF (Société Nationale des Chemins de Fer Français) introduced *Socrate* (Système Offrant à la Clientèle des Réservations d'Affaires et de Tourisme en Europe), a computerised reservation system (CRS) in April 1993. SNCF bought *Sabre* from American Airlines in 1989 in order to build *Socrate*; one of its aims was to transform its commercial activities through the instigation of a new philosophy of selling, based on a technological investment importing techniques used in the airline industry. One of the marketing slogans used by SNCF, "Avec la SNCF tout est possible"[1] [Naulleau 1993] seems ironical since even the worst proved to be possible: *Socrate* is perhaps the first software system which provoked nation-wide strikes when it was introduced and which attracted massive negative media exposure. For such an ambitious project, and perhaps because of it, the number and type of problems encountered were rather spectacular: problems in its analysis and design, development and implementation, consultation,

[1] "With SNCF everything is possible".

ergonomics, training, linked to a highly controversial commercial strategy and to communication blunders.

SNCF started the *Socrate* project in 1989. The aim was to reposition the enterprise in a new European competitive environment, which would involve a substantial traffic expansion. *Socrate* would offer a better quality of service, and support the diversification of services [Bentegeat 1991]. The initiators of the project also explicitly emphasised the importance of an appropriate policy for maximising revenue, since SNCF had been an industrial and commercial establishment since 1982 (a 'semi-public' as opposed to a strict public sector nationalised utility). One of their most important objectives was to instigate a "new philosophy of selling" based on yield management techniques [Bromberger 1993]. SNCF bought *Sabre* (initially SABER for Semi-Automatic Business Environment Research), the American Airlines computerised reservation system and classic example of a successful strategic information system. Several years were spent adapting this software developed by a private air company to the context of the rail industry and of a national semi-public sector institution.

When first implemented, however, SNCF staff and customers rejected this new technical tool and its underlying ticketing, pricing and selling policies. These implementation problems were widely reported and examined by: SNCF itself [SNCF 1993a; SNCF 1989], French trade unions [CGT *et al* 1994; FO 1994], business consultants [APST 1991; Causa Rerum 1993], passengers' associations [FNAUT 1993], by the French government which commissioned a public inquiry into its failed implementation [Moissonier 1993; Cuq and Bussereau 1994], and by the media [Faujas 1993a; Penicault and Riche 1993; Henno 1993]. Technical malfunctions, political pressure, poor management, unions and user resistance led to an inadequate and to some extent chaotic implementation [Eglizeau *et al* 1996; Mitev 1996]. The project management team gave a rather secondary importance to the databases and input sets; staff training was inadequate and did not prepare salespeople to face real-life problems such as tariff inconsistencies and printing problems; the user interface was designed using the airlines logic and therefore was not at all user-friendly; the new ticket proved unacceptable to customers; public relations failed to prepare the public to such a dramatic change. The inadequate database information on timetable and routes of trains, inaccurate tariff information, and unavailability of ticket exchange capabilities caused major problems for the SNCF sales force and customers alike. Impossible reservations on some trains, inappropriate tariffs and wrong train connections led to large queues of irate customers in all major stations and to a major public outcry in France. Online reservations available through the Minitel public network failed, booked tickets were for non-existent trains whilst other trains ran empty, railway unions went on strike [Devillechabrolle 1993], and passengers' associations sued SNCF [D'Aufresnes 1993; Faujas 1993b].

These events, widely reported in the media, [e.g. Christie 1993; Dutertre, 1993; Langley 1993; Maleysson 1993], showed that such a project contributed to the upheaval of the French railways scene,

which had been relatively unchanged, particularly regarding the services on offer and the ensuing passengers' practices. The new ticketing and pricing policies introduced through *Socrate* radically changed railway users' and rail workers' practices, which were grounded in important cultural dimensions of French society. In contrast to previous technical changes (which had so far taken place in a stable and well-established SNCF), *Socrate* began to indicate a new phase of forced global innovation in an enterprise facing strategic imperatives. The competitive environment became that of European integration, which opened the area of transport to deregulatory moves and to the growth of competition across transport modes (rail, air, road).

1.1.2 The technology

As a response to a growing demand for reservation management, the previous computerised reservation system *RESA* [Monnet 1987], was implemented in the early eighties at SNCF ticket offices, and was also made available in private homes through the Minitel public network. It needed to be improved and extended since it was reaching saturation point (50 million reservations a year). It was projected that there would be a need for 130 million reservations a year as soon as 1995 [Bouché *et al* 1993]. SNCF therefore decided in 1988 to completely change its computerised reservation system. Important decisions about pricing strategies were also taken in parallel, which contributed to the difficulties experienced in 1993.

One of the most fundamental changes in design was the disappearance of the railway station as the basic 'unit' or entity, which was replaced by a concept of the 'relation' between two stations (origin-destination), derived from air reservation systems. Design difficulties arose since *Sabre* was written for a maximum of 80 relations with very few intermediate stops. SNCF discovered that it had to be rewritten to cope with the 22,000 most important relations in the French rail network and its 2,400 stations. If the relation has not been pre-recorded (not enough demand in small stations) the transaction has to be done semi-manually by the sales staff and takes twice as long. This important fact, especially for sales staff and passengers, was overlooked; only a small number of relations was pre-recorded for the launch in March 1993. This was one of the main reasons for the queues in the stations, and SNCF had to rapidly deploy input staff to record more relations and facilitate the work of sales staff. Another problem with *Sabre* was that it was designed for fare structures for air travel, which are much simpler than for rail travel. American computer scientists had to be brought in to help adapt the system, and *Socrate* had cost 1.3 billion francs by 1993 [Bouché *et al* 1993]. Design and programming were carried out in the Paris area and in Lille, where three super computer mainframes are centralised and control the network of sales workstations and automatic ticket machines in rail stations at SNCF premises. They are also connected to the SNCF server accessible via the Minitel public data communications network and global distribution systems. *Socrate*,

like *Sabre*, *Amadeus* and *Galileo* (American Airlines, Air France, British Airways respectively) which run air CRS for travel agents, is a global distribution system [Colombin 1994]. It is linked to *Hermes* and *Esterel* which enable connections with European and global CRS for travel and tourism distribution channels.

Socrate was envisaged as a technical tool which can also manage, control and modify demand in order to maximise profits. By using a database management system together with a commercial optimisation system, SNCF hoped to reproduce the success of American Airlines. Yield management techniques used in *Sabre* were applied to ensure optimal filling of trains, combined with as great a profit as possible for each seat filled, through optimising the average price/rate of occupation ratio per seat. Beyond booking and ticketing, the optimisation software aims at redirecting demand not by altering prices but by changing the number of seats on offer at normal and reduced prices (the pricing mix) according to demand [Daudel and Vialle 1989]. This system limits access to certain prices, particularly reduced prices, train per train, and is intended to make customers book their seats as early as possible; if customers buy their tickets near the time of departure, they are unlikely to be entitled to reductions, such as reductions for old age pensioners, children, families, etc. This highlights an important difference between European train and air travel, namely that there is a social dimension to rail travel which is not present in air transport. *Socrate* also includes some software (called *Thalès* and *Aristote*) which accumulates statistical profiles of types of seats sold and fares paid per individual train, in order to modify the pricing mix on offer in the future, for each individual train. The pricing mix for each train is therefore defined according to analysis of past statistical data, marketing surveys, socio-economic characteristics of each origin-destination relation, air and road competition on that O-D (origin-destination) relation, and the value customers find in the service.

1.1.3 Organisational and political conflicts

Union organisations condemned the new SNCF strategic objectives as early as December 1991 with arguments about social costs and environmental consequences (under-utilisation of rail infrastructures, road traffic saturation, pollution, accidents) [Faïta 1993a]. They suggested that, instead of competition across different transport sectors, there is room for co-operation and complementarity in the interest of the public and that *Socrate* could be used to support this objective instead and integrate different transport modes as well as consider social aspects. Unions were also keen not to be seen as blaming the technology. Unions saw *Socrate* as an opportunity taken by SNCF and the government to realise their own political agenda and as a way of replenishing the public coffers and tackling the SNCF budget deficit, prior to privatisation. Some contended that it was also inconsistent in the medium to long-

term: fare increases for captive travellers on profitable lines, such as the Paris-Lyon and Paris-Lille lines[2], improve profits; but if increases are carried too far and on too many lines, the balance is broken, demand diminishes and passengers choose to travel by car instead. This was one of the reasons why the number of sales dropped after *Socrate* was actually introduced [Adine and Lewino 1993]. This decrease in sales numbers was also due to the technical problems outlined above, which turned passengers away, as well as the ensuing problem of public image and lack of public confidence in SNCF. The economic recession was also a contributing factor.

The strategic choice was also in opposition to existing organisational cultures and skills within SNCF, which were ignored. The technological choice of *Socrate*, which is closely related to the new strategic direction adopted by SNCF, was not well accepted by some of the computer staff, managers and workforce since it was perceived as based on financial motives rather than principles of public service. The interests of various SNCF divisions diverge, particularly those of regional and inter-city transport. Conflicts arose since *Socrate* concentrated on inter-city connections. Regional trains suffered because regional timetable information was not readily available through *Socrate* and reservations for regional trains were semi-manual and time-consuming since they had not been pre-recorded in the first *Socrate* version. The organisational climate became tense, conflictual, rivalries between divisions worsened, staff became demotivated. Sales staff was particularly exposed to demotivation. Before the launch of *Socrate*, training sessions were organised which lasted five days; three days were spent explaining the new commercial policies and the rationale for the new pricing structures. It was judged inadequate by staff and unions since it did not provide enough information on the user-computer interface and too little time was spent explaining the technical and user-computer interface aspects. Unlike its predecessor, which was almost self-explanatory and 'transparent', the new system required a thorough understanding of what happens 'behind the screen'. A computer-based simulation was used but it was criticised for being simplistic and unrealistic and it was soon abandoned [Foot 1993]. Sales staff qualifications and promotions were structured around a thorough knowledge and understanding of fare structures and their professional ethos was to create good relationships with the passengers and search the best possible routes and fares for them. For sales staff their knowledge of fares became irrelevant, the computer system having taken over that role. The dialogue with clients became difficult since staff had to keep looking at a

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[2] The date of 1st April 1993 as the launch of *Socrate* was seen as crucial by SNCF management as it coincided with the opening of the new Paris-Lille TGV Nord connection. SNCF wanted to launch *Socrate* at the same time at TGV Nord as a publicity exercise and in order to accumulate information about travel patterns on that new line as soon as it was opened; it was considered a highly strategic line, leading to the North of Europe and to the opening of the Channel tunnel rail link in 1994. Monitoring demand and influencing travelling patterns as soon as the line was open was considered a top priority. It was argued by many afterwards that this strategic imperative was the reason for many rushed decisions, which had dramatic consequences. Many SNCF managers agreed that they should have started *Socrate* on only that line in April 1993, instead of launching it on the whole SNCF network.

complicated and cluttered screen, and their role became one of reporting to the clients what was displayed on the screen. Customer choice became more complex and paradoxically the staff-client dialogue was made more difficult, being framed through a difficult and complex staff-computer dialogue. SNCF management argued that since staff do not look at the screen whilst talking to the customers, work breaks were not necessary. This added to stress levels experienced by sales staff, who had to deal with large queues of angry and confused customers. This was also in contradiction with the new commercial attitudes staff were expected to adopt, for instance through the use of words such as customers and clients instead of passengers or users. At the same time as introducing the new computerised system, SNCF implemented a monitoring system, which keeps track of the number of transactions, the time taken for each transaction, the types and prices of tickets sold, for each sales employee. Sales staff was therefore subjected to a change of computer system and its user interface together with changes in training, role, qualifications, promotions and job prospects (cheaper, part-time and less qualified staff could now do the same work), professional ethos, working conditions, handling of performance monitoring and reporting. It is little surprising that they took the side of the passengers-turned-customers, joined in protests and went on strike, by issuing open tickets. Ticket controllers and train agents refused to inspect tickets, which was also very popular with passengers' associations and the general public.

1.2 STATEMENT OF THE AREA OF CONCERN

This failure story raises interesting questions: How should one analyse information systems case studies? Are there inherent differences between successful and unsuccessful ones? Are there methodological points that should apply when investigating and describing such cases? It is argued here that only an in-depth,'rich' description and detailed examination of the various actors, their histories, interactions, intentions, actions and effects on each other, can do justice to the complexity of this case study; can help analyse how information systems relate to people, organisations and markets; and help understand how the technical and the social keep being negotiated and constituted.

The following figure (**Figure 1.1**) shows the human and non-human actors involved and summarises the levels of analysis necessary to craft as complete an account as possible: from a micro-level, in which individuals and artefacts interact; an organisational level in which groups, techniques, systems and expertise shape events; to a macro-level environment in which the organisation is situated and with which it interacts.

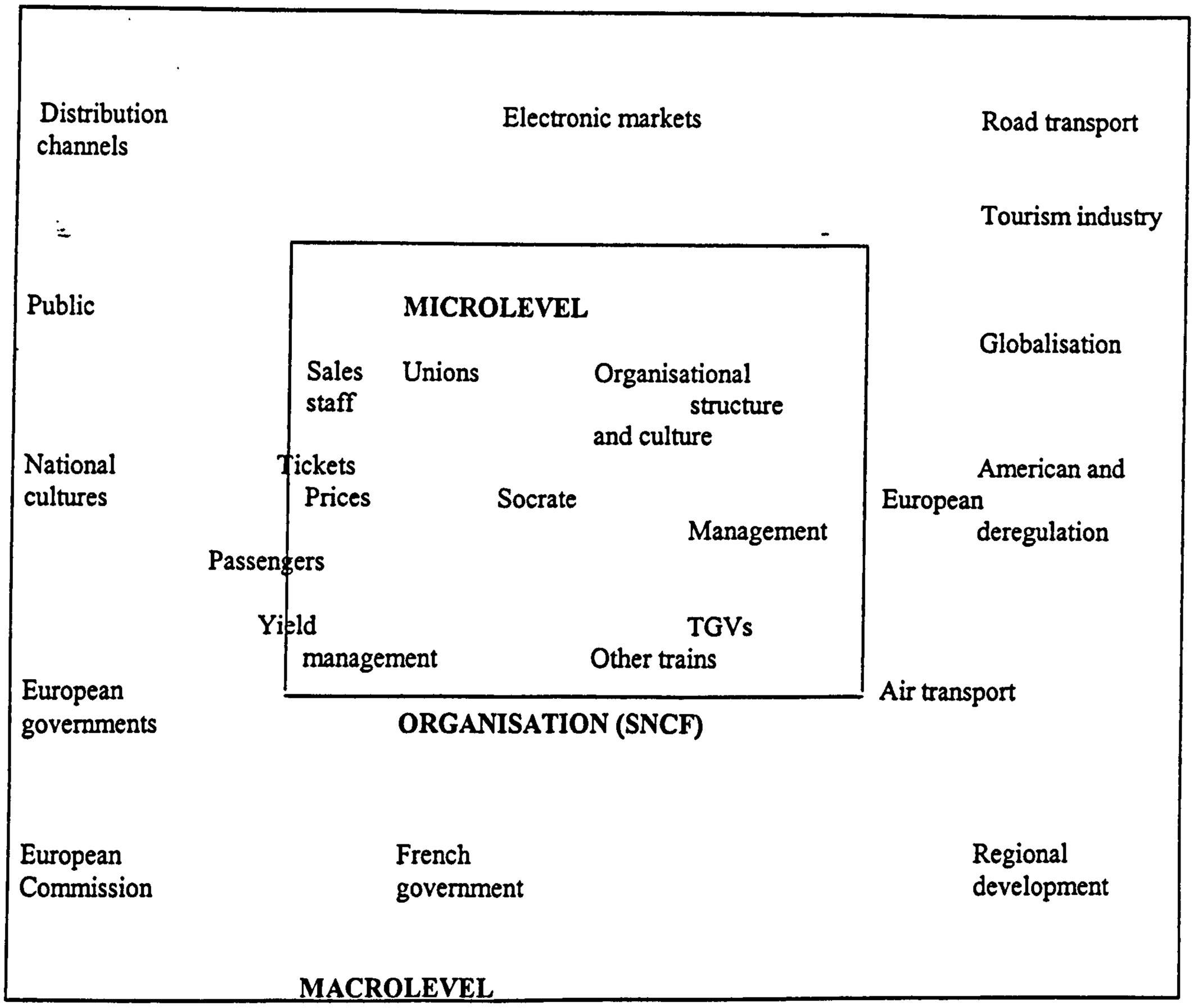

Figure 1.1 Actors and levels of analysis

1.3 PURPOSE AND OBJECTIVES

1.3.1 Failures?

The general purpose of this thesis is to understand the initial failure of the *Socrate* implementation at SNCF. It is argued here that this requires the appreciation of issues at micro, organisational and macro levels and of how they relate to each other, as introduced above. Beyond explaining this particular failure, the stance taken here is that the usual notion of failure is unhelpful. It belongs to a managerial and technicist discourse in which technology is seen as unproblematic. Managers and IS practitioners tend to envisage their technology as being neutral and evident, and these beliefs and

assumptions of obviousness need to be questioned. Reasons for failures are often expressed in statements such as: "the company obviously did not know how to manage change", "users showed resistance", "there was no leadership or vision", "the technology and business strategies were not aligned", etc. These, often retrospective, statements usually draw on the latest management fad, from total quality management, excellence, strategy, change management, reengineering, to empowerment and the virtual enterprise. Each new managerial discourse, usually devised by a management guru of some kind, competes with the previous one in its claim to solve and explain management problems, and introduces a series of new techniques, textbooks, measurements, tools, training packages, jargon, consultants and experts. What these managerial discourses have in common is a truncated understanding of organisations characterised by: a belief in 'rational' management; a denial of the permanent existence of power relations and conflict; a desire to eliminate organisational politics, for instance by using technology; a tendency to see organisations as individual closed entities, which have to survive in a hostile environment; a limited focus on the business environment (i.e. customers, competitors, suppliers) which ignores broader social, political, cultural, economic and historical perspectives. This narrow understanding of organisations colours the telling and explaining of failure and success stories. The explanations found in the IS/management literature are as simplistic for successes as they are for failures. They often take the form of lists of naive prescriptions; in the case of successes (e.g. have a champion, manage change, communicate the corporate vision to staff, etc.); in the case of failures they retrospectively try to find something/someone to blame, as if using IT/IS was a neutral, objective, rational exercise, which in the 'normal' course of event is successful and unproblematic. Often IS implementation activities are only partial successes/failures. What is a more useful exercise is unearthing the accounts various groups make of these stories at different times and for what reasons; this should lead to a much richer, more complex, and less manichaean picture of the use of information systems in organisations. Our analysis must therefore move away from managerialist and technicist explanations, not limit itself to the organisation as a closed entity and include the broader environmental perspectives mentioned above.

A first research objective is therefore to move beyond common (/sensical) explanations of failure and success, and find more complex and richer ways of describing and understanding the, in this case study, controversial use of information systems in organisations, through the inclusion of broader social, economic, political, cultural and historical perspectives.

1.3.2 The technical and the social

One of the current debates about IT failures is whether they are management or software failures [Flowers 1996]. Technologists blame management and managers get carried away with what they are told

the technology can do for them. This reflects a convenient dichotomy between the technical and the social. It is argued here that another way of looking at it is not to see the technical and the social as separate and stable entities. Technical and social choices are constantly negotiated and constructed, and their construction follows the same logic in successes and failures. Conversely, disentangling the interplay of actors and the construction of technical and social choices can be done by focussing on 'failure' studies since they can show that, at the beginning of and during a project, choices are not obvious or unproblematic, unlike what they appear to be in a successful project. Failure studies also allow for more complex explanations from actors (some interviews with SNCF staff lasted more than three hours and interviewees, having just lived a very traumatic experience, were incredibly soul searching and questioning). This leads to richer verbalisations of the complex links between technical choices and the social environment, and more readily so than in the case of 'successes' (such as *Sabre* at American Airlines), where choices tend to be seen as obvious.

> "The sociology of technology has borrowed from the sociology of science its programme - the analysis of the production of artefacts, as that of scientific facts - and some of its methods, whether in following scientists at work to describe the mechanisms by which they mobilise various entities, or in studying controversial cases to show how the social and the technical are allocated and constituted" [Akrich 1993:35, my translation].

> "Like the sociology of science, the sociology of technology has chosen as its methodological principle to use the same explanatory resources when reporting on successful and unsuccessful innovations. However, to challenge the impression of obviousness which can be given by technical choices that lead to devices which 'perform well', there is no better strategy than concentrating on failure cases to show that it is impossible to distinguish between good and bad decisions. Moreover, in failures and controversial cases, actors facilitate the researcher's work since they express the more complex relationships between technical choice and social environment" [Akrich 1993:36-37, my translation].

A second research objective, therefore, is to investigate how the technical and the social are combined and constructed when introducing an information system in an organisation, using the failure and controversial aspects of this case study.

1.4 THEORETICAL FRAMEWORKS

1.4.1 IS interpretive research

In order to find more complex and richer ways of describing and understanding the use of information systems in organisations, which can be used to analyse this failure case study, it is necessary to draw on several disciplinary bodies. The most immediately relevant academic tradition is the

interpretive work in IS research [e.g. Myers *et al* 1997; Walsham 1993; Walsham 1995a; Orlikowski *et al* 1996; Lee *et al* 1997]. Orlikowski and Baroudi [1991:10] observe that in the positivist tradition, when conflict occurs, it is seen as dysfunctional to the social system and is something to be suppressed or overcome. This is related to the theoretical perspective that human action is intentional and rational, and to the quest for universal laws, which disregard historical and contextual conditions as possible triggers of events or influences on human action [Orlikowski and Baroudi 1991:12]. In contrast to positivist rational-economic interpretations of organisational processes, interpretive methods of research aim at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by its context.

> "Context is concerned with the multi-level identification of the various systems and structures within which the IS is embedded. This can include such obvious elements as the organisational department within which the system is being used, the organization as a whole, and the various sectoral, national and international contexts within which the organization is located. (...) Human actors draw on elements of context, such as resources or perceived authority, to carry out actions, and this activity can reinforce existing systems of resource distribution or power, or can create new systems of authority or meaning. Thus human action draws on context or structure and, in so doing, reinforces existing structures or contexts, or creates new contexts. An investigation of this dynamic process of action/context interweaving is fundamental to an understanding of the process of organizational change within which the IS is one element" [Walsham 1993:5].

Within the interpretive tradition, the study of the interaction between IS and organisations has led to the development of many theoretical models. Markus [1983] is one of the firsts to have questioned commonly used explanations and assumptions about the implementation of information systems in organisations, particularly the notion of user resistance. She developed an 'interaction theory' as opposed to a people-determined approach (changing the people), a system-determined approach (fixing technical problems), or a people-plus-system approach (pick and choose from both). She states that there are no tactics which are useful in every situation [Markus 1983:441] and she draws on the concepts of power and organisational politics. However, her aim is still to predict resistance and generate strategies that will help to prevent resistance and deal with it, which may seem presumptuous. Markus and Robey [1988] examine the causal structures found in theories about the relationship between information technology and organisational change. Causal agency is classified into the technological imperative (technology as the causal agent), the organisational imperative (humans as agents of social change) and the emergent perspective (indeterminate interactions between technology and human actors). Markus and Robey state that the logic of change is either based on variance theories (antecedents are necessary and sufficient conditions for outcomes) or process theories (antecedents are necessary but not sufficient). Levels of analysis can be macro (societies and organisations), micro (individuals and groups) or a mixed macro-micro analysis.

The present thesis is strongly based on the emergent perspective, the process theory and mixing levels of analysis. This enables the exploration of the dynamic interplay among individuals, technology and larger social structures. Orlikowski [1992] uses Giddens' structuration theory and proposes a structurational model of technology, which underscores its socio-historical context, and its dual nature as objective reality and as a socially constructed product. The interaction of technology and organisations is "a function of the different actors and socio-historical contexts implicated in its development and use" [Orlikowski 1992:405].

1.4.2 Critical research

Ontologically, interpretive information systems research assumes the social world is not 'given' and that it is produced and reinforced by humans through their action and interaction. It is useful in capturing complex, dynamic, social phenomena that are both context and time dependent. Critical researchers, however, contend that the interpretive research philosophy does not recognise the inherent conflict and contradiction in social relations. Orlikowski and Baroudi [1991:18] identify four deficiencies in interpretive research:

- It does not examine the conditions, often external, which give rise to certain meanings and experiences;
- It omits to explain the unintended consequences of action; these unintended consequences of action are often a significant force in shaping social reality;
- It does not address structural conflicts within society and organisations, and ignores contradictions that may be endemic to social systems;
- It neglects to explain historical change; how a particular social order came to be what it is, and how it is likely to vary over time.

The critical research perspective offers a different view of the world than those of positivist and interpretive perspectives. Where the positivist and interpretive research perspectives are content to predict or explain the status quo, the critical perspective is concerned with critiquing existing social systems and revealing any contradictions and conflicts that may inhere within their structures [Orlikowski and Baroudi 1991:19]. System developers, for instance, exist only in the context of a society investing in IT as a form of production. Organisations cannot be studied in isolation of the industry, society, and nation within which they operate, and which they in part constitute. Burawoy comments that generalisation in critical research "seeks to illuminate the forces at work in society as a totality ... [an] extension from the micro context to the totality that shapes it" [quoted in Orlikowski and Baroudi 1991:20]. Critical organisational

sociologists [e.g. Knights and Willmott 1988; Knights and Murray 1994; Edwards 1979] argue that new technologies are designed and used to serve particular interests and they see organisations as a locus of conflict. Disagreements over technical changes are therefore an inevitable feature of organisational life, and not a consequence of poor management or resistant users. Gender aspects can be considered as a particular set of interests and Wilson and Howcroft [2000] for instance explore the role of gender in user resistance and IS failure. Academics in the field of critical management studies more specifically [e.g. Alvesson and Willmott 1992], maintain that management literature has been dominated by 'one best way' organisational models of change, which take the form of lists of prescriptions [e.g. Burnes 1992]; and that the dominant line in management texts presents politics as an aberration from a rational norm. They argue that change is a political process requiring the capacity to mobilise power resources. On the other hand, critical research has been challenged in that it may tend to be totalising or deterministic, assuming for instance that class is the primary determinant of antagonistic social relations. [Orlikowski and Baroudi 1991:23] claim that the form of theory and knowledge in this tradition is uncertain.

1.4.3 Sociology of technology

Another theoretical approach of interest is the sociology of technology. One of its constituent perspectives is the social shaping of technology [MacKenzie and Wajcman 1985] which points, like organisational sociology, to the socially contingent form of technology itself. It seeks to identify factors that influence the form or content of technology and the direction of technological innovation. For instance it argues that some technologies (e.g. typesetting machinery) are a reflection of male dominance in the labour market and society at large. Another branch of the sociology of technology, the social constructionist approach [Bijker, Hughes and Pinch 1987], has its origins in the sociology of scientific knowledge, which seeks to reveal key points of ambiguity or controversies between competing scientific claims and how one interpretation prevails over others. One of its principles is that all knowledge claims must be treated 'symmetrically' and that the explanation for their creation and acceptance rests on social factors, not the natural world. This relates to the earlier point made about treating failures and successes in the same way, symmetrically. A more extreme form, the relativist approach [Grint and Woolgar 1997], suggests that identifying circumstances such as the interests of particular social groups, which become embodied in technologies, is problematic, and is subject to interpretive flexibility. It is clear that recent work has tried to develop alternatives to technology-deterministic explanations, and to the essentialist perspective which sees technical capacity as inherent to the technology. Anti-essentialist positions such as social shaping, and social construction of technology share the view that "antecedent circumstances, i.e. design, manufacture and production, are said to be 'built into' and/or 'embodied' in the final product; the resulting technology is 'congealed social relations'" [Willcocks and Grint 1997:103].

Some important issues are however currently being debated within the sociology of technology field (for instance between Woolgar and Grint, on the one hand, and Kling, on the other, see [McLoughlin 1997]). The extreme relativist approach is criticised in that the influence of broader social structure and the roles of competing stakeholder interests are viewed as superfluous to the analysis of technology [McLoughlin and Harris 1997:17]. 'Strong' constructivism believes that technology sociologists should not adjudicate between different claims and constructs of technical capacity. In strong constructivism, the process of technological change and its outcomes, is seen as almost entirely locally constructed, negotiable and contingent. Technical capacities are not fixed but indeterminate and open to interpretive flexibility, not only during conception, design and development but also in its use. The problem revolves around how technical capacities (associated to the notion that, once technology is socially shaped, it becomes stabilised and can have independent effects) are perceived. Kling thinks technical capacities (of computing and information systems specifically) influence how technology is used; Woolgar and Grint think this is technicist and unacceptable, and that, ironically, it becomes technological determinism in that the "artefact has a definitive character and effect" [Woolgar and Grint, quoted in McLoughlin 1997:214]. On the other hand, constructivists are criticised for denying a 'critical dimension' to social analysis and its ability to challenge "traditionally held views about the political neutrality of technologies and the links between social advantage and technological innovation" [Kling 1992:351], and for their scepticism towards broader social and economic structures of power and interest:

> "These 'material' or 'structural' phenomena, just as with technological artefacts and systems, are it is insisted created anew by social actors within the context in which they act (...) [It is suggested] that factors such as class, power and politics should be seen as 'effects' and not 'causes' of social action" [McLoughlin 1997:216].

It is clear that, as Orlikowski [1992] has remarked, theory and research on the question of the relationship between technology and organisations remain at best "ambiguous and conflicting". Organisational sociologists are blamed for over-stressing social choice at the expense of technological influences. At the other end of the spectrum, constructivists are accused of seeking to eliminate any distinction between the social and the technical. This thesis is not intending to address the in/commensurability of paradigms and different theoretical approaches; on the other hand, this debate highlights some important issues in investigating organisational changes, such as those involving computing and information technologies.

The specific case study investigated in this thesis is also an appropriate challenge: it clearly involves actors and their interpretations of organisational situations, the social configuration and reconfiguration of technological systems in both their production and consumption within adopting organisations, as well as their interaction with broader social and economic structures of power and

interest.

1.5 RESEARCH QUESTIONS

1.5.1 Sociological analysis

Research on information systems and organisations has only recently moved away from managerialistic and technicist interpretations and positivist and essentialist ontologies. IS researchers have only begun to explore the use of interpretive sociological approaches such as structuration theory [Walsham 1993], hermeneutics, critical social theory, relativism [Sahay *et al* 1994; Wilson 1999], social shaping, social construction, constructivism [Whitley 1999] and actor-network theory [Walsham 1997]. It is hoped that the complexity of this case study can provide enough material for pursuing a similar line of enquiry. Conversely, an important research question is to assess how current forms of sociological analysis, of technology more specifically, can make better sense of this material than the common explanations found in the management and IT literature. The initial research objectives (**Section 1.3** above) have already used the notions of symmetry (between failure and success) and of the construction of the social and the technical, which originate in the sociology of technology. Actor-network theory, in particular, tries to avoid both forms of extreme determinism, social determinism and technology determinism. It attempts to transcend the distinction between the so-called 'social' and the so-called 'natural' world [Callon 1986] and stresses the contingent nature of networks and network building. An actor network is configured through the enrolment of allies (both human and non-human) into a network by means of negotiations; the 'sociology of translation' aims to describe, rather than explain, the many transitions taking place when networks are constructed.

Thus, the major research question this thesis seeks to address is whether and how an anti-essentialist sociological analysis can be used to describe the translations and negotiations leading to the socio-technical actor network of the introduction and use of Socrate at French Railways; what further insights this can provide compared to essentialist managerialist and technicist accounts; and what are its associated difficulties and challenges, in particular, how it can accommodate or be reconciled with more critical concerns of power and interest issues.

1.5.2 Technology and change at SNCF

A scientific statistical computer model was used by SNCF to redesign computerised ticketing and reservation systems, address financial objectives and redefine the notion of transport. This considerable

shift was envisaged as a purely technical change and was assumed to be unproblematic in practice. This proved to be a serious mistake since social and political factors and power relations cannot be suspended and a technical solution imposed. Implementation difficulties and market, economic, political and cultural differences in the transfer of *Sabre* from American Airlines to French Railways illustrate how complex change, the use of technology and the development of socio-technical actor networks are. The research seeks to understand the links between the strategic and political aims and the technical choices and how actors interpret and appropriate technical tools. It attempts to describe events as they unfold from the perspectives of actors and networks involved. Although problematic in that it interprets events using perhaps artificial categories, more specific research questions are formulated in the three following groupings:

- ***At an organisational level, how the transfer of an American airline reservation system was perceived at SNCF to play a crucial part in the changes brought forward and witnessed by staff and customers;***

- ***At a micro-level, how this system was associated with a dramatic change to the ticketing, pricing and selling policies and practices, and how this change was carried out (or not) and experienced;***

- ***At a macro-level, how these changes are related by actors to the more general political and economic context of deregulation in the European transport industry and how this type of software is seen as intervening in the competition between rail, air and road transport markets.***

1.6 ASSUMPTIONS AND LIMITATIONS

This thesis concentrates on the introduction of *Socrate* in 1993 and its immediate aftermath, as well as the subsequent events, until the beginning of deregulatory measures at SNCF with the split between infrastructures and operations in 1997. The antecedents and historical context of *Socrate* are also examined, going back to the early 80s when the first computerised reservation system *RESA* was put in place at SNCF, and when TGVs were first introduced together with some differentiated pricing. It includes some history of CRS, *Sabre* in particular, and US airline deregulation in the 80s. The aim is to study some of the 'antecedent circumstances' of technology, using Grint and Woolgar's [1997] expression, although as they point out, there is a fundamental dilemma in trying to "locate the origin of action and behaviour either in the essence of an entity or in the circumstances antecedent to the entity" [Grint and

Woolgar 1997:69]. They also warn about "the temptation to get wound up in disputes about whether one of another category of antecedent circumstances is the more appropriate essence of the machine" [Grint and Woolgar 1997:114]. It is clear that the choice of antecedents in this thesis is subject to debate.

However, there is no 'true' representation of the world and we are interested here in histories, narratives and representations of technology, so as to analyse the way in which certain technologies gain specific attributes. Moreover, Czarniawska-Jorges [1995], an organisational sociologist, argues against the distinction between the logo-scientific mode of knowing (which requires proof of truth and falsity) and the narrative mode of knowing (or everyday knowledge) and claims that they might have more in common than anybody wishes to admit. She reasons that by overcoming this distinction "one can envisage an alternative of creating an interpretive space which will be able to contain many approaches and relate them to each other without ascribing them strict positions" [Czarniawska-Jorges 1995:14]; and that this might generate a dialogue between practitioners' realist narratives and researchers' theoretical interpretations. In fact, she found that:

> "When in the field (...) researchers picked [narratives] up when nobody was looking in order to take them home and beat them into a scientific shape. In final reports, narratives were serving a subordinate role: filling in the gaps, providing illustration and entertaining the reader when the main argument became too heavy" [Czarniawska-Jorges 1995:14].

This stance implies that explanation or interpretation depends on the intentions of the narrator. The present author therefore is left with the task of trying not to offer (or think of it as) a 'true' representation, but of proposing convincing enough representations and a persuasive enough argument as to how different interpretations construct rather than reflect the phenomenon at stake [Grint and Woolgar 1997:33].

1.7 ORGANISATION OF THE REMAINDER OF THE STUDY

The literature review in **Chapter 2** concentrates first on IS failures analyses and shows how their focus has shifted from individuals and systems to organisations. IS failure models have also evolved from stakeholder models, structural models, to contingency and contextual models. Similarly, the analysis of management failures has developed from functionalist to more radical analyses of rational decision-making, best illustrated by Drummond's research on *Taurus* [1996]. Two contrasting analyses of technology failures demonstrate the superiority of rich ethnographic research and of an interpretive sociological perspective that ties social structures, culture, managerial decision-making, power, organisations, and technology together. To gain such a rich understanding, we must acquire better tools for analysing failures, and it is therefore necessary to explore relevant elements of various social theories.

The sociology of technology is introduced, with specific attention given to actor-network theory, the notion of symmetry between the social and the technical, and the sociology of translation. Critiques of

actor-network theory are then reviewed, leading to an overview of critical approaches such as politics, power/knowledge, institutional analysis, frameworks of power, and unintended consequences, and to the theoretical debate about micro and macro approaches to sociology. Following Drummond's example [1996], the distinction between macro, 'meso' and micro levels of analysis shows promise in fulfilling this thesis's objective. The chosen research methodology attempts to do justice to the complex realities of social life in organisations and their wider social and historical context. It is typical of longitudinal in-depth case studies and includes a variety of techniques: audio-taped intensive interviewing, group discussions, observations and hands-on experience, research material such as public domain official reports and analyses, secondary sources and press reports, internal documentation such as technical reports, training material, memos (some confidential), audit reports, as well as specialised transport literature.

Chapter 3 starts at the organisational level by outlining: the reasons SNCF management gave for the purchase of *Sabre* (e.g. need to increase capacity); the history of this system at American Airlines and how it was seen (and is still seen) by many IT academics and practitioners as a major strategic success; the modifications carried out on the US air reservation software to turn it into a French rail computer reservation system; and the new yield management and optimisation techniques the software included. A first translation therefore concerns the appropriation of an air computer system for a rail company and can be referred to as a strategic formulation or interpretation of the purpose and use of this technology on the part of SNCF. It also relates to macro issues, which link socio-economic conditions to organisational analysis and individual and group action [Knorr-Cetina and Cicourel 1981].

Chapter 4 examines some of these broader macro perspectives which were called upon as a justification for introducing *Socrate*: how the French rail industry is evolving from a public monopoly situation to one of increased inter-sectorial competition; the deregulation of European transport and the planning of high-speed trans-European networks; the different liberalisation regimes in European member states; the issues of European, national and regional economic development.

The political debate about the deregulation of public transport is then explored by comparing US air and European rail transport deregulatory moves. It highlights the social and economic conflicts between competition, co-operation and complementarity in inter-modal and intra-modal transport. The transferability of the deregulation model from the US to Europe, and from air to rail is questioned. The role computerised reservation systems are claimed to have played in the restructuring and deregulation of the US airline market is examined. The complexity of these changes underlies SNCF's strategic choices and its decision to buy *Sabre*, which was seen as a mechanism through which American Airlines responded to similar market changes in order to gain competitive advantage [Hopper 1990; Doll 1989]. A second political translation therefore complements the strategic translation from an air to a rail reservation system, reflecting a certain political reading of environmental changes and construing the technology as an

independent agent capable of intervening in this environment.

Chapter 5 returns to the organisational level of analysis by examining the new commercial techniques to manage passenger travel, which can be traced back to differentiated pricing techniques initiated by SNCF (when it launched its fast TGV trains) in the early 80s. More sophisticated differentiated pricing was made possible with *Socrate* and its yield management techniques and is intrinsically linked to, and inconceivable without, the use of powerful computer and information systems. From an economic and financial perspective, not only does the use of yield management techniques and sophisticated information systems fulfill a need to balance the books, it can also become a management tool for maximising profitability through market segmentation. It is shown that this erodes cross subsidising and leads to new controversial notions of access to transport and pricing, towards which the new information systems are geared. At a micro-social level, for passengers, these systems were associated with a new marketing culture which implied an unwelcome change in buying and travelling patterns; this is a third translation for passengers, who interpreted the technology as facilitating demand control and price discrimination, which led to resistance and problems.

Chapter 5 explores the link between *Socrate* and the successful TGV innovation as the latter can be seen as an important antecedent to *Socrate* through pricing primarily. Revisiting this past success enriches the understanding of the CRS failure. It helps see how innovation is a complex and uncertain process with unpredictable elements, that emerges when various entities are associated to a problem with many aspects which interest them all, even if these interests are different. Both innovation processes were situated in similar contexts, leading to similar negotiations, perceptions and conflicts about the survival of rail and the 'modern' nature transport.

Chapter 6 highlights that the micro-social level, as represented in the interactions between management, technical and sales staff, passengers and the computer system, is related to the previous macro and organisational levels. As actors, sales staff not only reacted to the technical system but acted in a much broader and problematic organisational and economic context which can be described as one of maximising profits, implementing productivity gains, reducing over-capacity, streamlining unprofitable lines, etc. A fourth translation takes place in that the technology is seen as associated with a change in the organisational culture, away from a public service ethos (particularly for the sales force), leading to tensions and clashes. This chapter concentrates on the individual and group level as follows:

- How these changes are interpreted, experienced and appropriated by SNCF employees, managers, passengers (now 'clients' who are expected to become rational customers), pressure groups, consumer associations and public opinion at large; the activities of SNCF sales staff and of distribution outlets; the regional actors, government officials, union and political representatives.
- In terms of skills, competencies and human capital within the organisation, the transformation of

certain jobs reflect and oppose different rationalities. For example, the yield management expert straddles the lines between marketing, operations and distribution. Sales jobs are now heavily standardised and monitored through a complex computer interface. Together with ticket inspectors, sales staff now has to control as well as assume a commercial and marketing role with customers.

Focussing on the organisational and macro levels again, **Chapter 6** also examines how these new information systems are credited with generating organisational, industrial and market changes in terms of infrastructures, operations and transport planning. At an organisational level, a traditionally engineering-orientated company, SNCF is beginning to give predominance to computer specialists, accountants and marketing experts. And now that the marketability of specific route segments is supported by the information systems in place, different organisational forms are emerging within French Railways and in the European rail transport industry. One of the tenets of rail deregulation is that infrastructure costs and the running of trains operations should be accounted for separately; through the accumulation of data in the computerised reservation systems, it is possible to link profit and cost information much more precisely and accurately for each route segment. In a final translation, this technology is therefore seen as transforming and restructuring this market sector.

In conclusion **Chapter 7** reviews the main findings of the thesis and summarises analytical insights about each translation:

- Strategic translation and the socio-technical role of yield management;
- Transport deregulation, economic relations and political translation;
- Pricing, customer ethos and consumer rationality;
- The TGV as an antecedent technology with modern cultural connotations;
- Organisational culture, systems and actors and managerial transformation;
- Potential IT-induced market restructuring and electronic markets.

Clegg's circuits of power are used to complement non-essentialist actor-network theory and the sociology of translation: by identifying the effect of power relations on the constitution of successful and unsuccessful obligatory passage points through failed problematisation, mobilisation and dissidence. Social constructivism is concerned with how actors' claims about technical capacities are constructed. Discourses and preoccupations related to transport are the link between technology and globalisation, and the concept of techno-nationalism. They are drawn upon as social explanations and are examples of a blurring of boundaries between the social and the technical. They are briefly addressed in relation to the case study, before contributions, limitations and areas of further research are suggested.

For ease of understanding, and to structure the analysis into a coherent argument, the remainder

of this work retains the distinction between micro, macro and organisational ('meso') levels of description and analysis. The concept of 'translation' from one set of interpretations to the next is also used throughout the thesis, to build a series of translations which help understand the formation of this complex actor network. Each chapter of the thesis represents one of these translations, as represented in [**Figure 1.2**].

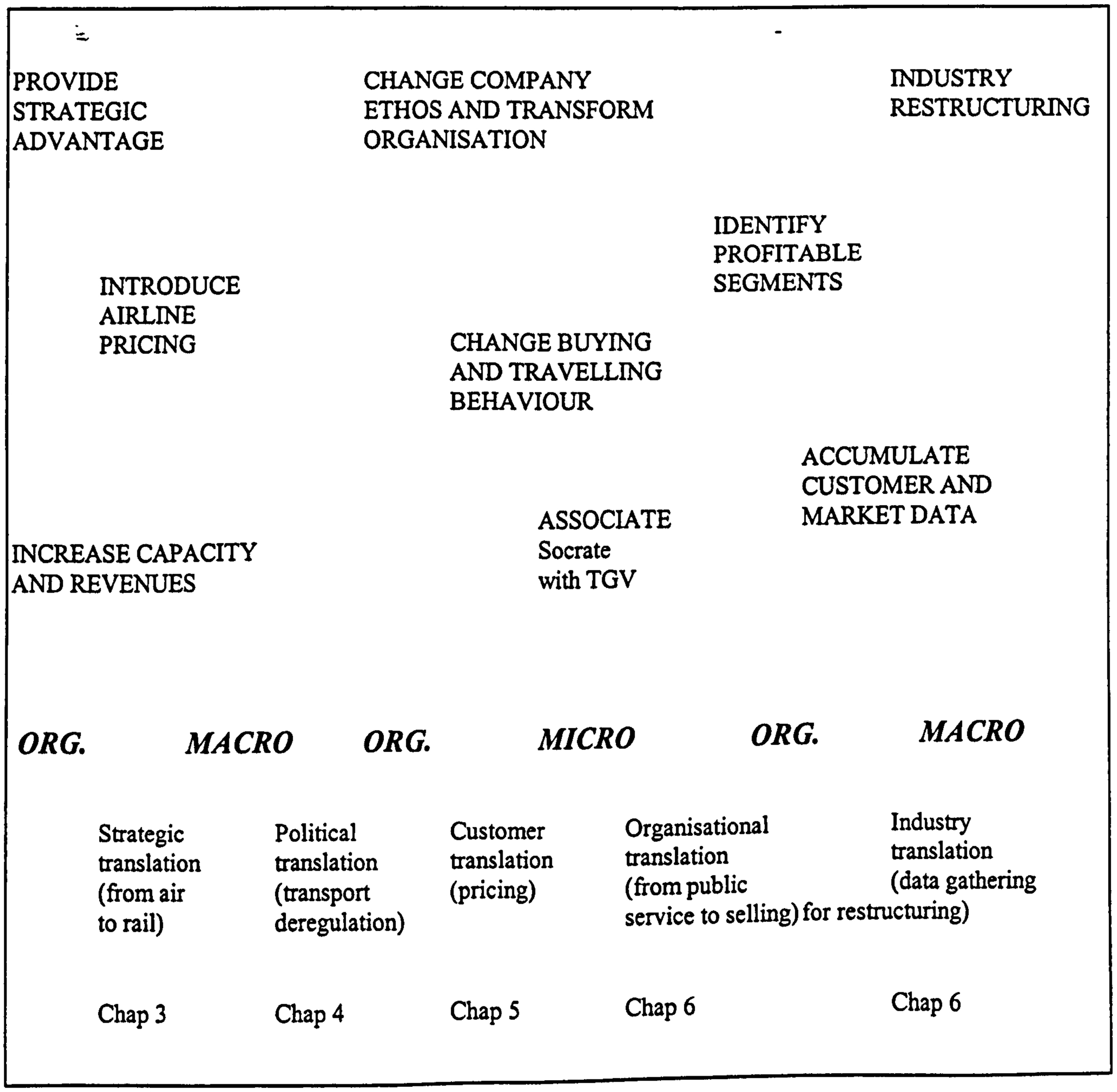

Figure 1.2 A series of translations

CHAPTER 2

LITERATURE REVIEW AND RESEARCH METHODOLOGY

The research literature on failures is first reviewed. It is clear that the disciplines of engineering and information systems and their functionalist epistemologies have only provided limited explanations of failures in the past. Nevertheless, they have evolved from trying to allocate blame onto individuals, perceiving failure situations as systems, to identifying causes as coming from organisational factors, and considering stakeholders, organisational structure and culture, contingency and context. In doing so, they have drawn upon other disciplines such as management and organisation theory. Furthermore, technology failure analyses such as Vaughan's [1996], use an interpretive and ethnographic approach to understand the actors' views in order to build a complex understanding of the *Challenger*'s disaster; and Drummond [1996] adopts a quasi-critical perspective to question the notion of managerial rationality in the decision-making escalation which led to the *Taurus* fiasco. As exemplified in these two major studies of technology failures, sociological frameworks enable us to move beyond functionalist explanations of failure. The chapter discusses the evolution of understandings of failure, and contends that it is structured along the three dimensions represented in **Figure 2.1** below.

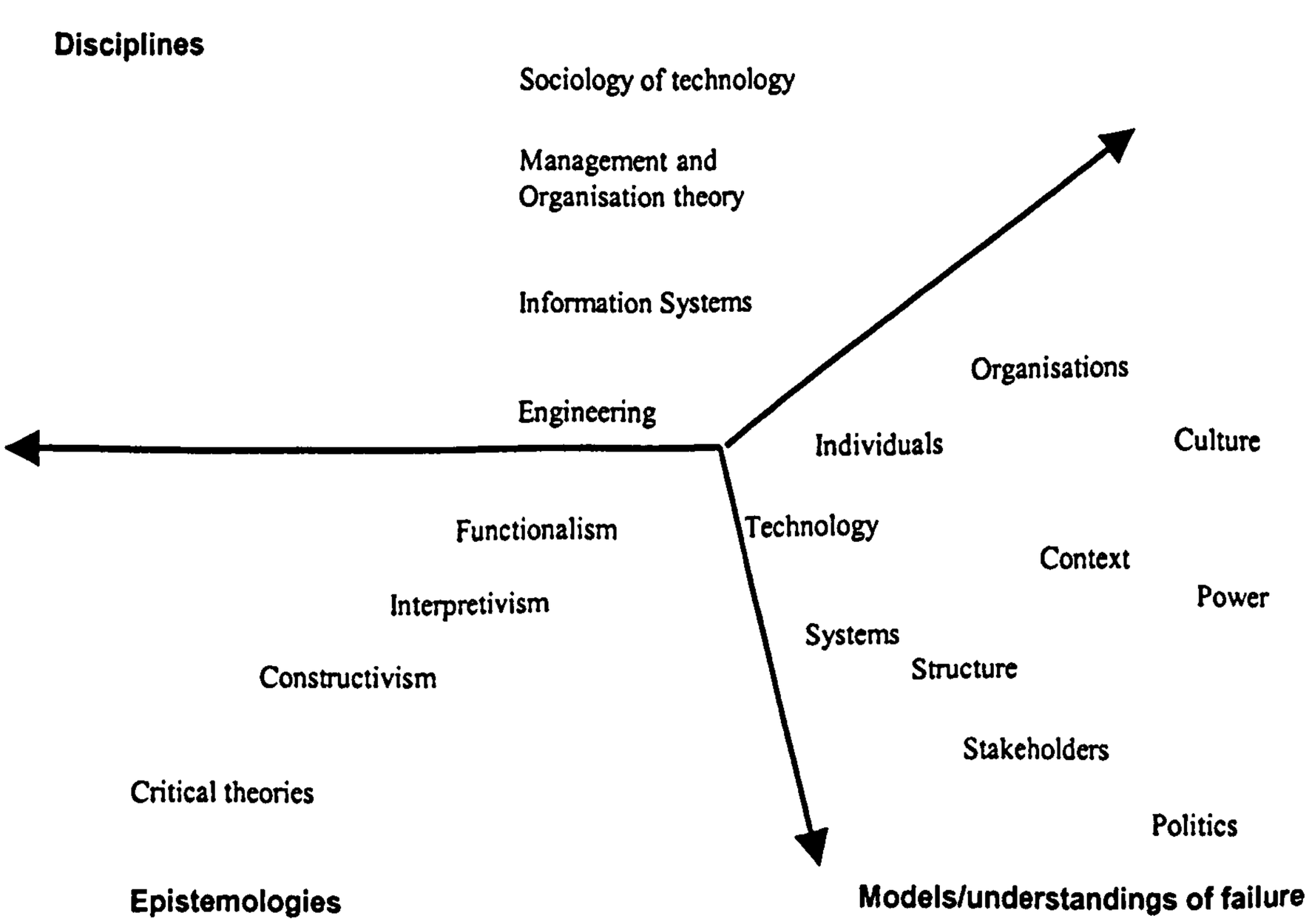

Figure 2.1 Evolution of understandings of failure

A particular sociological framework that pays great attention to technology is actor-network theory. It is a constructivist approach to the sociology of technology, and is reviewed next with a particular emphasis on symmetry and the sociology of translation, both of relevance to this thesis. Truex and Baskerville [1998:99] argue that:

> "importing (..) theoretical constructs from one discipline to another is intellectually stimulating and inherently healthy for expanding both the generality of the construct and the understanding within the receiving discipline" but that "however when such constructs are first borrowed, they must be abbreviated extensively as it is problematic to import an entire, fully developed paradigm at once".

Truex and Baskerville [1998:110] also warn that "in so borrowing concepts (...) that are not taken for granted, [one also] borrows the controversy". ANT has been criticised for disregarding macro social structures and for its weak capacity for explanation (as opposed to description). Accordingly, elements of social theories relating to politics, power/knowledge, institutional analysis and unintended consequences are selected for review as they relate to the case study material. The macro-micro question is shown to be complex and unresolved. The strength of actor-network theory (ANT) is in its methodological approach and as an analytical device, in that describing a network in detail is a good contribution to building an empirical base. It is therefore useful as a theoretical framework, and a variety of research methods were used to build as close an account as possible to a rich longitudinal in-depth case study and its wider social and historical context.

2.1 FAILURES

Research work on technology-related changes, on the relationship between organisational change and information technology, and on implementation failure issues has been carried out by academics (e.g. Fortune and Peters [1995], Latour [1996], Vaughan [1996], Drummond [1996], Sauer [1993], Flowers [1996]) in many industrial and commercial sectors, such as the health service (e.g. Beynon-Davis [1995], Robinson [1994], Bloomfield [1995]), the public sector (Myers [1994]) and the financial services sector (Knights and Murray [1994]). This work reflects many different theoretical perspectives: managerialist, sociological, ethnographic, positivistic, systemic, interpretive, the sociology of technology and innovation, the sociology of mistake, decision-making theories, etc.

It is clear that failures in general (technology or IS) emerge from a complex interaction between human and technical components, and, unlike Sauer [1993:21], it is believed here that the study of IS failures can learn a great deal from existing work on 'other' failures. In this chapter, IS or computer failures in general are first examined and the progressive shift of focus from technology to people, systems

and organisations is reviewed. Failure models suggested by IS researchers are then summarised, leading to a foray into management failures through the example of escalation of decision-making during the *Taurus* project. Finally, two approaches are contrasted to illustrate how technology failures can be analysed using systemic and sociological perspectives. The latter ethnographic work illustrates how the Challenger disaster can be analysed using the notions of power, structure and culture in order to go beyond a managerialist and rationalist account.

2.1.1 IS failures

Information technology failures have attracted renewed public attention in recent years, due to a series of spectacular cases in the UK: the failed and tragic introduction of a computer-aided dispatching system at the London Ambulance Service [Watts 1992; LAS 1993; Beynon-Davies 1995; Robinson 1994; Flowers 1994]; *Taurus* (Transfer and Automated Registration of Uncertified Stock) at the London Stock Exchange [Willcock 1993; Drummond 1996]; the failed integration of computer systems at Wessex Health Authority [Kelsey and Brown 1993]; the alleged £77M write-off of a computer system at the Foreign Office and a computer project abandoned at the Ministry of Defence at a cost of £10M [Kelsey 1993a]; the controversial cost of energy settlements information systems in the privatised electricity industry [Kelsey 1993b]; nurses' difficulties with data collection for NHS information systems [Brindle 1995]; the collapse of the Read project intended to facilitate the creation of an individual's medical computer record [Brindle 1996]; another City computer 'bungle' [Murphy and Saigol 1997]; the Inland Revenue's legal battle with EDS over the embarrassing failure in the processing of the 1997 income tax self assessments [Farrell 1997]; and more recently the Passport Office fiasco which delayed and ruined the summer holidays of people applying for passports in 1999 [Hencke 2000]; also outside the UK, for instance in France with the computerisation of the French judicial system abandoned after having wasted 3.4 billion francs [Chemin 1993; Jacquin 1993; Leclerq 1993] and the difficulties with the computerisation of the child benefit allocation systems [Canard Enchaîné 1995]; the loss of the European *Ariane V* rocket which exploded after take-off due to a major software design flaw [Irwin 1996; Phillips 1996]; and in the US with the failed implementation of an automated baggage-handling system at the Denver International Airport [Montealegre 1995].

As early as the 1960s, computer specialists began to be concerned that computer software development was being marred by overspends, delays, inefficiencies, and operational problems ranging from bugs to catastrophic failures. In 1994 an ESRC-PICT (Programme on Information and Communication Technologies) Policy Research Forum gathered world experts to discuss information and communications technologies (ICT) failures and make some recommendations to help avoid failures in the future [Dutton *et al* 1995]. A shorter version was later published in [Peltu *et al* 1996]. They examined

three case studies, the London Ambulance Service and *Taurus* mentioned above, and the USS *Vincennes* shooting of an Iranian Airbus in 1987. One of the experts involved, MacKenzie [1994] found that despite the many worries about future failures, the actual record of ICT-related accidents and deaths (up to the end of 1992) compared favourably with the history of general engineering developments. However, some experts warned that "increasing pressures to earn money in highly competitive markets could still lead to 'bigger and bigger mistakes' as the use of complex and interrelated ICT systems escalates" [Dutton *et al* 1995:5].

Attempting to classify ICT disasters was inconclusive; but a number of contrasting kinds of systems and environments were offered to "show the way in which disasters tend to be contingent on organisational settings" (p.7), such as the complexity of the system, how tractable the problem was, radical versus incremental progress, mandatory versus voluntary change. There was some disagreement as to how information technology differs from other technologies, although it was clear that this should not inhibit learning from the experiences of others (p.8). It was noted that people at operational levels, for instance pilots and drivers, tend to be blamed for failure, "whereas more fundamental management and systemic flaws are often the root cause of the many problems caused by increasing use of complex integrated socio-technical systems" (p.23).

In the context of IS, systems developers and software engineers are often the ones blamed for failure, like 'pilots and drivers'. More specifically, when the implementation of an information system in an organisation fails, it may be attributed to a technical failure in information gathering and made the responsibility of specific developers. Clarke [1991] argues that the approach that characterises systems as products for and by individuals obscures the social nature of work and organisations. In other words, the social relations of power invested in systems development mean that 'problem' individuals are located as the cause of systems failure; whereas information systems development should be viewed "as a set of social practices intervening in organisational discourses", and deliverables should be viewed "as texts implicated in the social construction of meaning in organisations" [Clarke 1991:60]. He claims that commonsensical 'liberal-humanist' discourses obscure problems and contradictions revealed in practice, "which might explain how system failure is often explained away as a failure to collect enough data" [Clarke 1991:62].

The PICT experts noted a growing acceptance that technical risk factors "cannot be extricated from 'softer' psychological, social and organisational influences" [Dutton *et al* 1995:8] which are less amenable to definitive solutions. Some felt that political, social, economic, technical and organisational factors are so interwoven that they must be considered together at all stages; and that is why "there is no magic 'silver bullet' such as a new regulatory regime or a set of technical fixes which can solve problems in all circumstances" (p.9). "Too many computer scientists believe software and organisational design can be represented by two dimensional drawings and mathematical models, although these can never

adequately represent the myriad social interactions involved" (p.28). Many decisions in the lead up to ICT disasters may be rational in terms of their specialist domains, but these interact to produce failure. Despite these observations, the PICT report prescribes standard management techniques such as informed decision-making, leadership, project management methods, quality management, risk management, training, regulation and standards. More interestingly, some of the dilemmas recognised during the Forum, and of relevance to this thesis, are as follows [Dutton *et al* 1995:48-49]:

- A pragmatic desire for relatively simple prescriptive solutions versus the acceptance that ICT systems are intrinsically complex and context-dependent;
- Seeking 'best practice' guidelines versus analyses based on specific cases and contexts, which view such guidelines as 'cookbooks of bland platitudes';
- Studying the uniqueness of ICT systems versus exploring the ability to share knowledge from other technologies and disciplines.

This thesis aspires to avoid prescriptive solutions, cookbooks and platitudes and to learn from other technologies and disciplines. The Forum recommends the promotion of multi-disciplinary research projects. Two of the 'cross-cutting' themes (p.53) identified are of interest here: the way in which innovation progresses and how management cannot assume a predictable translation of ideas into successful working systems; and approaching the 'politics of blame' with caution as it often reinforces the interests of powerful actors and deflects attention from the underlying causes. This thesis is not concerned with some of the other themes suggested by PICT, for instance, the emphasis on the psychology of organisational decision making, cognitive dissonance and individuals' mental models of reality. Common explanations of IS failure and success are critically examined next.

2.1.2 Reasons for failures and successes: shifting the blame

From technology to people

When perceived as technology failures, purely technical solutions are often suggested, such as computer simulations, which can show how a complex computer system will work before any money is spent on development or installation [Moran 1994]. MacKenzie [1994:234] states that it is too narrow to include as computer-related only cases of 'technical' failure of a computer system, and that cases where there has been a breakdown or error in human interaction with the system should be incorporated. The emphasis on people as opposed to the technology itself, inappropriate or faulty, is present in various forms in the literature. Poor management, ignorance of information technology, human error, poor training, lack

of consideration of human factors, are some of the explanations commonly put forward. A typical recommendation is to get human factors and organisational design specialists' advice at the system design stage [ACOST 1993; Patel 1993]. However, the following view is still quite common. Jones [1995] examined six software industries and found that poor software development management tends to be the primary root cause for many failures. He recommends good software development practices such as software and professional standards, training, software metrics, software quality norms, licensing and accreditation. He argues that software engineering has not yet reached maturity, like medical practice in the 1890s [Jones 1995:264]. This argument, often vocalised by software engineers, shows a naive faith in a 'normal' and scientific road to engineering progress and perfection. This is highly questionable: the medical profession is not particularly immune to accidents and failures and the sociology of professions [McDonald 1995] has a much more sophisticated account of the emergence of professional expertise... Jones's account [1995] supports a belief in professional remedies such as project management and quality control techniques, which leads to blaming the 'pilots and drivers' (as covered above) for not knowing or applying these techniques properly.

In a similar vein, Neumann [1995] studying computer-related risks in a series of sectors (e.g. telecommunications, aviation, medical health, military) found that problems which occur during system development "often involve people as an underlying cause" (p.6). Requirements are inconsistent, design is misconceived, maintenance is sloppy, and outputs are misinterpreted. He suggests well-defined and socially enforceable social policies such as codes of ethics, educational processes, more enlightened management and responsible employees and users. He concludes: "technology by itself is not the answer to any vital social questions (...) More fundamental human issues must be considered (...) technology can have a constructive role to play if it is kept in perspective" [Neumann 1995:306]. This seems reasonable and cautious liberal-humanist advice; but the blame is put on fundamentally flawed humans who include users, managers, employees as well as designers, and who have to be disciplined to use an intrinsically objective and useful technology.

From people to systems

Perrow [1984:5] presents a more convincing analysis by coining the term "normal accident" which signals that, given the system characteristics, multiple and unexpected interactions of failure are inevitable and that the cause of accidents is to be found in the complexity of systems. Researching the Three Mile Island nuclear accident, Perrow [1984:7] suggests that each individual failure (e.g. procedures, design, operators) is trivial by itself and that it is the interaction of the multiple failures that explains accidents. Accidents cannot be entirely avoided and quality control, training, design experience will not be sufficient. He explores the links between complexity, tight and loose coupling, and de/centralisation of

organisational structures and control (p.330). His theoretical approach is to see human constructions as systems, not as collections of individuals (p.351), whether designed by engineers and corporate presidents, or the result of unplanned, unwitting, slow evolving human attempts to cope. As human constructions, humans can destruct systems or reconstruct them, which leads to his quite sensible recommendations: abandon a project if it is beyond your capabilities; redesign a faulty project, regardless of short-run costs; regulate a project, regardless of the imperfections of regulation (p.351). The value of Perrow's work is in how problems are seen as not coming from individual motives or errors, and how he redirects attention towards systems, technological and economic. Certain technologies are so inherently unsafe that what is called "operator error" is actually made inevitable by the way in which parts of a system are related.

From systems to organisations

The notion of system has been broadened by many researchers to include the 'behavioural and organisational factors', seen as essential ingredients of successful - and by implication causes of unsuccessful - implementation and use. Of the hundreds of studies that have been conducted on the successful implementation and use of information systems, there are almost as many different measures of success as there are research studies. Pinto [1994] has assembled some of the most commonly identified critical success factors (CSFs), from literature based on surveys of IS projects in a broad range of organisational sizes, types and environments in the UK and the US. Some of these CSFs are: management decision rules and procedures (p.47); use and acceptance of the new system by the intended users (p.47); consensus (p.45); effective management control over the political and cultural aspects of implementation (p.45); balance between technical focus and human side (pp.59, 65); clear objectives, personal/team motivation, client/top management support, personal ambition, financial support, leadership (pp.61-63); organisation enthusiasm, satisfaction with project, project manager's human skills, team capabilities, job security (pp.64-65); project mission, client consultation, monitoring and feedback, communication (p.73). Some [Wastell and Newman 1996] even diagnose failure and user resistance as related to stress and recommend the use of psycho-physiological techniques for monitoring psychological pressures during IS development.

The success or failure of technological systems is not due to individuals only and is now related to 'behavioural and organisational factors' such as organisational politics, culture, psychological concerns, managerial competence, user participation, training and human resource management. The 'problem' areas within project implementation have moved from individuals to 'organisational' factors. The next section concentrates on how some IS researchers have tried to analyse failure in this organisational perspective and some of the models they have developed are critically assessed. Approaches from other disciplines are

then discussed in the following sections.

2.1.3 IS failure models

Stakeholders

Lyytinen and Hirschheim [1987] offer the concept of 'expectation' failure, a notion which encompasses correspondence (system does not fulfil objectives), process (failure to produce a system) and interaction failure (users do not use the system). They define it as "the inability of an IS to meet a specific stakeholder group's expectations" (p.263). Sauer [1993:24] criticises this notion in that it belongs to the "politically equitable stance of total pluralism", whilst he recognises its value in making explicit the fact that failure is relative to interests which may differ among stakeholder groups, and in that it makes it clear that failure is an evaluation rather than a description.

A model suggested by Sauer [1993] is that of a 'natural' system in which IS project organisations pursue their survival through their work on an IS which is intended to serve supporters well enough to yield the support needed for the project to survive. He uses a 'triangle of dependences' in which the IS depends on the project organisation, the project organisation depends on its supporters, and the supporters depend on the IS [Sauer 1993:30]. The task of the project organisation is twofold: the process of developing and operating the information system, and the process of managing support. "Thus it is the interaction of difficulties in the innovation process and difficulties in managing support that leads to failure, not the one, nor the other" [Sauer 1993:318]; lacking a base of power from which to negotiate, the project organisation will be unable to offer any incentives to supporters. Sauer suggests (p.321) that "further research is needed to examine *in toto* the behaviour of all relevant supporters". This is similar to PICT experts' advice to focus on the humans involved in the process rather than on formal project management methods, in order to secure sufficient resources, influence decision makers and shape policies [Dutton *et al* 1995:33].

Throughout these formulations of failure, there is an undercurrent which assumes that, if it was not for stakeholders' conflicting interests and judgements which lead to lack of support, IS development and use would run smoothly. Sauer's aim [1993] is to develop the 'right' management strategies that can enrol the 'right' amount of support from the 'right' stakeholder groups. His model is intended to provide "a basis for the analysis of the strategies by which the project organisation can attempt to manage the support it receives" [Sauer 1993:318]. He suggests a "support-power analysis to determine who has the power to provide the support required" (p.322) and, if necessary, the appointment of a "support manager" within the project organisation executive. This is problematic in that support (or lack of it) is not just a matter of how (rightly or wrongly) stakeholders interpret the impact of IS and how they can be persuaded (or not) of

its value. Stakeholders are not equal; support cannot be 'managed'; how are the 'right' stakeholders chosen? What happens to the 'wrong' stakeholders? Eliminating some stakeholders ensures that the remaining ones are all satisfied. Perhaps more fundamentally, interpretations and actions cannot be anticipated and therefore 'managed'.

Configurational fit

Another organisational view of IS failure derives from the debates about strategy, systems and structure in the organisational theory literature. Sauer *et al* [1997] propose a configurational theory which conceptualises IS projects as part of a management choice about the way it organises IS projects and which is based on the belief that their outcomes are influenced by the way the whole organisation is managed. Sauer *et al*'s core proposition "is that 'weak' configurational fit causes failure modes by encouraging behaviours conducive to failure" [1997:1]. Weak fit creates competing motivations for different people in different parts of the organisation and there is tension between strategy and structure. Top management intervention may be required to break down the barriers created by weak fit. Configurational 'incompabilities' are identified along, for instance, strategy-structure-skills and structure-roles fits, drawing on organisational structure and behaviour constructs such as bureaucracies, decentralisation, change skills. It states that 'dysfunctional' behaviour arises from confusion from a configuration in weak fit. The focus is at the organisational level and is complementary to individual explanations. In other words, there is an evolution from the model above [Sauer 1993] in that the blame is not on individual stakeholders anymore, but their 'dysfunctional' behaviour is now understood to be caused by structural phenomena. Altering structures therefore should guarantee 'good' behaviour. This is a typically functionalist way of thinking. It presumes that conflict-free organisations can be engineered and that, by altering structural conditions, one can prevent conflict, manage behaviour and risk. So it still shares a rationalist and managerialistic philosophy with the previous model.

Instead of structure, Gallivan [1997] concentrates on the cultural aspects and on "the importance of fit between a technology and the adopting organisation by characterising IT systems as 'culture bound', indicating that the same system may be subject to different interpretations across different contexts" (p.246). He thereby adheres to an interpretive stance. He believes that implementation outcomes are unpredictable, because "the meaning and appropriation of a technology depends on the fit between the culture that system designers assume to exist and the actual culture of the organisation" (246). He also reports that there is disagreement as to whether organisational cultures can be changed and whether managers should abstain from attempting to change them. Where a mismatch or conflict of organisational incentives exists, it is unrealistic to expect that technology alone will create the necessary catalyst to change a social system [Gallivan 1997:252]. Managers can recognise the misfit and reject the technology,

for fear of dire consequences to users (frustration, unrest and hostility among workers). Even if the technology is used and does become routine, the notion that it will lead to desirable or appropriate changes in the social context is to accept technological determinism.

Some IS research has demonstrated that change is emergent, unpredictable, and often accompanied by contradictory outcomes in different contexts. Gallivan's evidence [1997:254] suggests that "where a mismatch exists between the features supported by the system and users' beliefs and assumptions regarding the activities that are rewarded by the organisation, the intended users will reject or ignore the system". He suggests a cultural analysis (innovation and action orientation, level of individual autonomy, performance orientation, reward orientation, integration and lateral interdependence). This determines whether the organisational culture in which the intended users reside is ready for the system (either because there is a natural fit or the necessary changes to the social system are made proactively) to assess whether the technology is more likely to be used. We agree with Gallivan that the outcomes of any intervention are not predictable or controllable, but emergent, and contingent.

Contingency

Poulymenakou and Holmes [1996] state that we need to understand the relationship of IT with its organisational context, in order to meet effectively the challenges that systems failure presents, and that the study of failure should move away from attempts to define 'silver bullets'. Their theoretical approach is that failure should be considered from a contingency viewpoint: "failure is highly situational (...) and dependent upon a number of environmental factors which, although common to the study of failure, manifest themselves very differently in different circumstances" [Poulymenakou and Holmes 1996:37]. They classify contextual factors into macro contingent and micro contingent variables. They question the common assumptions that technology will resolve all problems, and claim that organisational and political issues are perceived to be non-existent, thereby creating a situation where technocratic utopianism dominates and projects fail (p.38). They suggest various areas that can help the adoption of the contingency perspective: the adoption of learning principles, implementation issues and project management (p.42). Developing a learning culture, involving people with the change process, using risk management, motivating staff, evaluating projects all contribute to "creating a sufficiently open culture to permit failure to be recognised, openly discussed and resolved" (p.44).

Although it seems that the contingency perspective is a definite progress when compared to technological determinism, these statements are as managerialist and functionalist as earlier ones in this section. They depict not a technocratic utopia but an organisational and cultural one, in which people listen to each other, do not seek to blame anybody, do not play politics, are rational, open and presumably equal.

Contextual 'factors'

As Sauer [1993] points out, it is impossible to determine which techniques, tools and recommendations can overcome failure. Both practitioners and empirical researchers often "presume that the causes of (and actions to prevent) failure can be fairly simply identified, either by casual inspection or by relatively simple factor analysis (...). Too often books offer case studies which (...) demonstrate a particular point or which are carefully filtered so as to bring out some points at the expense of simply ignoring others" [Sauer 1993:3]. Examples of some such points have been so far the enrolment of stakeholders' support, the modification of organisational structure, project management and cultural change. It is clear that there are no simple models and generally applicable solutions to IS implementation problems. One possible reason is that existing models of IS failures in organisations fall short of analysing the relationship of humans to technology within organisational, social, economic and political environments.

Whilst many IS researchers share the view that an information system is a social system that uses information technology, the social and contextual components selected are often limited and/or perceived as exogenous 'factors' to be circumvented, controlled or eliminated. Classifications of environmental factors, such as Poulymenakou and Holmes's [1996] into macro variables (i.e. organisational culture, systems planning, accountability, irrationality and evaluation practices) and micro variables (i.e. power and politics, resistance, development practices) are debatable: organisational culture could be micro, and power and politics macro, depending on one's theoretical perspective. Similarly, Davis *et al*'s [1992] chosen 'social' components in their analysis of IS failure are: "reactions to the technical system", "performance indicators" (measurement of system inadequacy), "development processes" (processes through which the technical system is designed) and "theories in use" (ideas and beliefs about the technical system). These could be interpreted as concentrating primarily on, or at least starting from, the technical aspects. Others are often limited to the interactions between the technology and individuals and/or small groups and take the technology as given.

Perhaps more importantly, construing these contextual social factors as exogenous separates them from, and isolates/insulates, the technology and implies the pre-existence of a technological 'natural trajectory' [MacKenzie 1988] independent of external social 'contexts'. MacKenzie argues that technical trajectories do not exist but are actors' constructs, that technology is never self-directing and that a technological trajectory is a self-fulfilling prophecy. This concept of a natural trajectory is illustrated by Newman and Robey [1992] when they express the hope that IS practitioners can use models to diagnose and predict problems in order to move projects in the 'right' direction. This assumes that there is a normal, successful, natural, right way of using technology and the objective is to trace evidence of failure in terms

of discrepancies from this natural and inherent technological development. MacKenzie [1988] suggests that the term natural can be read as 'asocial'.

Having critically examined existing analyses of IS failures, it is now useful to compare them to management perspectives, particularly when IS researchers express such confidence in the possibility of controlling and mastering the organisational future, as in the following two quotes: "As our understanding of the IS process improves over time, we may expect that practitioners will acquire more control over the problems they face" [Sauer 1993:334]; and "Future research will ultimately result in the demise of IS failures" [Lyytinen and Hirschheim 1987:301].

2.1.4 Management failures

Crisis management

In an effort to prevent crises and ensure success, writers such as Augustine [1995] and Mitroff *et al* [1996] suggest ways to: assess a company's strengths, vulnerabilities and 'level of crisis preparedness' before a crisis ever happens, how to handle a crisis effectively once it hits and how to learn from a crisis so that future problems can be minimised. Some of their proposed techniques are: anticipating and managing the media, containing the damage, assuming (or not) responsibility, delaying response, training in security, human relations, quality assurance, corporate communications and law, and building a culture committed to crisis management amongst all stakeholders [Mitroff *et al* 1996:115]. They believe that, like Total Quality Management (TQM), crisis management is a systemic process [Mitroff *et al* 1996:75]: "crisis management is systemic because crises not only affect a system as a whole but also result from the breakdown of systems as a whole" (p.117).

Again, the notion of systems and their increased complexity is called upon (see **Section 2.1.2**) and factors perceived to be present in every crisis and to be 'managed' include: technology, human factors, organisational structure, culture, top management psychology (p. 48), mirroring some of the organisational factors identified by IS researchers and their associated shortcomings considered above. Additionally, Gallivan [1996] found that managers are being offered contradictory advice when confronting crises and that there are inconsistencies in the literature. He claims that the classical view of crisis is narrow; and that practitioners and researchers alike may benefit from the insight of research in organisation behaviour, decision-making and strategy to provide a different interpretation of crises and to refute the need to blame individuals (for failure) or praise senior management (for success). Gallivan [1996] suggests more specifically the use of research on the enactment view of managerial sense making in a crisis, and the escalation of commitment effect, which both provide useful lenses to interpret crises.

Enactment: rational decision-making?

Weick [1988] examined Union Carbide's procedures for dealing with gas leaks during the Bhopal disaster to explore sense making in crisis situations. He uses the enactment perspective, which concentrates on how individual actions are implicated in industrial crises and according to which people think by acting and action tends to confirm preconceptions. His objective is to prevent crises through smarter management since "human errors cannot be designed away" [Weick 1988:308]. Enactment affects crisis management through several means such as the psychology of control, effects of action on stress levels, speed of interactions, and ideology (p.315).

He found that enactment is labour-intensive and that knowledge was reduced, not because of automation, but because of understaffing. This is related to "institutional memory" (p.312) and has serious implications for organisational learning and the use of IS in organisations. The enactment perspective urges people "to include their own actions more prominently in the mental experiments they run, to discover potential crises of which they may be the chief agents" (p.316). However, "justifications prefigure both perception and action", which means they are often "self-confirming" (p.310). Even though this is an extremely brief and succinct overview, it is clear that this approach exposes the complex relationships between acting, thinking, perceiving, knowing and learning (or not), and by extension, justifying, diagnosing, deciding and preventing. This leads to questions about rational decision-making, as several researchers have investigated in relation to a reluctance to abandon failing projects.

Escalation decision-making: the example of *Taurus*

Escalation situations are those in which decision makers have continued commitment to a specific course of action, despite information suggesting that the course of action is failing. Common explanations are over-commitment, equivocality of the situation, expectancy theory, self-justification, feedback from previous decisions made, entrapment (further expenses justify already sunken costs); Nulden [1996] found that it is unclear whether the determinants are psychological, social or organisational. Having studied two case studies of over-commitment, he recommends to "be open to dismiss particular solutions", to "invest in face-to-face meetings to evaluate risks" and to use formal methods to monitor progress (p.71). This may seem simple and rational commonsense but it provides a limited account of escalation stories.

Drummond [1996] criticises the socio-psychological literature for assuming that decision criteria are objectively verifiable and for confusing the causes of escalation with the symptoms (p.185). In her in-depth, qualitative and very detailed investigation of the failure of *Taurus* at the London Stock Exchange [Drummond 1996], she found that there was no clear dividing line between the rational and the irrational

in decision-making (p.82), and that information was equivocal and part of the 'ritual' of decision-making. She suggests that decision criteria are simultaneously rational and flawed (p.77). Decision dilemma theorists predict that market forces eventually curb unwarranted persistence. Social-psychological perspectives, on the other hand, assert that market forces are too slow to act and that decision-makers persist with failing projects long after the rational point for withdrawal has been reached. Drummond departs from both these theories by researching how rationality is reasserted rather than enquiring into what reasons caused withdrawal (p.159). She states that it is "necessary to look beyond decision dilemma theory and social-psychological theory in order to understand how organizations become 'locked in' to highly questionable ventures" (p.92). Institutionalised behaviour is escalatory because it leads to attention riveted upon solving the problem rather than questioning the problem itself, and "decision-makers respond by applying 'more of the same', that is, they try another engineering technique, or demand more detailed information" (p.124). However, information may lead away from the truth rather than towards it (p.125). Her study highlights "how decision debacles may be caused not by a breakdown in rationality so much as by rationality itself" (p.125, original emphasis) and how the process is clothed in a rhetoric of scientific objectivity (p.132).

A functionalist approach would investigate what factors cause escalation; an interpretive perspective would convey what escalation is for participants. Drummond adopts a "quasi-radical" stance and examines the roots of escalation. She asserts that the root of escalation was the changed balance of power in the City following deregulation (p.31) and that escalation was an attempt to maintain the dominant viewpoint. Accordingly, the notion of escalation is "simultaneously rational and irrational, bound up with power, politics and opportunity, and influenced by the vagaries of project and organization" [Drummond 1996:89]. It was rational in that settlement was potentially a lucrative business and the London Stock Exchange had to take initiative to maintain its reputation; and irrational in that it ignored the new balance of power in the City post-'Big Bang' (p.77).

This fundamental contradiction explains how everyone acted logically, according to their circumstances, and that decisions turned on political acceptability (p.81). Staff adjusted to a new culture whereby price rather than relationships became the new business imperative - some are quoted as saying that "the fun went out of the City" (p.50). Conflicting priorities were apparent in that participants soon learned that the operant principle was to fight one's own corner regardless of the common good and that the majority wanted "none of it" (p.56). Taurus was driven by financial institutions and the rebellion was spearheaded by the listed companies. Various sectors of the securities industry attempted to chisel further advantage for themselves. No-one was prepared to speak out publicly, for *Taurus* had become sacrosanct and vital to London's preminence as a world financial centre (p.64). The cumulative effect of everyone behaving rationally resulted in the transformation of the 'horse' into a 'camel' (p.91). Drummond concludes that: "*Taurus* went ahead because of the impact of the settlements crisis, the ambitions and competitive

weaknesses of the Stock Exchange, and the irresponsible cynicism of the market" (p.92); and that the eventual withdrawal is best understood as a process, a power struggle whereby one myth competes with another for dominance (p.160). She therefore views withdrawal as the reassertion of rationality and this highlights the critical role of power in constructing a new reality (p.173). She finally comments that "organisational weaknesses are significant but so too are politics, the organisational ethos and more deeply rooted forces, notably the institution of management" (p.185). Drummond's analysis is grounded in a substantial exploration of the context and the actors, and the next section contrasts Vaughan's comparable use of sociological concepts and interpretive standpoint to Fortune and Peters' functionalist approach.

2.1.5 Technology failures

Contrasting two approaches

Examples of technology failures (as opposed to IS failures), which have been analysed using two fundamentally divergent theoretical approaches are by (a) Vaughan [1996] who studied the *Challenger* disaster, and by (b) Fortune and Peters [1995] who analyse several failure cases. Vaughan [1996] seeks a sociological explanation whilst Fortune and Peters, since people do not learn from mistakes, present a "highly developed and well-tested (...) systems methodology" which they claim can be used to analyse, understand and predict failures [Fortune and Peters 1995:2].

Vaughan's research into the *Challenger* disaster was carried out over a period of nine years (p. 465). It took the form of a historical ethnography, based on archival documents and interviews and resulting in a very thick and rich description, that draws on and contributes to the social history and anthropology of modern complex organisations (p. iii). By contrast, Fortune and Peters expand on a method derived from the systems discipline, already outlined in an earlier book [Bignell and Fortune 1984] which applied the method to several failure case studies: Three Mile Island, Humber Bridge, Normansfield Hospital, the capsizing of the Kielland rig, and the pricing of South Yorkshire buses. Their more recent book similarly analyses several other case studies to illustrate the use of their method, named the Systems Failures Method (SFM). The case study material seems to be derived mainly from other people's accounts and public inquiries, with also some of the authors' own consultancy work, and covers: the aircraft fire at Manchester Airport, the Union Carbide gas leak at Bhopal, an electronic patient records system, and the safety of the Channel Tunnel.

The material is presented in a step-by-step instructional style in which SFM (a) is shown to explain the reasons for failure at the Manchester Airport fire and at Bhopal and (b) demonstrates its power of prediction for potential failure of the patient records system. Having seen the light, the reader can then

apply SFM to predict potential safety failures at the Channel Tunnel in a didactic way. SFM relies on traditional systems concepts and techniques such as worldviews, holism, closed and open socio-technical systems, conceptual and idealised modelling, rich pictures, representation of structure and process, cybernetic control, feedback, input-output diagrams, etc. The model of the 'real world' failure is compared to the model of an ideal 'robust' system which represents how "the situation should be structured and managed if it is to be capable of operating without failure" (p. 109). The failure is regarded as an output deficiency of a faulty "transformation process" (p. 99), and recurring themes, identified through comparing 'real world' models of failure and 'ideal' models are: lack of performance-measuring and control, no clear statement of purpose, lack of communication, environmental disturbances (p. 113). It is hardly surprising that Fortune and Peters 'find' these systems-related themes since they are the very themes they bring prior to their analysis, through the lens of their systems approach. A clear case of finding what you are looking to find. The case material seems almost incidental, and the authors discount all other approaches as too narrow because they concentrate on the background of the people involved or the context in which they act (p. 29). They argue that this obscures the common features which are not specific to the failure situation (p. 29).

Fortune and Peters' approach betrays a mechanistic and simplistic standpoint on organisations, viewed as animals or humans who display adaptability to their environment (p. 5), as well as a controversial managerialistic stance, for instance: "everyone [in organisations] must pull in the same direction" (emphasis added, p. 7); or the view that disagreement in organisations is simply a breakdown in communication (p. 132) which can be remedied through designing robust communication networks (p. 134) or better links between subsystems (p. 191). Fortune and Peters' use of the systemic approach to analyse and diagnose, and even predict, failures is problematic. Considering underlying organisational structure and behaviour, which they claim they do (p. 17), cannot be seriously achieved if the massive amount of existing literature and research on management and organisations other than systems thinking material, is disregarded (p. 41), and if critiques of the systems approach are simply ignored. For example, the concepts of conflict and power are conveniently disposed of in one line by recommending hierarchical sub-systems (p. 113).

Moreover, the authors' quest to explain all disasters in one stroke (p. 53) through the "disciplined approach of systems engineering" (p. 61) epitomises a belief in universal and scientific solutions. The nature and origin of the 'ideal', robust and successful models proposed to rectify the failures go unquestioned, when it is clear that they represent technically inspired managerial solutions. It is unsurprising that the lessons learned are so broad and superficial (and sometimes even contradictory, see below) as to be universal. For instance: organisations should encourage involvement and commitment and resolve conflict without causing alienation (p. 139); different interfaces should be designed to suit different information needs between people (p. 199); criteria for assessing the 'rightness' of the climate

should be established (p. 200); management interference should be avoided (p. 242), which contradicts the first recommendation above; putting in place performance-measuring subsystems and acting on feedback information; and finally resorting to quality and zero-defect approaches (p. 253). It is perhaps more surprising that the authors believe that such superficial recommendations can prevent future failures, even if such broad advice may enable them to say that they could have predicted it when failures do take place.

Repeated past successes: the *Challenger* disaster

By contrast Vaughan [1996] relies on a sophisticated and extremely detailed exploration of the *Challenger* case study to try to go beyond the historically accepted retrospective version of this tragedy and she slowly builds a complex understanding of its causes. Instead of outside experts using predetermined techniques and models to analyse and correct the situation, she is concerned with understanding the 'native' view of events and believes that explanations have to rest on the presentation of detail (p.73). She achieves this by: giving a chronological account of the history of the decision-making; resituating controversial actions in the stream of actions in which they occurred (for instance by extensive examination of paper trails, p.56); restoring the launch decision to its position as one decision in a stream of decisions; and examining the connection between the environment, organisation and individual choice (p.73). Through this meticulous disentanglement of the detail, she exposes micro-macro links, and reveals a very complex picture that shifts the attention from individual causal explanations to the structure of power and the power of structure and culture, "factors that are difficult to identify and yet have great impact on decision making in organisations" (p.xv). One of the interesting outcomes of this rich ethnographic work is that it contradicts conventional interpretations of the *Challenger* disaster, which can be found in, for instance, the US Presidential Commission reports which saw it as a technical failure due to managerial wrongdoing and production pressures.

Starbuck and Milliken [1988], amongst others, had analysed the Challenger disaster as due to the effects of repeated successes, gradual acclimitisation, and differing responsibilities of engineers and managers (p.320). They reason that engineers and managers who had successfully launched 24 consecutive shuttles may well have inferred that the next flight had a very very high probability of success (p.322). For Starbuck and Milliken [1988], repeated successes nurture complacency, confidence, inattention, routinisation and habituation (p.323). Accordingly, "success makes a subsequent success appear more probable, and failure makes a subsequent success seem less likely" (p.323).

Investigating the meaning actions and decisions had for participants at the time those actions were taken, enables Vaughan to understand many of the actions which were eventually seen as controversial and were not understandable after the accident, since they were judged retrospectively and with hindsight. It enables her to undermine the common explanation of managerial wrongdoing and

complacency put forward, for instance, by Starbuck and Milliken. To summarise it somewhat, the *Challenger* disaster is seen through Vaughan's account as a mistake embedded in the banality of competition, an unprecedented, uncertain technology, incrementalism, patterns of information, routinisation, organisational and inter-organisational structures, and a complex culture (p.xiv).

The argument therefore illustrated is that mistakes and disasters are socially organised and produced by social structures and culture. "Social forces and environmental contingencies impinged on and changed organisational structures and culture, routinely affecting the worldview that decision makers throughout the organisation brought to their interpretation of technical information" (p.xiii). Her contribution to the analysis of failures is particularly interesting in that it illuminates how incidents, that when abstracted from context contributed to an overall picture of managerial wrongdoing, became ordinary and non-controversial (p.60); and in how she discovers that actions defined as deviant after the tragedy, can be seen as conforming to rules and culture at the time. For researchers this is of importance, since it goes beyond oversimplifying managerial action: either by (a) singling out managers for failing to assess risk properly or adhering to outdated goals and beliefs in the case of disaster, or (b) conversely, by celebrating managerial vision, wise risk-taking and well-conceived goals, in the case of successes. It enables a move away from focussing on individual decision making and reintroduces the complexity and ambiguity of the tasks and environments that people face.

Another interesting facet of her work is how she refutes a scientific approach to organisational decision-making, through exposing the importance of understanding the position - historical, political, cultural, gendered, organisational and professional - of the NASA managers and engineers, and thus something of the worldview they bring to the interpretation of information (p.76). Vaughan draws on authors concerned with social structure and culture such as Merton, Berger and Luckmann, Short; with complex technical systems and risk such as Perrow; sociologists of science, technology and innovation such as Latour, Woolgar, Bijker, Pickering; and organisational theorists, anthropologists and sociologists such as DiMaggio and Powell, Goffman, Geertz, Schein, Starbuck, Giddens, Smircich, Douglas, Bourdieu. The main themes occupying her book are the production of a work group culture, the culture of production and structural secrecy (patterns of information, organisational structure, the structure of regulatory relations).

In three chapters, details about the technological aspects (e.g. the solid rocket booster joints from 1977 to 1985), the engineering methods, NASA language, organisational procedures, institutional history, technical diagrams and other cultural artifacts, are used to reconstruct the production of culture in work groups; and to show how the institutional history of competition and scarcity created structural effects that impinged on decision making and the culture of production. Vaughan shows how historic changes altered the structure and emphasis of the space agency and created a problematic culture dominated by three imperatives: those of the original technical culture, bureaucratic accountability and political

accountability (p.198). A business ideology emerged, infusing the culture as if NASA were a corporate profit seeker (e.g. contracting out, increases in non-technical staff, paying its own way) and eroded the strong research-oriented technical culture of *Apollo* (p.210). Top NASA administrators were absorbed with 'myth management' seeking legitimacy by projecting and living up to a cultural image of routine, economical spaceflight (p.212), which was far removed from the normal and unruly, characteristics of technical systems and costs. "Banking on past technical achievements, the new elites were far removed from hands-on technology" (p.213). Project managers faced constant pressure to meet the demands of all three cultural imperatives (p.219) and 'impression' management [see also Caldwell and O'Reilly 1982] created intense preoccupation with procedural conformity (p.220). Computerised reporting systems exacerbated the situation through information overload (p.184), in a context in which the practices associated with the original technical culture (typically concerned with safety) were more difficult to carry out because of increased accountability. This book clearly and convincingly demonstrates how structures of power can alter the environment of decision in the workplace. The research questions raised about the intersection of the social and the technical, and about the relationships between power, structure and culture, are of paramount importance to any researcher investigating how organisations design, manufacture, produce and use technological products.

2.1.6 Not just failures

The relationship between success and failure in implementing and using technology is obviously not a straightforward one [Davis *et al* 1992]. Starbuck and Milliken [1988] believe that drawing useful insights from success stories is more difficult than drawing lessons from failures. Organisations learn more readily from failure than from success, because the causes of failure are more easily identifiable than the causes of success. However, it is easy to believe that success demonstrates competence and that failure reveals deficiencies. Managers attribute success to themselves rather than to luck. Moreover, Vaughan's account clearly shows that failures cannot be seen as deviations from a successful norm, and that "failures may express exactly the same dynamics, motives, interests and logic as successes" [Robinson 1994].

Failures are best seen as a methodological convenience: controversy surrounding failure tends to reveal processes that are more easily hidden in the case of successful projects and institutions [Bijker and Law 1992:22]. Particular cases may be publicised as success stories, but their evaluation may well be more qualified [Sauer *et al* 1997]. It could be argued that a system doesn't either succeed or fail and that partial successes/failures are probably the norm, at least not when deaths occur, such as in the *Challenger* case. Computer professionals have shown commendable zeal in searching for and publicising cases of computer-system failure leading to accidental deaths [MacKenzie 1994]. However, under-reporting of computer-related failures is the more intractable problem as there is no straightforward way of

investigating its extent. Many cases are culled from press coverage, only a minority from primary research [MacKenzie 1994:236]. Cases take place with employers who may have no wish to see them widely publicised; some may be considered as too routine by the media to be worth extensive coverage.

The failure aspects are not the only focus of attention in the present thesis. The attraction of the *Socrate* case study as a 'failure' is that it can show that choices are not obvious or unproblematic, unlike what they appear to be in a successful project. Compared to successes, failure studies often make it easier for the researcher to elicit more complex explanations from actors and to disentangle how technical and social issues are constructed and delineated [Akrich 1993]. For instance, claiming that the reasons for failure are that SNCF users showed resistance to the system or that managers couldn't manage change properly, is unhelpful. It also has an implicit agenda which, by separating the technical from the social, often exonerates the technology. A good (transport-related!) example is how car manufacturers dissociate the technical from the social when claiming that road congestion is not their problem but a social issue. Similarly, implementing information systems is not a neutral, rational and objective exercise, which in the 'normal' course of events is successful and unproblematic.

Beyond rationalist accounts

Not only is the demise of IS failures highly implausible, as Sauer points out [1993:32], but the idea that failures can be eradicated reveals the underlying assumption, often found in the IS and management literature, that failures are atypical and irrational and that they can be corrected using managerial and/or technicist means. The dominant trend is to see the introduction, design and development of information systems as a rational decision-making process carried out on behalf of management. Much of the literature on organisational issues in relation to IS "reflects a rational-economic interpretation of organisational processes, and a positivist methodology" [Walsham 1993]. Designing IS is equated to engineering, and it is believed that if the practices of the engineering professions are adopted there will be a decline in the number of failed projects in IS [Ewusi-Mensah and Przasnyski 1995]. As Knights and Murray [1994:244] comment, "we note the utility of processual approaches emanating from within the functionalist tradition that begin to dissect the practical actions of managers, albeit from a perspective that usually ignores those larger contextual conditions that are a condition and consequence of such action". In order to help us go beyond functionalist accounts, other approaches to be considered are presented below. We shall concentrate on the constructivist and critical traditions, starting with the sociology of technology and in particular the notion of symmetry and how it relates to failure, actor-network theory and the sociology of translation.

2.2 SOCIOLOGY OF TECHNOLOGY

Over the last twenty years the sociology of technology (e.g. Latour and Woolgar [1986], Collins and Pinch [1993]) has argued that there is no such thing as a social problem that does not have technological components; nor can there be a technological problem that does not have social components, and that any attempt to make such a division is bound to fail. Sociologists of technology therefore argue that the development of technological devices should be interpreted within an analysis of the struggles and growth of 'systems' or 'networks'. The constructivist approach to the study of technology moves away from making distinctions among technical, social, economic and political aspects of technological development; and uses the 'seamless web', 'system' or 'actor-network' metaphors, which stress the importance of paying attention to the different but interlocking elements of physical artefacts, institutions and their environments, linking the micro- and macro-levels of analysis. However, it can be argued that in order to make sense of the complexity of thickly described case studies, it is necessary to employ some structuring, if simplifying, concepts.

There are various strands of social constructivism of technology, for instance, Callon, a 'strong' constructivist, who refuses to categorise the elements in a system or network "when these elements are permanently interacting, being associated, and being tested by the actors who innovate" [Callon, 1989:11]. Callon [1986, 1991], a major advocate of the 'actor-network' approach to the sociology of technology, uses a higher abstraction, 'actors', that subsumes science, technology, economics, politics. 'Human' and 'non-human' actors are the heterogeneous entities that constitute a network. By contrast, Bijker, Hughes and Pinch are 'weak' constructivists who preserve the social environment and argue that the social groups that constitute the social environment play a critical role in defining and solving the problems that arise during the development of an artefact. Problems are defined within the context of the meaning assigned by a social group or a combination of social groups. Because social groups define the problems of technological development, there is flexibility in the way things are designed, not one best way [Bijker, Hughes and Pinch, 1989:14].

2.2.1 Symmetry and failure

The sociology of scientific knowledge has, as its focus, the ways that scientific facts are created and used [e.g. Barnes 1996; Collins 1994]. It has arisen through the in depth study of the methods and techniques of practising scientists. These studies showed that methodologically it was important that they applied a principle of symmetry. The sociologist studying the work of a particular group of scientists should use the same methods, explanations and resources to explain those scientists who were 'successful' as those who were 'unsuccessful'. At the start of the investigation, there is no way of knowing whether the scientists under study are going to succeed or are going to fail. Either outcome is, in principle, equally

likely. Collins and Pinch [1993] applied this notion of symmetry in their study of parapsychology, which many scientists would regard as a 'pseudoscience' that does not follow scientific method. Their study, however, demonstrated that the para-psychologists were often as rigorous as their more traditional colleagues, if not more so, a result which could not have been found if an a priori assumption about the result was made.

Borrowing from the sociology of scientific knowledge, that calls for sociologists to be impartial to the truth or falsity of scientific beliefs so that they can be explained 'symmetrically', historians and sociologists of technology therefore have argued that technology failures are of as much interest as success stories. Moreover, you cannot, at the start of a project, tell if it is going to succeed. This implies that the same methods of analysis should be used to describe successful and unsuccessful projects and hindsight should not be used to describe the problem. The sociology of scientific knowledge also recommends that scholars interested in the development of science and technology choose controversy as one important site for research. The controversy is about the truth or falsity of scientific belief, or about the success or failure of a technology in solving problems. Different groups will define not only the problem differently but also success or failure, and there is not just one possible way, or one best way, of designing an artefact [Bijker, Hughes and Pinch 1989:14]. The notion of symmetry helps dismantle beliefs and assumptions of *obviousness* [Akrich 1993] (in French, "l'impression d'evidence"), as illustrated in Akrich's quotes in **Section 1.3.2.** For instance, it would be inadequate to say that *Sabre* was more efficient, socially acceptable and better designed technically than *Socrate*, since "all of the former's qualities and all of the latter's defects are results and not causes" (Latour [1993:382] original emphasis) of the success of *Sabre* and the lack of success of *Socrate*.

Latour's investigation [1992, 1993] into the abandonment of a new revolutionary subway transportation system planned in the South of Paris, *Aramis*, is a good example of how to tackle symmetrically the failure story (*Aramis*) and the success story (VAL, a working automatic suburban train in the Northern city of Lille). Trying to explain only *Aramis*, since it has been a failure, whereas VAL has turned out to be a success, would be "asymmetric since it would look for social explanations only when something goes wrong - the straight path of happy technical development being, in contrast, self-evident and self-explanatory" [Latour 1993:383]; both projects tie together many interests, and in both cases, these interests do not exist independently of the projects and (potential or eventual) artefacts. In following the design and redesign of *Aramis*, and all the interested groups and actors, and in gathering what they said, did and didn't do throughout the project, Latour assembled not only one explanation but at least twenty; however, he claims that he does not practice two different interpretations, one about the nature of the artefact and the other about the meaning it has for social groups: "it is the same task to define the artefact tying together the various groups or the groups tying together one artefact" [Latour 1993:381].

His theoretical premise is what he calls "distributed monism" which he opposes to dialectical

arguments or dualism and, through which he believes he can render a more precise and fuller account of this "twofold move of people assembling around things and things forcing people into assent" [Latour 1993:388]. More fundamentally, "explanations in terms of social forces or in terms of technical trajectories are excluded since they would be asymmetrical or dualist" [Latour 1993:383]. In other words, social actors are not considered as simply pressing their wills on inert passive things, and, at the other extreme, artefacts are not autonomous technologies [Winner 1997] pressing their goals onto human actors. Investigating *Aramis* in such a manner avoids dualistic and simplistic explanations about 'better' technologies or 'better' social environments. It bypasses the dialectical movement between those who tie their fate to the object, and those who are tied by the object. It refuses to set the failure in the following dualistic terms: is it because *Aramis* failed that the interpretations diverged so, or because the interpretations are so divergent that the project never became an institution, a stabilised thing? The next section expands upon these theoretical foundations by focussing on the notion of actor-networks, human and non-human actors, and translation.

2.2.2 Actor-network theory

Work in the sociology of scientific knowledge and social studies of technology has contributed to an understanding of technology as an integral part of social life. In the actor-network theory articulated by Latour [1987; 1989; 1991] and Callon [1986; 1992], technological innovation is viewed as an attempt to build and stabilise a diffuse system of allies composed of both human and non-human entities. The idea of an actor-network centres on the notion that the development of technology involves the building of networks of alliances between human and non-human actors. This corresponds to a breakdown of the clear divide between science and society, and it argues that there is no such thing as a social problem that does not have technological components, nor is there a technological problem that does not have social components. No project is purely technical, nor is it purely social. Actor-network theory proposes the use of networks of interrelated human and non-human actors who shape the way things are, 'actor-networks'. This enables to circumvent technological determinism in which technical projects and innovations proceed naturally unless they are actively stopped, and replaces it with the idea that things do not happen unless human and non-human actors make them happen. Techno-economic networks mix humans and non-humans actors. Callon [1991] contends that networks can rarely be cut up into simple descriptive frameworks and he suggests that, when the clouds from Chernobyl spread over Europe and contaminated the Lapp reindeer, then the plant as actor gained the upper hand over the plant as intermediary. According to Callon [1991], this explains how the discourse presenting technology as an uncontrolled and autonomous force [Ellul 1965, Winner 1977] gained ground over discourse that had reduced it to being a mere instrument that people in society used for better or for worse.

One of the strengths of the actor-network approach is the systematic avoidance of what can be called 'methodological dualism': the making of a priori distinctions between what is 'technical' and what is not (and is therefore by implication 'social') [Bloomfield and Vurdubakis 1997:85]. "Rather than assuming that we are dealing with two separate, but related, ontological domains - technology and organisations - we propose to regard them as but phases of the same essential action" [Latour 1991:129]. The presumed separation between technology and organisation is a sense-making device, one of the means by which we orient ourselves in the world [Bloomfield and Vurdubakis 1994]. In ANT, identities are negotiated through the deployment of various human and non-human intermediaries, which thereby mediate the relationships between actors. Intermediaries are passed between actors. This can imply a distinction between actors who have agency, and intermediaries which are seen as essentially passive. However, it should be noted that attributions of agency versus passivity are context-dependent, made for particular purposes [Bloomfield and Vurdubakis 1997:106]. For instance, in the case of the use of IT in the NHS studied by Bloomfield and Vurdubakis [1997:89], the intermediation between the domain of technology and the (social) world of the organisation is interlinked with the intermediation between the professional groups of management and clinicians, and their respective rationalities (medical/administrative). Thus in addition to constituting/negotiating the boundary between the 'technical' and the 'social', the IT-review at the NHS is an intermediary device which effects translations between the worlds of management and medicine, the commercial ethos of management consultancy and the public service orientation of the NHS [Bloomfield and Vurdubakis 1997:89].

2.2.3 Sociology of translation

Latour's [1991] alternative to technological determinism, in which things do not happen unless other actors make them happen, implies that each actor who takes the project further may take it in a different direction than that intended by the previous actor. As the study of science has shown [Knorr-Cetina and Cicourel 1981:37], to construe a certain representation of the world is in principle always at the same time a matter of truth and a matter of political strategy, that is imposing one's say and of instituting certain consequences with or against others (original emphasis). Latour uses the term 'translation' to describe this effect, playing on both of its meanings. The innovation is translated or carried from one position to another in the sense of a mathematical manipulation; the innovation is also interpreted or transposed from one position to another in the linguistic sense of the word translation. Translation operates between actors: an actor gives a definition to another actor, imputes him/her/it/them with interests, projects, desires, strategies, reflexes, afterthoughts [Callon 1991]. An actor might be the company that has conceived, produced and distributed a machine, and another actor its users. The translation operation is regulated by conventions that are more or less local, and are always revisable

[Callon 1991]. The final shape and position of the innovation is unlikely to be that of the original developers. In each stage of its life, the project is taken and adapted by the actors that become involved in it. Only in the rare case when the future users can be persuaded to follow the initial goals, does the innovation proceed as originally planned. All too often, however, the issue becomes sidetracked and unintended effects occur.

In one stratagem to achieve a translation, the actor may suggest that it shares a 'common' problem with putative allies; that is, it may draw an equivalence between its problem and the problems which preoccupy others. This is known as 'problématisation' [Callon 1991]. If the actor can convince the allies that it has the necessary skills, knowledge, or other resources to devise a solution to their 'common' problem, then it may come to be seen as indispensable. It will have translated both the allies and their problem. The original problem is renegotiated while the allies become actors with a network defined by their common ownership of the translated problem. The negotiation of the identities of the various actors inside and outside an actor-network ('intéressement') is an intrinsic part of network building. Intéressement is: "the group of actions by which an entity (...) attempts to impose and stabilise the identity of the other actors it defines through its problématisation" [Callon 1986:207-8]. In order for an actor to secure or win the support of others (potential allies) it must in some way make itself indispensable to them by translating their interests and enrol them; it must become an 'obligatory passage point' [Callon 1986]. A successful negotiation/ translation of an obligatory passage point is a condition of network stabilisation [Latour 1989]. The process which 'folds up' (or stabilises) an entire network so as to transform it into a point in another network (which at the same time becomes more general and more encompassing), is the basis of the progressive passage from the micro to the macro.

Of particular interest are the related concepts of stability, irreversibility and obligatory passage points. Network building is a search for stability which is enabled to the extent that changes set in train during network construction become irreversible [Callon 1992]; either because it would be too costly to reverse them or because to do so becomes unthinkable. According to Callon [1991], convergence and irreversibility of techno-economic networks are both involved in the acts of translation and the networks that they sometimes succeed in forming. Convergence is the degree of accord (alignment and co-ordination) engendered by a series of translations. Controversies are translation as betrayal. The network is constructed according to the translations' own logic. "The more aligned and co-ordinated a network is, the more the actors composing it work together in a common enterprise without their status as actors being under constant challenge" [Callon 1991]. A translation is irreversible in that it is impossible to return to a previous situation. Convergence can increase or decrease, and the same holds for irreversibility. The impossibility for other (past or future) translations to develop and impose themselves is a battle, a fight that is never definitely won. Irreversibilisation, taken as the predetermination of translations and as the impossibility of a return to competing translations, is synonymous with normalisation. A network which

irreversibilises itself is a network that has become heavy with immutable, durable devices (frozen elements or 'black boxes') and inscriptions, norms of all sorts, and which as a result slips into a codified metrology and information system.

2.2.4 IS and actor-network theory

Many of these concepts can be related to understanding attempts to build socio-technical information systems which 'deviate' or fail; and to how that cannot be explained solely by recourse to mere technical factors, nor by reference to the supposed effects of some powerful social forces which were always there but somehow mysteriously overlooked [Bloomfield *et al* 1997:130]. Instead, to explain these deviations in information systems development, use and implementation, we can consider several of the processes inherent in the building of heterogeneous actor-networks. The notions of intermediation and translation were used with good effect in the research mentioned above on IT at the NHS by Bloomfield and Vurdubakis [1997]. Attempts to apply actor-network theory in other disciplines can also be found, as represented in the "Actor-Network Theory and After" conference in July 1997 at Keele University, in for example: sociology [Barry and Elam 1997], health ethics and policy [Berg 1997], ecology [Cussins 1997], history [Harris 1997], cultural studies [Hatt 1997], medical technology [Lehoux 1997], urban planning [Murdoch 1997], linguistics [Myers 1997] and geography [Soderstrom 1997]. A selection of the conference papers has recently been published as a monograph [Law and Hassard 1999]; and a recent issue of *Organization* includes a themed section on actor-network theory and managerialism, in which several papers discuss how actor-network theory can be used for organisational analysis [Hassard, Law and Lee 1999]. Also, organisational theorists at Gothenburg University are applying ANT, and in particular the sociology of translation, to organisational processes, institutional transformations, management and organisational identities [e.g. Czarniawska 1998; Adolfsson 1998; Dobers 1998].

In a discussion of actor-network theory and IS research, Walsham [1997:469] observes that software devices can be seen as network elements which display strong properties of irreversibility and are mobile inscriptions across time and space. He also reviews several recent applications of actor-network theory to IS empirical research, some of which were contained in the proceedings of the IFIP Working Group 8.2 Conference in Cambridge [Orlikowski *et al* 1996]. They range from: the inscription of work in a classification scheme for nursing work [Bowker *et al* 1996]; the process of translation in activity based costing and accounting technology [Boland and Schultze 1996]; the processes of inscription and translation in the role of standards in EDI systems in the Norwegian health sector [Monteiro and Hanseth 1996]; the attempted translation of interests in a car parking system [Vidgen and McMaster 1996]; as well as his own work with Sahay [Walsham and Sahay 1997] which describes how and why the attempts at translation and alignment of interests around the development and use of administrative geographic

information systems in India were a relative failure.

However, Walsham comments that some of this IS and actor-network research either explains the technology at the expense of social interactions, or conversely portrays social interactions without giving detailed descriptions of the technological inscriptions. Walsham [1997] also outlines some of the existing criticisms and limitations of actor-network theory and classifies them into four broad strands: limited analysis of social structures; amoral stance; the problem of generalised symmetry; and the problem of description. The next section will draw and expand on Walsham's paper and bring in other authors' critiques of actor-network theory, which are relevant to information systems research in general and to this thesis. The aim, as suggested by Walsham [1997:473], is to combine the methodological approach and conceptual ideas of actor-network theory with insights and analyses drawn from other social theories.

2.2.5 Limitations of actor-network theory

The four broad strands of criticism identified by Walsham [1997] are briefly reviewed first. One of the strengths of actor-network theory is in its methodological approach, which will be covered in a later section (**Section 2.4**). Criticisms of actor-network theory relate to its disregard for social structures, its levelling and neutralising of the role of human actors, its lack of political and moral analysis, and its descriptive power as opposed to its capacity for explanation. These limitations point to a need to complement it with some form of social theory and some theories of power and politics are suggested.

Social structures

Actor-network theory has been criticised for concentrating on how things get done to the detriment of how broader social structures shape socio-material practices, for giving interesting accounts of local contingencies and material arrangements, without taking into account macro social structures. In response to these criticisms, Latour [1991] has replied that the actor-network methodology can be used to move between levels of analysis, that the macro-structure is made of the same 'stuff' as the micro-structure, and that macro-structures can be investigated with the same methodological tools as micro-structures.

Humans and non-humans

The symmetry between human and non-human actors, which is related to the symmetry between the social and the technical, society and nature, politics and science, values and facts, has been criticised for having gone too far in erasing all distinctions and reducing people to the status of things. In other words, there are political implications of levelling human and non-human differences.

Amoral and apolitical

The disregard for macro-structures has led to criticisms of actor-network theory, and of strong social constructivism and relativism in general, for being amoral and apolitical in how it leads to ignoring the political biases that can underlie the spectrum of choices for relevant actors [Winner 1993]. Star [1991] refers to the "networks of the powerful" and to how irreversible networks are only stable for some and discriminate against those who don't belong to the community of practice who form, use and maintain the network. Latour [1991] responded to criticisms of apoliticism and moral relativism thus:

> "Refusing to explain the closure of a controversy by its consequences does not mean that we are indifferent to the possibility of judgements that transcend the situation. For network analysis does not prevent judgement any more than it prevents differentiation. Efficiency, truth, profitability, and interest are simply properties of networks, not of statements. Domination is an effect not a cause. In order to make a diagnosis or a decision about the absurdity, the danger, the amorality, or the unrealism of an innovation, one must first describe the network." [Latour 1991:130]

Description

The argument put forward by Latour is that social constructivism is not in itself amoral, and that describing the network is not only a prerequisite but the only way to get at explanations:

> "The explanation emerges once the description is saturated; if we display a socio-technical network - defining trajectories by actants' association and substitution, defining actants by all the trajectories in which they enter, by following translations and, finally, by varying the observer's point of view - we have no need to look for additional causes. Explanation is the stabilisation of a network. If one is capable of explaining effects of causes, it is because a stabilised network is already in place" [Latour 1991:129].

This is related to the criticism that actor-network theory is a method for describing, but not for explaining. Callon's answer [1991] is that explanations are only offered by networks which increase their convergence and irreversibility (an agreement getting firmer), and that the descriptions delivered by intermediaries turn into explanations (and even predictions). This leaves the question of how to explain the failure to converge in the case of a divergent, reversible and unstable network, which consequently cannot offer an explanation (but maybe a series of conflicting explanations?). If all explanations are the result of a stabilised network already in place, one assumes that one (and actors too?) could use explanations of other (previous?) stable overlapping and neighbouring networks, but then the problem is transposed to where does one stop? As Walsham [1997:476] observes, identifying all of the heterogeneous associations within an actor-network is difficult enough, let alone those of overlapping

networks.

2.2.6 IS, ANT and structuration theory

Walsham [1997:476] acknowledges that Latour's extreme position is useful in forcing us to rethink issues and is a valuable analytical device, and that describing the network in detail is a good contribution of actor-network theory to building an empirical base. However, he thinks that it does not contribute directly to debating moral and political issues. He asks the question: "where do the moral judgements come from if not from ideas that transcend the situation?" and adds that political and ethical theories cannot come from the basis of the network alone [Walsham 1997:475]. He suggests to complement actor-network theory with Giddens' structuration theory which, he asserts, offers sophisticated models of social action and structure from individual to global levels: structure constrains actions, but at the same time, human action serves to establish structure; modalities link action and structure. There are three modalities: interpretative, facility and norm. Interpretative refers to how agents understand; facility refers to the mobilisation of resources of domination and IT can be said to constitute a system of domination; norms guide action through sanctions and IT codifies norms, therefore information systems are power instruments because they have embedded rules.

However, Monteiro and Hanseth [1996] argue that conceptualisations of IT based on Giddens' structuration theory [e.g. Orlikowski 1992; Orlikowski and Robey 1991], despite being very convincing, "lack in precision regarding the specifics of the IS" (p.326); and "are not fine-grained enough with respect to the technology to form an appropriate basis for understanding" (p.328). They claim that actor-network theory is more effective for describing how minute, technical design decisions are interwoven with organisational issues. In their study of information infrastructure standards, actor-network theory proved useful in "accounting for how standards acquire stability, how they become increasingly 'irreversible'" (p.327); another important aspect of actor-network theory for Monteiro and Hanseth is its "potential to account for how restricted interpretative flexibility across great distances can be obtained" (p.332). Nevertheless, they believe that the superiority of actor-network theory over structuration theory only applies to the issue of "being specific about the technology" (p.330) and they conclude that actor-network theory cannot properly deal with institutions (p.339). More recently, Hanseth and Monteiro [1998] have complemented actor-network theory with: (a) new institutionalism, after Powell and DiMaggio, to understand how institutions become stable and reproduce themselves; and (b) with Bourdieu's theory of practice and his notion of 'habitus' to account for the stability of action, in order to examine the design and use of electronic patient records in Norwegian hospitals.

One of the difficulties anticipated in using actor-network theory to analyse the *Socrate* case study, is how to deal with not only one but large numbers of actor-networks and how they connect and

interact. In their analysis of power and conflict in IS strategy within UK local government, Kawalek and Hackney [1998:1210] refer to Giddens' central tenet of agency, and how this has been used to determine action based around internal organisational politics, resulting from the imperatives of the market and the goal of profit maximisation. However, they argue that operationalisations of the agency concept have tended to ignore wider societal issues of conflict, particularly in the management and IS/IT literatures; in fact, Giddens' view of structure is multidimensional in that "capitalist production is a complex (...) cohesion where key social issues such as ethnicity, gender, class, knowledge and the state play a key conflicting role to generate structure" (p.1211). Kawalek and Hackney [1998] suggest to reconsider Giddens' work which they think "provides a theoretical scheme with the potential of being applied to many contexts at an organisational and societal level" (p.1212). In their analysis of IS strategy in local government, Kawalek and Hackney [1998] bring in the doctrine of competitiveness and recent legislation, the structuring of organisations and initiating of change as the privilege of the powerful, and the link between institutional and managerial action. They aim to achieve a "wider critical historicism" (p.1221) and transcend the distinction between inter and outer organisational politics and social structures through issues of power and politics. Other authors, reviewed next, have suggested to apply the notion of power/knowledge, after Foucault, and to draw on political approaches to power in organisation.

2.3 POWER AND POLITICS

2.3.1 Power/knowledge

What seems to be missing in actor-network theory and which, as shown above, researchers have tried to redress, is a recognition of the role of power and its relationship to networks and knowledge. Power has also been the topic of recent major IS conferences panels e.g. Hanseth *et al* [1999] and Butler *et al* [1998] and of books [Knights and Murray 1994; Introna 1997]. According to Law [1991:18] power, whatever form it may take, is "recursively woven into the intricate dance that unites the social and the technical". To go further, one way of including power is to suggest that translation is a political representation. Callon and Latour say:

> "The scattered wills are recapitulated in the person of the sovereign who says what we want, and whose word has force of law and cannot be contradicted. (...) After political science, the science of economics also claims to be able to say not only what the goods, services and people (...) desire, but also what they are worth" [Callon and Latour 1981:296].

Knights, Murray and Willmott [1997:151] show that the sociology of translation is useful for exploring the processes through which support for an electronic trading system in the UK life insurance

industry has developed, been sustained and was rendered virtually irreversible. However, they find that Callon's conceptual framework "marginalises consideration of the wider structures of inequality that are a condition and consequence of the reproduction of power/knowledge relations" (p.151). They suggest to complement Callon's analysis of the dynamics of network building with a Foucauldian appreciation of how power and knowledge circulate throughout organisations and societies, as a principal medium of network construction and reproduction. Network-building activities require considerable reflective and political activity, however, and even the most astute actor can be blown off course by unpredictable events and the emergence of new actors on the network stage. Knights, Murray and Willmott [1997:153] suggest that "new 'regimes of truth' (...) undergo a process of multiple translation and accident as their champions rethink, and are challenged, subverted and blown off course by recalcitrant actors and unexpected intermediations".

According to Bloomfield *et al* [1997], the distinctive property of information systems is their capacity to create rather than merely report organisational reality. "The implication of this constructivist dimension of the development and use of IT is that the nature of management control takes on a different modality as a result of attempts to implement it through the medium of IT" [Bloomfield *et al* 1997:114]. Similarly to Knights, Murray and Willmott [1997], Coombs *et al* [1992] argue that a disciplinary conception of power, inspired in part by the work of Foucault, provides a more substantive way of accounting for these properties of IS. The power examined here relies on the self-disciplinary effects of reconceptualisations of practice and professional identity [Coombs *et al* 1992]. While IT is the very medium through which social relations may be articulated, forms of knowledge intersect with power, and this means engaging in a 'regime of truth', in which the world is made meaningful (represented) according to a particular set of interests. Such information resources are not divided equally in organisations, of course; hence, the introduction of IT to mediate data provision also serves to reaffirm an institutional order of authority [Orlikowski and Robey 1991]. IT is chronically implicated in the modalities through which structures of domination and legitimation are reproduced.

As illustrated by Bloomfield *et al* [1997] in their fieldwork on IT in the NHS, the introduction and application of concepts previously associated with commercial organisations have been the object of ongoing struggles and renegotiations; and "the internalisation of such constitutive concepts as costs, overheads, assets, customers, quality, etc. and the willingness of an organisation's members to construct their world and their work in terms of these concepts, is an instance of the exercise of disciplinary power" (p.115).

2.3.2 Politics

Of particular interest is Knights and Murray [1994]'s emphasis on the political context of IT

implementation and how management practice is influenced by, and has consequences for, broader socio-political, economic and organisational conditions. They argue that "it is largely through the social interpretation, construction or reconstruction of these conditions and what they mean for the organisation that specific political alliances are mobilised and particular information systems are made possible" [Knights and Murray 1994:xii]. They criticise constructivist and actor-network approaches for their unwillingness to bring into consideration general socio-economic conditions and theorise the basis of power in contemporary society. However, Knights and Murray do draw upon actor-network analyses of the social achievement of technological innovations through the construction of webs or networks of actors. They also value actor-network insistence that technologies are constructed through social process comprising accident, fortuitous circumstance and political action.

In examining the different perspectives to technological and organisational change, Knights and Murray propose a two-dimensional framework, derived from Burrell and Morgan, that "differentiates theoretical approaches by their analytical focus (global or macro versus local or micro) and their view of politics (abnormal or disruptive versus normal or inescapable)." [Knights and Murray 1994:244]. Using this framework it is possible to understand the diverse range of positions taken by the technological change literature. I have added to this framework the items printed in italics in [**Figure 2.2**], as they are of interest to the present thesis and are reviewed above (structuration theory in **Section 2.2.6**, power/knowledge in **Section 2.3.1**) and below (institutionalisation theory in **Section 2.3.3**, power in **Section 2.3.4**). In terms of methodological focus, global studies tend to rely on systemic or structural factors such as innovation, class or gender. Micro studies tend to produce dense descriptions of technological and organisational change but at the risk of loosing their analytical power, although most studies combine elements of both the global and the local. On the other hand, authors tend to see politics in one of two ways: either as disruptive to the smooth and rational management of an organisation or as an inescapable fact of organisational life [Knights and Murray 1994:3]. Knights and Murray [1994:244] position themselves primarily in the segment that combines a focus on localised events and that regards politics as an essential feature of organisational life.

Focus of research	Political Position: Politics as disruptive	Politics as inescapable
Localised	Pluralist and processual theory	Constructivism Actor-network theory
	Socio-technical systems theory	*Power (Foucault, Clegg)*
	Structuration theory	
		Institutionalisation theory
	Technological determinism	Social shaping of technology
Globalised	Functionalism	Marxism Feminism

Figure 2.2 A classification of theoretical approaches to technological change [adapted from Knights and Murray 1994:2]

However, they see local sites of social process as part and parcel of the global relations that condition and are reproduced in those localities. They particularly see information as socially constructed "to convey politically charged messages to politically motivated people" (p.252). Organisational change is a political process; change has several objectives, some of them contradictory in their implications, and many giving expression to opportunistic and implicit tactics, agendas or strategies. De facto change emerges from conflicts at tactical level, ad hoc management decisions, and accidents, rather than from a rational planning process. "Although dominant coalitions will probably be involved, strategy [or change or resistance] can emerge from anywhere in the organisation. Organisational goals are not unitary, may be conflicting, and are frequently left unstated or unclear for political reasons" [Knights *et al* 1997:28].

By contrast, the IS literature is predominantly rationalist and subscribes to prescriptive managerialism which claims to offer advice on how to manage IT using a descriptive norm. It does not make reference to the political character of IT developments and their essential contestability [Knights and Murray 1997:37]; whereas they have found that: "tensions surrounding IT management are systematically related to complex sets of power, managerial and market relations" [Knights and Murray 1997:37]. Strategy and change are a contested terrain of discourse rather than a description of a rational

process or a prescription for rational action. Knights *et al* [1997:30] recommend that we should concentrate on the internal political context, as well as on the social and institutional aspects of the external context; and that we should not neglect the way in which organisations both reflect and reproduce the major social inequalities in society and hence the essentially contestable nature of organisational relations.

Knights and Murray's understanding of power is opposed to the individual conception of power as a property or capacity of individuals or institutions. Power is synonymous with social relations [Knights and Murray 1997:42]. Conflict is conditioned by, and regulated through, the exercise of material and symbolic power. This power can be used to mobilise particular views of the market and technology in order to legitimate choices that may have more to do with specific individual and/or collective interests than corporate objectives [Knights and Murray 1997:43]. The formulation and implementation of IT strategies is a social process in which political activities are related to the choices being made, the structures of organisational control and co-ordination, and the changes taking place in the organisation's broader environment [Knights and Murray 1997:44].

2.3.3 Institutionalisation of IS

Similarly to Knights and Murray [1994], Silva [1997] believes that organisations do not have power structures but are comprised of power relations, which determine information systems, "and that an adequate interpretation of such relations underscores the success or failure of technology-based systems" [Silva *et al* 1997:512]. They criticise Walsham [1993]'s use of structuration theory in that he claims that IS are power instruments but does not spell out the relationship between IT and power [Silva *et al* 1997:513]. Although they value Walsham [1993] and Orlikowski's [1992] use of structuration theory in taking into account the relation between action and structure, Silva and Backhouse [1997:394] state that Orlikowski, for instance, does not discuss fully the political factors that influence the institutionalisation of IS. Silva [1997] and Silva and Backhouse [1997] believe that the institutionalisation of information systems is an outcome of power relations, and they propose a framework that can provide a starting point for researching the legitimisation, control and political dimensions of information systems.

Their framework draws on actor-network theory and the sociology of translation, but they complement it with institutionalisation theory and the model of 'circuits of power' proposed by Clegg [1989]. They select the brand of organisational institutionalisation theory (after Meyer and Rowan) which concentrates on the processes that lead to the institutionalisation of rules and how they become legitimate. The other brand of institutionalisation theory (after Powell and DiMaggio) focuses on how organisations structure themselves by taking elements from the environment, and seeks to explain similarities among organisations [Silva and Backhouse 1997:392]. By contrast, Hanseth and Monteiro [1998] mentioned

above, adopt the second brand.

Unlike Markus [1983] and others, who adopt a voluntaristic approach to power which explains power via mechanical metaphors (e.g. individuals or groups affecting other individuals or groups), Silva and Backhouse [1997]'s approach is closer to Foucault's concepts of power and knowledge (see **Section 2.3.1**): they wish to explain "the process of how an information system becomes objectivised and taken-for-granted knowledge" (p.393). They assert that their research is also complementary to, for instance, Knights and Murray's [1994] valuable work on the political features of implementation and design of information systems [Silva and Backhouse 1997:393]. They agree with Monteiro and Hanseth's [1996] criticism of Orlikowksi and Walsham for not describing the influence of social factors on IS and how interests are inscribed in IS to make them irreversible or durable, the latter of which Monteiro and Hanseth do using actor-network theory.

On the other hand, Silva and Backhouse [1997:394] estimate that Monteiro and Hanseth's [1996] explanations of the institutionalisation of IS do not focus on the political elements. Hanseth and Monteiro [1998], though, have since incorporated 'new' institutionalism (Powell and DiMaggio or institutionalisation of organisational structures) to enrich their analysis, again in contrast to Silva and Backhouse [1997] who use the first form of institutionalisation theory (Meyer and Rowan or institutionalisation of rules and legitimation), as mentioned above. Silva and Backhouse [1997] believe that "power is a concept with many approaches and theories in social sciences and (...) that some of these theories are not mutually exclusive but complementary" (p.395). Their circuits of power framework is an attempt to integrate several of these theories of power.

2.3.4 Clegg's circuits of power

According to Silva and Backhouse [1997:395], Clegg's [1989] frameworks of power "should lead us to understand the relationship between the authority and politics of organisations". The circuits of power framework considers power as circulating in three different circuits: the episodic circuit; the social integration circuit; the system integration circuit, which are all linked by obligatory passage points [Clegg 1989; Silva *et al* 1997:513; Silva and Backhouse 1997:395], see **[Figure 2.3]**.

In the episodic circuit of power (which represents causal power), agents struggle to control resources and other agents may resist. The circuit will be completed (the information system designed and implemented) when the recognition of the resources utilised to carry out the outcomes are identified. However, information systems will affect organisations in two other dimensions. They may change the organisational norms, meanings and membership of groups (social integration); and they will affect the way jobs are performed (system integration). Those agents who successfully control resources will be the ones with a stronger power base. The power base of agents is given by the circuits of social and system

integration.

Social integration (dispositional power) refers to rules for meaning, group relations and membership [Silva *et al* 1998:514] and is therefore related to institutional order. Bringing about this circuit will lead to the identification of the legitimate and illegitimate dimensions of power within the organisation. The circuit of social integration will comprise the norms, rules and meanings that identify and allow the integration of a particular group.

System integration (which facilitates power) is defined in terms of the material conditions: the material means of production, but also the material means of organisation and violence, or in other words, the techniques of production and discipline [Silva *et al* 1998:515], which, according to Clegg, cannot be separated. New techniques of production and discipline, such as information systems, imply new agencies and new obligatory passage points "that the social integration circuit might find difficult to resolve" [Silva *et al* 1998:515].

Whenever an innovation is introduced in organisations, this creates new meanings and therefore disturbs the circuit of social integration. Success in implementation will depend greatly on the ability to translate the new rules and norms implied by the system into pieces of discourse that other members of the organisation can understand and accept. The new meanings are fixed in obligatory passage points. An obligatory passage point (**Section 2.2.3**) is a rhetorical device that presents the solution for a problem and that will allow the formation of alliances and the control over resources that agents need to achieve their outcomes. Information systems can be considered as obligatory passage points [Silva and Backhouse 1997:400]. In the case of this thesis, computerised reservation systems are an example of an obligatory passage point since commercial airlines in effect present them as an unavoidable way for travel agents to do business.

One implication of this framework is that "analysts should focus on how information systems are used as a means of control and discipline" [Silva *et al* 1998:516], and this is strongly related to the Foucauldian notion of power/knowledge outlined above [see Bloomfield *et al* 1997]. Silva *et al* [1997] also incorporate the actor-network concept of translations already outlined in **Section 2.2.3**. The concept of obligatory passage points originates from the sociology of translation.

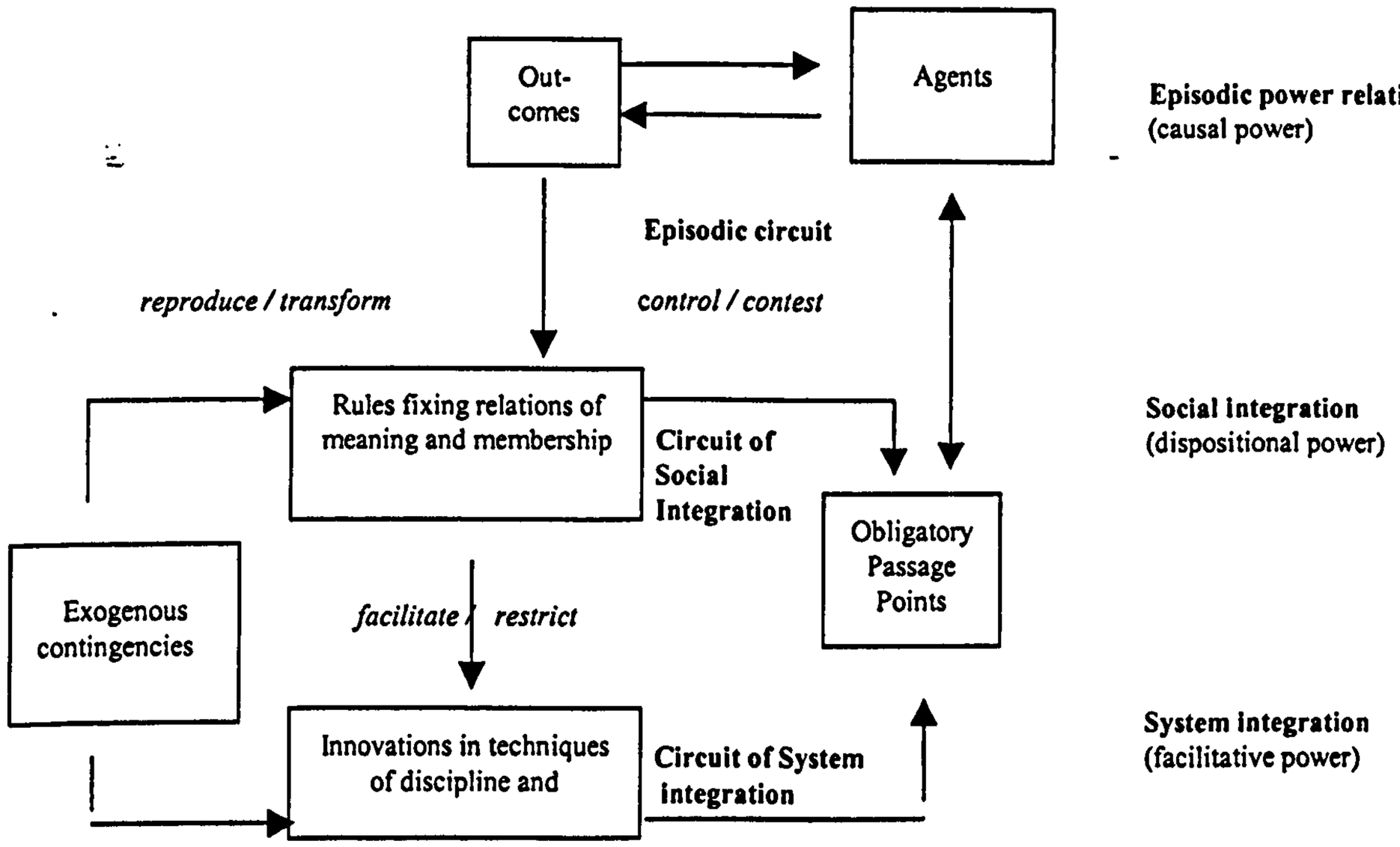

Figure 2.3 The circuits of power
[based on Clegg 1989:214 and Silva *et al* 1997:514]

Silva and Backhouse [1997] use this framework to analyse the London Ambulance Services computer-aided dispatch failure, already mentioned above. They found that exogenous environmental contingencies (e.g. managerial discourses available about strategies supported by IT) influence the circuits of system and social integration. Using the episodic circuit of power enables an analysis of the power struggle dynamic between LAS management and staff. But using the episodic circuit of power on its own would not explain why the system was rejected, which is explained by the fact that the circuits of system and social integration were not fixed in a successful obligatory passage point [Silva and Backhouse 1997:404]. In terms of social integration, the new rules stemming from the new tasks were not translated successfully [Silva and Backhouse 1997:406]. The authors conclude that: the translation of the actors in the obligatory passage point, the computer-aided dispatch system, failed, despite managers having the power in terms of money and decision-making; this "shows how risky it is to prematurely consider information systems as black boxes producing outputs such as change in culture and power structures without considering the social and system integration" [Silva and Backhouse 1997:408-409].

Silva *et al* [1997] also apply the circuits of power framework to the case of the introduction of a federal IT infrastructure by a UK borough council wanting to become a 'networked' local authority. The

translations of this federal 'networked' model, the obligatory passage point, gave rise to contradictory interpretations, made clear through the analysis of the social integration circuit, and failed. Perhaps most interestingly, the authors found that "both system and social integration were affected by exogenous contingencies" in the form of "economic crisis, internal market ideas, and managerial practices supported by IT", i.e. cost-benefit and cost-effective techniques, leading to staff redundancies and outsourcing [Silva *et al* 1997:522-523].

2.3.5 Macro/Micro

Using Clegg's circuits of power helps describe and analyse how information systems are situated within power circuits and authority relationships in organisations. The issue of 'macro' social structures, and in particular the correlation between macro factors, power and politics within organisations need to be considered further, and this is related to the broader and ongoing debate about micro and macro approaches to sociology.

Knorr-Cetina and Cicourel [1981] define micro-sociology as the study of the micro-processes of social life and includes symbolic interactionism, ethnomethodology, social phenomenology and cognitive sociology; and they describe macro-sociology as the study of society, social institutions and socio-cultural change. These authors, amongst many, have advocated an integration of micro- and macro-sociologies through a re-construction of macro-social theory and methodology based upon a micro-sociological foundation since: "concrete social interactions may be considered the building blocks for macro-sociological conceptions" [Knorr-Cetina 1981:7]; and "macro-social phenomena are unknown and unknowable unless they can be based upon knowledge derived from the analysis of micro-social situations" [Knorr-Cetina 1981:8]. The last thirty years have seen a rejection of macro-sociology and its perceived social determinism (the social whole determines matters for the individual). Many have been attracted by micro-sociologies, which turn to interactions in social situations as the relevant methodological 'units', and to how actors's meanings are constituted with social relationships through the "interlocking of intentionalities" [Knorr-Cetina 1981:9]. In parallel, micro-sociologies have grown more concerned with the additional element of the context in which interaction is embedded and how actors manipulate contextual limitations and increase their contextual knowledge [Knorr-Cetina 1981:10-11]. Contexts (settings, occasions) are not viewed as 'external environments' to which individuals 'adapt' but are themselves seen as (re)constructed in social action through an interpretive process based upon presupposition and knowledge of broader societal institutions concepts [Knorr-Cetina 1981:12].

For instance, MacKenzie [1988] states that, though traditional macro-sociology is more relevant politically than micro-sociology, "the former is insufficiently puzzled by the phenomenon of structural power". He claims that the 'micro' concerns have great relevance to an understanding of power, for

example in investigations of scientific and technical change, through connections of power and knowledge and/or machinery. He argues that: the micro/macro distinction is probably a false and potentially damaging dichotomy; that structural power, science and technology all involve local situations; that it is worth investigating what is implicitly political in localities; and that there is a direct link between a local situation and questions of knowledge and power in its most 'macro' sense.

Many sociologists and social constructivists in particular have therefore dismantled the traditional dichotomies between the notions of power/powerlessness, structure/action, collectivity/individuals, usually associated with macro/micro, and power is now seen as emerging from local arenas of action. Foucault, for instance, has argued that power must be analysed as a microprocess of social life. Macro-influences cannot be known through direct evidence, local social situations are seen as the product of multiple forces and powers associated with strategic positions, of techniques of persuasion and tactical moves, conversations, implicit alliances, negotiations, interest affiliations, and micro-elements of social reality include interaction, relationships, internal environments, power, etc.

Unintended consequences

In this revised micro/macro climate, Knorr-Cetina [1981:25] points to two emerging conceptions of macro-social phenomena: the aggregation hypothesis and the hypothesis of unintended consequences, which both attempt to reconstruct macro-sociology from a micro-sociological perspective. The aggregation and unintended hypotheses both regard the macro-order as an emergent phenomenon composed of the sum or the unintended effects of micro-events [Knorr-Cetina 1981:40].

According to the first hypothesis, all evidence regarding macroscopic phenomena must be aggregated from micro-episodes or micro-situations in which situated interactions are partially structured by past definitions, and at the same time always open to reinterpretations [Knorr-Cetina 1981:26]. According to Callon [1991], aggregation is not a procedure invented by the observer in order to simplify the complexity of reality, it is the very movement of social life.

The second hypothesis is of particular interest here in that it relates to the failure debate outlined at the beginning of this chapter. Social situations exhibit chains of events and local interventions, which are the interrelations of scenes of action and agents construed through complex representations of mutual knowledge, intentions, projects, interests, etc. which lead to unintended outcomes, in addition to intended outcomes [Knorr-Cetina 1981:33]. This draws on Harré's [1981] analogy with the emergent properties manifested by a whole but not by its parts in the natural sciences; and on Giddens's [1981] argument that the formation and transformation of social institutions must be seen in the light of the unintended consequences of social action, which condition social reproduction and determine the process of structuration through which systems are maintained and change over time. The organisational sociologists

Knights and Murray [1997:44] also draw on this notion when they say that there is an "on-going cycle of decision-making and implementation, each stage of which necessarily generates unforeseen consequences and open-ended social interactions and developments" when implementing information technology in organisations.

Curiously, the idea of unintended consequences has being recycled recently, in a somewhat distorted manner, by some authors, one of which is Tenner [1996]. He holds that major technological advances lead to paradoxical, unforeseen and unintended effects, and that the technologies we have created are getting even and 'biting back', and that, as we complicate the systems which govern our lives, 'revenge effects' multiply. He presents a kind of technological pessimism and gloom and doom vision when stating that new disasters (as opposed to classical and predictable ones) "may be global and gradual, from radioactive isotopes in milk in the 1950s to climate change in the 1990s" [Tenner 1996:24-25]; and that "new disasters may (...) be unintended consequences of prior solutions" [Tenner 1996:256]. However, this approach seems based on deterministic (essentialist) and contradictory assumptions about nature and culture. For example, the notions that nature has a "tendency to strike back" (p.273) when abused, and that "human culture" has created most revenge effects through greed and arrogance ,"not some inherent will of the machine" (p.276) or 'natural' characteristic, are problematic.

Micro/macro and actor-network theory

The reformulation of the macro-micro question is one of the underpinnings of actor-network theory in its adoption of a "birdseye perspective to reconstruct the network of interrelated affairs" [Knorr-Cetina 1981:33], and in its rejection of the macro as an explanation. "The macro appears no longer as a particular layer of social reality on top of micro-episodes composed of their interrelation, their aggregation or their unforeseen effects. Rather, it is seen to reside within these micro-episodes where it results from the structuring practices of agents" [Knorr Cetina 1981:34, original emphasis]. Callon and Latour [1981:277] also conceive of the macro as actively construed and pursued within micro-social action. They comment that: micro-actors "blow themselves up to a macro-size by making themselves the spokesmen of many others whose following they enlist, through their summary representations" (which Knorr-Cetina refers to as the representation hypothesis, p.40); and that the macro-order consists of micro-actors who have successfully translated other actors' wills into a single will for which they speak, and because of the forces on which it can rely.

Furthermore, structures do not simply reside in the actions of people, they exist in a network of heterogeneous material arrangements. Latour [1991:129] urges to abandon the divide between material infrastructure and social superstructure and claims that, when actors and points of view are aligned, we enter a stable definition of society that looks like domination ("society made durable"). However, Knorr-

Cetina [1981:41, original emphasis] remarks that, pushed to its extreme, this "denies the existence of a macro-order apart from the macro-representations which are accomplished in micro-social action". In this perspective, macro-structures are created by routine inferences, interpretation and summary procedures, and do not control micro-events (p.51). In other words, the degree to which macro-structures control micro-events is a continual matter of controversy and struggle in social life [Knorr-Cetina 1981:39].

Avoiding taking the macro-order at face value is a strong motivation and a sound basis for wanting to study its production in micro-social environments instead. Knorr-Cetina [1981:40] argues that this does not "neglect the issue of power which hides beneath everyday differentiations between 'big' and 'small' actors" and that, instead, it "relocates and redresses questions of power". On the other hand, she warns that a microscopic recording of face-to-face interaction may not allow us to grasp whatever is the whole of the matter, even if she contends that "it may be enough to begin with [in order] to hear the macro-order tick" [Knorr-Cetina 1981:42].

Macro, meso and micro?

Other authors have suggested that transformations of social reality occur between levels. Duster [1981] studied income tax regulation and community-based programmes dedicated to the enactment of this regulation, according to different levels of abstraction of social reality and enquiry, so as to challenge the microscopic nature of all events [Duster 1981:109]. In his analytical framework, macro-phenomena consist of the effects of the unintended consequences of micro- or middle- range action. For Harré [1981:139] it is the macro-order composed of such effects which acts as a selection environment for social action, for example by determining which of the micro-mutations of social life will take off and persist as a component of social change [Harré 1981:139]. Harré proposes a theory of social change in which the notion of diffuse social influence from unknown structural properties of a macro-order plays a part [Harré 1981:158].

In Giddens's [1981] duality of structure, based on the tension between action theory and institutional analysis, rules and resources instantiated in social systems "structure" actors' actions; structural qualities generate social action and are reproduced through these actions. Knowledgeability and capability of social actors are bounded by unintended consequences of (previous) social action which condition social reproduction. Unintended consequences have a key role in explanations of social change since they divert social action from a structured course [Giddens 1981:161].

Callon and Latour [1981], on the other hand, do not believe in a micro-macro distinction. They do not think that we draw closer to social reality by descending to micro-negotiations or by rising towards the macro-actors. Macro-actors are not more complex than micro-actors and are just micro-actors "seated on black boxes" [Callon and Latour 1981:299]. They also, symmetrically, oppose the view that micro-

negotiations are truer and more real than the abstract, distant structures of the macro-actors [Callon and Latour 1981:300]. Furthermore, "by taking for granted differences in level and size between actors, [one] ratifies past, present and future winners (...) finding favour with the powerful" (p.300).

The macro-micro question is obviously complex and unresolved. Actor-network theory is also complex and difficult to use, since describing actors and networks, even when including Clegg's power circuits as illustrated above (**Section 2.3.4**), runs the risk of producing asocial, apolitical, ahistorical, and decontextualised accounts. In this case study, on the other hand, macro-actors and structures in the transport context are difficult to ignore and include 'big' business and 'big' politics, even though they may well be previous, stable, irreversible, actor-networks, which are conditioning the current actor-network.

2.4 RESEARCH METHODOLOGY

The macro-micro problem is particularly relevant to the *Socrate* case study and, clearly, the purpose here is not to resolve these socio-philosophical issues, but merely to avoid some of the pitfalls identified by researchers, such as: social or technological determinism, focusing only on either the micro or macro levels, and adhering to either micro or macro-actors' explanations unquestioningly.

As a constructivist theory, actor-network theory is, as claimed by Monteiro and Hanseth [1996], very effective for describing how minute, technical design solutions are interwoven with organisational issues; and as claimed by Walsham [1997], a good contribution to building an empirical base. However, as discussed above, it tends to ignore wider societal issues of conflict and it needs to be complemented with some critical analysis of power and political relations. Referring to Knights and Murray's [1994] classification of theoretical approaches to technological change in **Figure 2.2**, the theoretical framework of this thesis is localised and envisages politics as an inescapable feature of organisational life (the top right hand corner of the matrix). However, it is important to conceive of local sites as part and parcel of global relations. Organisations both reflect and reproduce the major social inequalities in society, thus Knights *et al* [1997] recommend concentrating on the internal political context as well as the social and institutional aspects of the external context.

Using Clegg's circuits of power, combined with Callon and Latour's sociology of translation, can also prove productive in the present case study in order to analyse how translations failed (i.e. obligatory passage points giving rise to contradictory interpretations). However, Silva *et al*' s [1997] have found that in utilising the circuits of power framework to analyse IS implementation in organisations, the role of exogenous contingencies such as economic crisis, internal market ideas and IT-supported managerial practices, must not be underestimated. Furthermore, "the activity generated and reproduced through managers (...) is rooted in market relations", and "markets and information regarding the state of particular markets do not exist independently of the conceptualisations and interpretations that organisational actors

have of them" [Knights and Murray 1997:41]. Organisational uncertainties are reproduced through markets, and this leads to tensions between individual and collective goals. In our case study, the changing nature and perception of transport markets, in particular the issue of co-operation versus competition (detailed in **Chapter 4**), are good examples of this.

> "The management of IT can first and foremost be understood as a process of organisational and extra-organisational politics responding to, and acting upon, perceived imperatives generated through the socially constructed phenomena of 'markets', 'technologies' and 'organisations'. These phenomena appear to take on a life of their own and the individual confronts them as a constraining or facilitating reality. The asymmetrical distribution of power as access to, and control over, material and symbolic resources allows certain individuals, groups, and classes to dominate a socially constructed development, design, use, and management of specific technologies. But tensions between managers locked into particular labour processes and the very unpredictability of markets suggests that this domination cannot necessarily guarantee the successful use and development of IT. This analysis would suggest that the role of IT in organisational change is neither pre-ordained nor predictable" [Knights and Murray 1997:53].

Clearly, it is believed here that macro-structures do not control micro-events, and that social processes exhibit chains of intended and unintended outcomes, which it is argued, explain failures. Some human perspectives win over others in the construction of technologies and truths, some human actors go along with the will of other actors, and some humans resist being enrolled, in an unpredictable manner.

In terms of clarity of analysis and presentation, Drummond's [1996:180-185] use of macro, 'meso' and micro levels in her *Taurus* case study seems appropriate and useful here, and is as follows. The macro level refers to the wider context and opens the analysis to the possibility that domination is tied to the "deep structure of power" [Drummond 1996:181]. Macro-level forces in her case study were the Establishment (surrounding the London Stock Exchange) and the power struggle within the City. At the 'meso' level, actors pursue their multiple, respective and sometimes conflicting interests. An example at *Taurus* was the institutionalisation of regular information gathering exercises through various reporting committees; each move is entirely logical, as the product of a previous decision, leading members to say "this is what the committee said we ought to do". The micro level includes issues of commitment, performance feedback and working practices. The categories already used in the introduction (**Section 1.7** and **Figure 1.2**) i.e. macro, organisational and micro levels of analysis correspond to these divisions.

Nevertheless, as Walsham points out [1997:469]: "actor-network theory is both a theory and methodology combined", in that the researcher needs to "trace and document network elements, both human and non-human, processes of translation and inscription, the creation of black boxes or immutable mobiles and the degree of stability and irreversibility of networks and their elements" during his or her empirical work. This is no small task for a complex network (p.470). Walsham [1997:476] observes that actor-network theory studies produce a veritable mass of detail which often lead to book-length outputs – for example Latour's monograph on *Aramis* [1992] examined earlier, but also Vaughan's [1996] and

Drummond's [1996] books which are typical of in-depth sociological case studies. Walsham [1997] estimates that IS research is lacking in research-based books such as those, and that studies based on actor-network theory could offer a contribution there. However, they are extremely labour-intensive and time-consuming, for instance Vaughan spent nine years researching and writing her book on *Challenger.*

Some IS researchers have found that "only a rich, integrative view of IS implementation does justice to the complex realities of social life in organisation" [Myers 1994:198], and that implementation can only be understood in terms of its wider social and historical context. Furthermore, Harvey and Myers [1995:23] argue that "generalisable knowledge is often neither relevant nor meaningful, in which case we are better off understanding specific contexts", even though story-telling approaches may be misinterpreted as non-rigorous. What is required is "a rigorous approach to the analysis of the institutional contexts of IS practices, with the notion of context being one of the social construction of meaning frameworks" [Harvey and Myers 1995:21]. Sauer [1993:3] recommends studying whole cases so as not to reject any part of them as irrelevant and to come closer to a realistic understanding of information systems failure. The social system dimension must include the larger social and political processes through which the interests of the different social groups interact with one another and with the technology [Robinson 1994]. This implies that macro-social and historical factors must be investigated, as well as the multi-causal relationships more immediately involved in failure [Lyytinen and Hirscheim 1987].

Despite the increasing prominence of interpretivism, the development of non-positivist research methods has been controversial, and the debate continues on the relative merits of interpretivist versus positivist approaches to IS research [Orlikowski and Baroudi 1991]. The positivist perspective, with its exclusive reliance on statistical or experimental testing of hypotheses, has been subject to heavy criticism and its application to the social sciences, as opposed to the natural sciences, is not so successful [Hirschheim 1992]. The positivist tradition tends to remove the effects of context to achieve 'objectivity' and reliability, but this is at the expense of a deeper understanding of what is actually occurring. Positivism is inclined to explain phenomena through determinate and one-dimensional causal relationships, which is inappropriate when studying the interactions among technology, organisations and society [Markus and Robey 1988]. The ontological position of interpretivism assumes that access to reality is only gained via social constructions such as language, shared meanings and artefacts. Whilst it is incorrect to equate qualitative research with interpretivism (and quantitative methods with positivism), it tends to be the method most frequently drawn upon.

Mainstream quantitative positivist research methods are therefore of limited use and longitudinal qualitative studies focusing on the context of each case are more appropriate [EJIS 1993]. They enable a richer investigation of (a) the micro-level, at which social actors and work groups act and interact locally; and (b) the macro-level in which actors and organisations are situated and which affects their economic and social interests, power, knowledge, culture and aspirations to control. Quantitative positivist research

methods have been criticised as too rooted in functionalism, and too concerned with causal analysis at the expense of getting close to the phenomenon being studied.

Many significant contributions in the social sciences have resulted from single-case studies published in book form. Darke, Shanks and Broadbent [1998] believe that case study research enables the capture and understanding of context and can be used to achieve a variety of research aims using diverse data collection and analysis methods. Dyer, Wilkins and Eisenhardt [1991] even argue that publishing in research journals prevents in-depth examination and extrapolation because of space restrictions. In the interpretive tradition, the most appropriate method for conducting empirical research is the in-depth case study, which allows for a comprehensive approach to the historical and longitudinal analysis of complex phenomena [Montealegre 1995]. The interpretive researcher attempts to derive his or her constructs from the field by an in-depth examination of and exposure to the phenomenon of interest. The categories and themes that emerge out of this approach are intended to closely couple those relevant to the study's participants [Orlikowski and Baroudi 1991:14]. Because of the commitment to a processual view of phenomena, critical studies also tend to be longitudinal. The research methods of choice in critical studies are long-term historical studies and ethnographic studies of organisational processes and structures [Orlikowski and Baroudi 1991:20].

Equally, radical micro-sociological orientations reconstitute macro-sociology on the basis of a micro-sociological foundation, partly due to their critique of quantitative measurement in sociology [Knorr-Cetina and Cicourel 1981:13]. Experts in social research methods have long argued that survey methods can only address exploratory questions of what, how many and how much, whereby case studies can investigate explanations to why and how questions [Yin 1989]. Social constructivism relies on theoretically informed empiricism and a sensitive methodology, which preserves the characteristic traits of the field of study. Some common elements used in micro-sociology are verbal and non-verbal data, cognitive structures such as frames, scripts or plans, gathered via tape and video- recordings and observations.

In this case study, the analysis is complex since it involves many groups and many levels. It encompasses a cross-cultural (from the US to Europe) and cross-sectorial (from air to rail transport) transfer of an information system, as well as an attempt to transform associated management discourses, commercial practices, economic models, strategic goals, political perspectives, sectorial markets and structures. A series of complex 'translations' takes place in the transfer of the deregulated model from the US to Europe, and from the air to the rail sector. The project goes through translations in order to proceed. It succeeds, not because it is inherently better than the alternatives, nor because it is the 'right' answer to the problem being faced, but rather because it is adopted by other actors to serve their purposes. Instead of understanding IS projects as proceeding 'normally' unless they are actively stopped (and hence 'fail'), projects are seen as not proceeding unless actors make them happen. Each actor 'translates' the

project and takes it in a specific direction according to his/her context. A detailed understanding of actors' contexts and purposes, therefore in the case of the present thesis researching the politics and economics of transport, rail and air, American and French, is critical.

Commonly, there are difficulties in gathering information for research into failures and disasters [Flowers 1996]; it is inadequate just to rely on the relatively few instances that come to light through public inquiries and press reports. Poulymenakou and Holmes [1996] even suggest that the 'famous' failures such as the London Ambulance Service or *Taurus* are merely the tip of the iceberg. There are often in public sector organisations where failures with high public profiles are more difficult to 'hide' than incidents in the private sector.

It is also difficult to make sense of events retrospectively. The act of exploring itself has an impact on what is being explored [Weick 1988:305]. Retrospection often creates an erroneous impression that errors should have been anticipated and prevented [Starbuck and Milliken 1988:338], and learning from disasters is neither inevitable nor easy since they typically leave incomplete and minimal evidence. Weick [1988:306] also argues that the exploring itself is guided by preconceptions of some kind. Moreover, decisions that are perceived as right (or wrong) at time (1) may be viewed in a different light at time (2) and in another light at time (3) [Drummond 1996:166]. And there may be a code of silence, which prohibits discussions about failures [Nulden 1996:69].

There is a multitude of different data collection techniques and they vary according to the extent of interaction (the 'distance') between the researcher and the phenomena under study. Until quite recently, much of the reported interpretive IS research [Walsham 1995a] only involved relatively distant data collection methods such as analysis of published data, textual analysis or surveys. Document analysis was used in my fieldwork together with less distant methods such as interviews and observation, which provided face-to-face contact with the social actors in order to explore and probe responses. The case study method necessitates the collection of a large amount of rich, 'thick' qualitative information from a number of sources in order to address the complexity of the organisational processes and of the context studied. These are described in the next section.

2.4.1 Fieldwork

The fieldwork for this research project started early in 1994, six months after the failed implementation, and lasted eighteen months. The choice of the case study was motivated by the uniqueness, richness and complexity of this case, which was seen as a rare opportunity for investigating the many contextual influences which affect the implementation of information systems, through detailed, in-depth qualitative research. My awareness of this case came as I was queuing to buy tickets in a Paris railway station in July 1993, and, apart from having to wait an unusually long time, I noticed a large

SNCF poster (see **Appendix 1**) apologising to travellers for difficulties with the new computer system. Every French person I talked to in the following few months, family, friends and strangers on trains, had a story to tell about their bad experience with *Socrate* and had strong, often divergent, opinions about the matter. It became obvious that the combination of *Sabre*, French Railways and failure had to be the topic of my thesis...

Stories and story-telling are common activities and for the most part we do not take these accounts very seriously. However, the significance of stories has come to the attention of researchers as they, in particular, document organisational successes and failures [Schwartzman 1993:44]. However, it is clear that even ethnographic descriptions "depend not just on decisions about what we believe to be true but also on judgements about relevance" [Hammersley 1990:609]. As Stanley [1990:623] in a comment on Hammersley [1990] argues, inexhaustible descriptions of empirical phenomena are possible, but writing accounts of social reality is not inexhaustible. We need to examine why 'this description' rather than any other. Of course, as a researcher and academic, I work within contextually-specific practicalities which provide me with particular responses to social problematics. I need to account for my research experience but also to produce a text that needs to satisfy the concerns of my academic peers. As Ely *et al* [1997] point out, creating research writing is also about crafting stories which are useful, believable and interesting and that evoke the complexity of the experience within their studies. Additionally (and mercifully!), unlike most readers who have not been 'there', I have experientially-based knowledge for making a judgement about validity. On the other hand, and reflecting upon my own involvement, my very first reaction when queuing in the Gare de l'Est in Paris in the summer of 1993 was of bewilderment and anger at SNCF having done something to 'my' trains, at having imposed a change to 'my' long-established (and youthful!) way of travelling in my native country... I suspect this was a widespread and very French way of reacting. This initial reaction in itself was of interest, and the subsequent realisation that *Sabre* was a major component of this new situation was a sort of retribution as it paid back for my years spent in the late 80s in business schools nearly believing in the American-born gospel of IT and strategic advantage... An obvious and convenient, if not strategic, advantage of being bilingual and French-born was my extensive knowledge of the French and English cultural contexts and perspectives.

Relatively easy research access to this public sector enterprise was also an important contributing factor. Flowers [1996] stresses how difficult it can be to gain access to private companies when investigating implementation issues, particularly failures. Sensitivities can lead to access difficulties and restrictions to report which may "serve the interests of the powerful" [Lee 1993:129]. When contacting my interviewees I engaged myself in writing to preserve their anonymity and only their initials are given in this thesis. At the beginning of each interviewing session I asked for permission to use a tape-recorder and no interviewee refused. In fact, they provided me with a tape-recorder when mine broke down. My interviewing technique started with outlining my background and my research interests; I clearly stated

that I thought failures were complex and far from clear-cut; and that several computer failures had also happened in the UK such as *Taurus* and the London Ambulance Services; most interviewees had not heard of these cases, so briefly telling these stories was a good opening line, which I concluded by joking that at least SNCF had not killed anyone, unlike London Ambulance Services... This proved extremely successful in relaxing the atmosphere (at the expense of the British mainly!) and somehow made it easier to build trust and show appreciative understanding, openness to exchange and complicity, ingredients that Lee [1993:136-9] recommend when researching sensitive topics.

Incredibly, my initial contact happened to be married to an English woman who had studied French at my institution, Salford University at the time. He responded immediately and showed great enthusiasm and generosity in helping me, providing me with names and contacts, introducing me to people in corridors, letting me browse in filing cabinets, directing me to libraries and photocopiers, taking me to the local café, and walking back with me to the métro station in the evening asking for my impressions. Eventually, it also became clear that being French but living abroad had been an advantage: not living in France anymore, interviewees did not feel threatened by my presence, in fact welcomed it and were actively seeking the opinion of someone they saw as more detached from the events. The timing proved judicious too. Research access immediately after the events (summer 1993) would certainly have been refused. SNCF was greatly exposed to the scrutiny of the media for several months and a climate of blame prevailed externally (it was still present internally during my fieldwork, which I will expand on in **Chapter 6**). They had just recovered from a reluctance to face journalists' accusations by the time I contacted them. In fact, one of my interviewees [JPD Interview 9, see below] remarked as I was leaving his office that if I had sought access as a journalist (even as late as November 1994 when I interviewed him), he would not have told me "one twentieth" of what he had said during our conversation. Interviewees appeared to welcome an opportunity to re-examine events six months later and many interviews lasted 3 hours. Some kind of relief at having had a chance to revisit painful events and unburdened themselves was evident at the end of several interviewing sessions. This would not have been possible in the heat of the events.

These were the dominant dynamics during interviews with SNCF executives. Other more complex elements influenced a particular interview [CQ Interview 10]: I felt this had been the hardest and most difficult interview and thought I had failed in eliciting much from CQ, the only woman in the *Socrate* team. In fact, after listening to the tape, she had talked very freely and had provided me with very valuable material. Possible interpretations of the tension I felt during the interview can be attempted. Being the only 'powerful' woman she may have felt threatened in her authority and expertise (although she was highly praised to me by her male colleagues). The issue of expertise I perceived on other occasions too and may have originated from an impression that I would know more about Anglo-American management and technical jargon. Listening to the tapes I realised that I dealt with it by

distancing myself from the English-speaking world (usually making some sort of joke about English peculiarities) and reasserting my French identity. My academic status I think was more of an asset than a threat as academics have generally a good image in France and researchers are usually seen as objective. This was very much the case with union and passenger representatives, as well as low level staff. In the case of Interview 10, I also realised listening to the tape, that one of my first questions was formulated in a very simplistic 'black and white' way; although I was not very knowledgeable about many areas - which is what makes interviewing challenging and is part of the research process – this was not the case about this particular question. My retrospective impression is that I did so in order to allow her to regain control, as she started arguing and shouting against my statement vigorously making the atmosphere uncomfortable for me. My memory of the interview is one of embarrassment, but she was given space as a result and her comments proved invaluable (the French also tend to treat shouting and arguing as a natural part of working life too).

Empirical evidence was thus gathered using multiple methods of data collection [Benbasat *et al* 1987] as follows. *Primary methods* resulted in approximately 25 hours of audio-taped in-depth individual and group interviews. Interviews lasted from one to three hours, and much informal discussion with many staff occurred in corridors, at the photocopier, in the library, in the nearby café and métro station as well as general observations. Simply being around is a form of research sometimes designated "hanging around and listening in" [Strauss 1987] which provides insights into the organisational climate, frequent topics of conversation, off-hand remarks, group events, etc. In fact, the café opposite SNCF headquarters is heavily frequented by staff, and one of the waiters had spotted me when he had brought us cups of coffee during one of my interviews. It had an impression on him as my interviewee was the ex-head of the *Socrate* project and well-known; the waiter was curious of my presence with the 'big boss' and this led to interesting conversations.

All 'formal' interviews were transcribed and analysed qualitatively (see **Section 2.4.2**). A list of common questions asked during interviews can be found in **Appendix 2**. Many of the original members of the *Socrate* executive team were interviewed, "tous les papas, et la maman, de Socrate" as one interviewee put it [GC interview 6], as there was only one woman in the team. Interviews took place at SNCF headquarters and various other locations in Paris with:

- SNCF top executives and senior managers,
- IS specialists (yield management in particular),
- Marketing and human relations managers,
- Training managers,
- Sales staff,
- Trade union representatives,

- Passengers' associations,
- Travel agents and tourism experts.

The London Ambulance Services case study [Silva and Backhouse 1997; Beynon-Davies 1995] illustrates the benefit of examining written secondary sources as research material which provide a multitude of interpretations. Documents such as public domain government reports, press analyses, consultancy reports, union documents were therefore included. Silva and Backhouse [1997:401-402] claim that a careful selection of secondary sources can establish some degree of triangulation. I was also given liberal access to internal files - some confidential - and documentation covering the initiation, development and implementation of the *Socrate* project, starting from 1989 until the 1993 events. This extensive 'secondary' material was analysed in order to: present background information on the social, political and economic context (**Chapter 4**); reconstitute the history of the project and provide empirical data for the technical sections in **Chapter 3** - in which some quantitative analysis was also carried out on demand projections; provide empirical data concerning, marketing, pricing and ticketing details (**Chapter 5**) and organisational issues (**Chapter 6**). *Secondary research* for this thesis thus included:

- press reports,
- internal SNCF memos and documents e.g. [SNCF 1993a; SNCF 1989],
- government and audit reports e.g. [Cuq and Bussereau 1994],
- technical documentation (e.g. pricing schedules, ticketing information and training procedures),
- union publications e.g. [CGT *et al* 1994; FO 1994],
- marketing research and consultants' reports e.g. [APST 1991; Causa Rerum 1993],
- Rail and air, French, European and US transport literature e.g. [Miétus 1989; Petzinger 1995; Bavoux 1994; Hepworth 1992].

A detailed list of interviewees, their organisations, departments and positions, and their previous roles during the *Socrate* project if different from the time of interview, can be found in **Appendix 3**. When interviewed together and therefore leading to a group discussion, interviewees appear in the same box. When referring to interviewees' comments in the rest of this thesis, their initials are used and the interview number, e.g. [JMM Interview 1] or [EC Interview 3]. Quotes from French interviewees and writers are my own translation throughout. However, some text is also left in French, for instance job titles and names of departments and systems in technical diagrams. In terms of time coverage, the interviews and internal documents concentrated mainly on the duration of the *Socrate* project, from its initiation in 1989 to the aftermath of its implementation until 1994, to include for instance the revision of pricing and

the new simplified ticket in January 1994. Interviews themselves took place from early 1994 to late 1995. Secondary sources and some interviews covered a longer period, going back to 1981 when the first TGV was launched in France between Paris and Lyon, and to the 70s to have some understanding of CRS and air deregulation in the US; and desk research carried on until the SNCF split between operations and infrastructures in January 1997, which seemed a natural milestone.

2.4.2 Data analysis

The essentially social nature of information systems has led many IS researchers to adopt research approaches which focus primarily on human interpretations and meaning [Walsham 1995b]. Interpretive studies reject the possibility of an 'objective' account of events, opting instead for a relativistic understanding of the phenomena being studied [Orlikowski and Baroudi 1991]. Interpretive researchers see the pursuit of meaning and understanding as subjective and knowledge as a social construction [Walsham 1993]. They examine the social reality and subjective meanings held by people by eliciting and observing what is significant and important to them. They are not reporting facts but their interpretations of other people's interpretations [Walsham 1995b]. There is no rigid separation between data collection and analysis and the process is an iterative cycle of data collection and analysis, with the intention that the results of the analysis will help guide the subsequent collection of data. The cycle is repeated and theory is elaborated and checked as the process continues. When conducting interpretive research it is believed here that researchers should interact directly and intensively with the subjects of their research over a period of time.

Open-ended interviews, or *primary* data, complemented by published, or *secondary* data, were the most suitable forms of data capture. Secondary data covered a wide range of sources (see **Section 2.4.1**) and provided essential preparation for the interviews. Secondary sources of particular importance were the internal SNCF documentation, technical documents, union and passenger associations publications. These secondary sources are presented in a different typeface in the references at the end of this thesis (see **References**). They allowed cross-checking of factual information, major events, technical details, historical decisions and main organisational players and roles; they also supported the probing and exploring of particular responses during interviews. Such field study methods permit 'thick descriptions' and iterative collection and analysis for instance within and across interviews. A progressive analysis of actors' interpretations was thus possible together with an immersion in the context and a more sophisticated involvement and growing awareness of my own interpretations and personal experience. The focus was exploratory and attempted to discover patterns in the data and then explain these patterns through induction of concepts.

This research study is by necessity bounded by choices – who to interview, when and where, the types of questions to ask – which limit the conclusions that can be drawn. Gaining access to social groups

of potential relevance is a mixture of forethought and intention, chance, expediency, acceptability and opportunism. The interviewees were chosen for their relevance to the conceptual questions rather than their representativeness. Asking participants to suggest names of other actors and general networking through personal contacts expanded the sample. The total number of respondents to interview was reached heuristically, i.e. the decision to stop adding respondents was taken when nothing new was being learned from the interviews and a state of theoretical saturation was achieved. The interviewees were selected on the basis of their closeness with the *Socrate* project and their high levels of experience of organisational change at SNCF. It was deemed essential not to limit interviewees to IS staff. Other internal functional areas such as strategy, marketing, human resources, audit, sales and unions were represented; as well as external actors such as passengers and travel agents.

Verbatim transcription of interview data (in French) was carried out and extensive written notes were also taken during interviews. The information gathered from these interviews was subjective although an attempt was made to present an account from various perspectives and levels within and outside the organisation. Interview transcripts and written notes were analysed systematically through iterative and repeated re-reading of notes and transcripts and re-listening of the audio-tapes themselves. This enabled a more and more elaborate understanding of each interviewee's viewpoint and perspective, of links and contradictions within and across interviews, of complex and intertwined contextual factors, and of the many relationships between concepts.

Conceptualised descriptions emerged throughout the research process as follows. The first level of analysis identified various categories and organised them hierarchically. A colour coding system was devised and applied to paragraphs and sentences in interview transcripts; this corresponded initially to a broad structuring of the subject matter (e.g. transport policy). A second level of comparative analysis was carried out through validating relationships between categories and more abstract descriptions were derived (e.g. relationship between yield management and deregulation). An example of identification of categories from some interview data can be found in **Appendix 4**. All interview data was 'coded' in this way, although not all 'data' was directly used in the text; nevertheless, the coding helped conceptualisation, for instance the extract from Interview 16 below shows that union representatives were keen to steer the interview towards issues of public transport policies.

Finally, a more formal process attempted to integrate categories into an increasing organisation of theoretical components and their conceptual relationships (for instance how information gathering and market segmentation relate to separating infrastructures from operations, see **Section 6.3.2**). This led to structuring the findings into chapter sections and sub-sections and constructing gradual building blocks to assemble a more complex theoretical account. The findings are presented in discursive form embedded in a thick context of descriptive and conceptual writing. Detailed discourse analysis and coding were not deemed necessary, as they were perceived to atomise individual perspectives and prevent the development

of rich conceptual relationships. An effort was made to keep a focus on real actors, their backgrounds, roles and stances.

Conceptual analysis, theory building and methodological processes are difficult to control and manage. They are an aggregate description of exceedingly complex phenomena. While empirical data may be presented in evidence of a theoretical argument, the very selection of which data to present (and exclude) is an act of interpretation. The tension between 'data' and 'subjects' was experienced very strongly during data analysis and is reflected in an effort to keep subjects 'whole' throughout the thesis. The issue of distinction between fact and interpretation in case analysis still remains in question; however, accounting for 'whole' subjects rather than isolated pieces of text seemed to do more justice to the actors and their dilemmas in complex situations.

The findings of this thesis are in the form of general propositions obtained by inference. Arguably, the use of rhetoric and generalisation, based on the researcher's interpretation of field data, is a medium for presenting research findings in interpretive research [Walsham 1993]. However, the aim of case study research is not to say that the account given is what 'really happened'. It is to make an informed interpretation and analysis of the events available [Geertz 1973].

Description and anecdote can be useful tools for learning but do not constitute a form of analysis. When we analyse data we are looking for 'tendencies' that have emerged in the course of the research which explain past data [Bhaskar 1979]. These are then put into logical clusters and communicated in the form of issues, themes and concepts held within a coherent analytical context. An example of logical clustering from the mass of field data is how almost all interviewees kept discussing the issues of transport deregulation and the relationship of SNCF to the State. Another example was the 'neutral' nature of yield management. It therefore became apparent that deregulation and yield management might form the basis of major themes in the thesis.

Logical clusters need to be related to social theories in order to generate a sociological analysis. Each theory is necessarily partial and was used in what was felt to be its most useful application, but also acknowledging that these theories have their critiques. The aim was neither to argue for the superiority of any of these social theories nor to use them in a mechanistic way. Indeed, the possibility of a 'complete' or 'perfect' theory is rejected. Describing how an analysis of data is constructed from social theories is challenging, as the process is not neat and tidy. The following attempts to describe how the logical clusters were broadly related to social theories.

Most IS failure models examine the phenomenon in a vacuum and are idealised and decontextualised. One fundamental tenet of the sociology of technology is that there is no one inevitable way to develop technological artefacts. Therefore, when interviewing, one is listening for narratives about why things emerged in the way they did *or not*, in the case of failures; hence collecting multiple interpretations with all their contradictions, rather than finding the 'correct' interpretation.

A non-essentialist, social constructionist approach to technology understands the design and role of information systems in relation to their economic, social, political and political context. Actor-network theory is useful in understanding how information systems are mobilised as a resource and 'translated' by different actors; and Clegg's circuits of power help concentrate on power and political interests. Analyses at the local micro level (passengers, vendors, yield management), organisational level (change, culture) and macro level (transport deregulation in France and Europe) show the interconnectedness of the different levels of analyses. They also consider the implications of information systems beyond their local context in transforming the nature of personal experiences, changing organisational practices and affecting market and industry structures.

CHAPTER 3

THE HISTORY OF *SOCRATE*: A STRATEGIC TRANSLATION FROM RAIL TO AIR

This chapter first looks at the origins of *Socrate*. Reasons put forward for upgrading the previous computerised reservation system, *RESA*, are examined. It is argued that, despite some technical justifications for the changeover, priorities were of a more commercial and strategic nature, such as increasing yields per seat and controlling distribution channels. Additionally, SNCF seems to have been fascinated with air transport, which played a part in the choice of software. The rhetoric of IT-led competitive advantage and the legend of *Sabre's* strategic success at American Airlines were also very influential on the thinking of the company.

The installation of the new system is then described together with the necessary software customisation and adaptations, and the ensuing technical and operational difficulties, due to the different nature of rail and air transport. A comparison is made with Greyhound Lines Inc., which also tried to computerise reservations of coach travel in the US and faced very similar problems. Finally, yield management techniques and optimisation models are reviewed to outline the technological basis on which changes were built.

3.1 ORIGINS OF THE *SOCRATE* PROJECT

Until the early 1980s rail passenger sales clerks in most countries had to use various sources to complete transactions and had to go from enquiry to reservation to ticket purchase, which was a lengthy process. Passengers often had to go from ticket office to ticket office to obtain information, a reservation, then a ticket. Workstations in rail stations ticket counters, travel centres and telephone services started being linked in the late 80s [Thomas 1989] to central reservation systems allowing reservations to be made at the same time as tickets being printed by an all-purpose ticket machine. The workstation usually has access to a computer-aided timetable enquiry system, which suggests the best route and train times. British Rail, for instance, integrated the systems into one set between 1991 and 1993 for InterCity services. Some of the objectives were to reduce the transaction times and to encourage people to make reservations more often.

Whereas BR built on its own systems, SNCF chose to abandon its in-house system and purchase a computerised reservation system developed for use in the airline industry and bought *Sabre* in 1989 from American Airlines for an initial FF 1billion (£100m). Jean-Marie Metzler, Directeur Voyageurs Grandes Lignes and a 'polytechnicien' (from Ecole Polytechnique one of the elitist institutions leading to senior civil service in France) with a long and successful record of top positions within SNCF, presented the proposed purchase to the SNCF Board on 22nd March 1989. All SNCF administrators, apart from five personnel administrators who either voted against it or abstained, supported his proposal [JMM Interview 1].

3.1.1 Technical reasons?

Capacity

A technical reason put forward for modernising ticketing and reservation systems was capacity. The existing system could only deal with 20 transactions per second, whereby the new system would manage 800 transactions per second. This technical reason originates from one of the early arguments put forward by SNCF strategic decision-makers. The previous system, *RESA* (short for reservation), was developed in-house and implemented in the 70s to respond to a growing demand for reservation management (and then through the Minitel network in the early to mid-80s). It was claimed that a new system was needed to handle up to 135 million reservations a year by 1995 (approximately two third on TGVs), particularly after the opening of the Channel Tunnel in 1994 and the TGV Nord-Europe (Paris-Lille) in 1993. *RESA* would be reaching saturation point (50 million reservations a year) by 1989. These projections varied (from 125 to 150 million, by 1995 then extended to 2000) and may have also represented symbolic and commercial reasons as well as strictly technical demands. In fact, Moissonnier [1994:2] even states in his official report to the government, that the existing system *RESA* would have been capable of absorbing future increases in reservations. Another secondary aim he identifies is also the ambition to to host other companies' data like airlines CRS.

In 1987 Raymond Monnet, SNCF Directeur Général Adjoint, stated that: "computer systems contribute to strategic objectives as well as operational efficiencies (...) and information technology is a fundamental element in the evolution of the culture of the enterprise and has an impact on commercial, technical, organisational, managerial and personnel functions" [Monnet 1987]. *RESA*, the first computerised reservation system, was designed in the early 70s and was available to sales clerks in most stations in 1973 [JPD Interview 9]. This booking system was stand-alone in the sense that it was not connected to timetabling information, ticketing or accounting. In 1977, SNCF joined the French Direction Générale des Télécommunications in its 'télématique' pilot activities which led to the establishment of the nation-wide Minitel public data network. In March 1984, a SNCF server was first made available to Minitel users in the Ile-de-France and Picardie regions, and expanded to the whole country by November 1986. This '36-15' (also called 'Kiosque') public access Minitel service provided train timetabling and reservation, first separately then integrated (in October 1986), for 160,000 'relations' as well as payment at a distance, leading to an increase in the number of reservations. Electronic reservations were also supported through *Hermès*, a European packet switching network enabling exchanges between national rail companies, for trans-national freight traffic since 1985, and for international passenger traffic in 1988. *Hermès* was initiated by the Union Internationale des Chemins de fer in order to stimulate rail traffic across borders.

A modern distribution system

Since 1987, SNCF was planning to renovate its distribution mechanisms and strategic studies were carried out by the Direction Commerciale Voyageurs to examine the nature of European passenger rail supply, pricing and distribution [SNCF 1989]. These studies stated that SNCF had an advantage with its high-speed network but that the environment would become more and more competitive [MJA&BT Interview 5]. Their major recommendation was to set up the *Socrate* project, which would enable SNCF to compete on sales and distribution.

A confidential document dating January 1989 [SNCF 1989] clearly describes the thinking behind *Socrate* and how some SNCF directors understood their environment. Competition was perceived as increasing between rail and other transport modes, particularly air; the opening of the European market would lead to increased competition between air operators; more than 50% of SNCF passenger rail supply on medium and long routes would compete with air. A primary objective was to improve supply, but more importantly, **"to be able to adjust supply in the short-term using the 'weapon' of pricing"** [SNCF 1989]. Adjusting fares to demand intensity was strongly advocated. A new distribution policy was clearly seen as the key to survival. It entailed a reduction in distribution costs through the use of Minitel and vending machines in stations; control of travel centres and agents distribution channels, and product penetration through these networks, in France, Europe and elsewhere; and tarification flexibility. A clearly defined tactic was to establish links between the SNCF network and global distribution systems (GDS).

More importantly, *RESA* was seen as obsolete, but not so much in its processing capacity. In fact, its robustness was not in doubt since it had been capable of absorbing the enormous increase in reservations due to the introduction of the TGV Sud-Est (Paris-Lyon) in 1981, the first train which it was impossible to board without a reservation. The strategic thinking is entirely apparent in this confidential document: "the functionalities of *RESA* do not support the marketing and distribution policies envisaged" [SNCF 1989]. Extra functionalities required include above all the forecasting and optimisation of levels of overbooking and tariff quotas. A quantitative and qualitative evolution was seen as necessary.

Inflated demand projections

One can therefore state that the demand projections referred to above were in fact secondary if not symbolic, and that commercial, rather than technical, objectives dominated SNCF thinking. It can be argued that a traffic increase was not paramount compared to commercial optimisation and that indeed a traffic **decrease** would not have been a problem as long as the new tarification and yield management system improved revenue and most importantly margins [EC Interview 3]. In fact, with the benefit of hindsight, it is clear that these projections were inflated. The Rapport de la Cour des Comptes[3] [Grosrichard and Jakubyszyn 1996] criticises SNCF for its inflated traffic estimates on the TGV Nord (Paris-Lille opened in 1993): actual figures were less than half the forecasts.

[3] The French National Audit Office

The 1993 overall SNCF traffic figures showed a decrease of 5.5% according to SNCF (from 854 million passengers transported in 1992 to 823 million in 1993 with a total revenue decreasing from FF 55.4 billion in 1992 to FF 52.9 billion in 1993 [SNCF 1994a]); of 7% according to the government enquiry [Cuq and Bussereau 1994]; and of 8.4% according to the Observatoire Economique et Social des Transports [SNCF 1993b]. Compared with other European countries where the average growth in traffic was 9%, SNCF lost an important market share [Eglizeau *et al* 1996], although SNCF claims that this decrease did not affect TGV traffic, but only normal intercity trains [SNCF 1993b]. Jacques Fournier, SNCF president at the time, claimed that: 5% of the 1993 decrease in traffic was due to an economic recession; and 2% came from both an insufficient reaction to the competition with Air Inter (French internal flights) which had a good price policy, compounded by SNCF worsened public reputation due to the *Socrate* debâcle [Cuq and Bussereau 1994:35]. Nevertheless, public transport traffic stagnated at best or decreased (depending on urban, regional or intercity) during 1994 and 1995 too [Bridier 1995]. Only in 1997 did traffic figures and total revenue increase again for the first time since 1992 (intercity and TGV by 4%, regional by 3%, urban by 1.7%, freight by 8.9%, total revenue from FF 40.9 billion in 1996 to FF 43.1 billion in 1997 [SNCF 1997]).

Table 3.1 Reservation forecast for 1995 [SNCF 1989]

Total	120 million				
France	106	Stations	74		
		Travel agents	32		
Abroad	14	Amadeus	1.4		
				Stations	0.7
				Agents	0.7
		Galileo	11.6		
				Stations	8.7
				Agents	2.9
		Overseas	1		

Table 3.1 provides a reservation forecast for 1995 (total 120 million) put forward by SNCF in its strategic justification for the *Socrate* project in 1989. The actual (reserved and unreserved) figures for 1995 [SNCF 1996a] give 254 million passengers for regional and intercity trains, with 45.7 for regional trains, 208.3 for intercity of which 95.8 million are for TGV. The total of 95.8 TGV reservations is far from the predicted 120 (even if allowing for some reservations on 'classical' intercity trains).

Choice of software

In order to build the required system, three options were possible: (a) modifying the existing system, (b) starting from scratch and developing a bespoke software, or (c) adapting existing software from the airline industry. SNCF chose the third option. The first option was quickly dismissed because it did not permit to integrate new commercial concepts such as optimisation, although the main official

argument put forward was about the limited capacity of *RESA* (again on the grounds of projected demand). SNCF decided against option (b) because of human and technical resource limitations, and also the added risk of failure and lengthy development. It was estimated that building its own system would have taken SNCF seven years [Anon 1992].

It is clear that 'intelligent' distribution and optimisation and short-term adjustment of fare prices was paramount in the decision to look for existing software. A fourth option could have to been to simply register with an existing air GDS. Jean-Marie Metzler and Andrée Maître, the latter at the time worked for the joint venture between AMR Information Services and SNCF set up to develop the new software, argued against that option on the basis that rail transport has some specificity which an air GDS could not cater for [Metzler and Maître 1990]. Yet this argument was either ignored or not applied to the choice of an air CRS and its implications not fully realised (see more on the crucial differences between air and rail CRS below in **Section 3.3.1**). Another interpretation is that there was the ambition with some SNCF technocrats to be the first to set up a rail electronic distribution network and become the first owner of a rail GDS in the world, rather than depend upon other GDS.

A fascination with air?

Additionally, the search for technical partners was heavily influenced by the perception of competition with air transport. As witnessed in a confidential document [SNCF 1989], decisions by rail and air transporters regarding their choice of GDS were carefully examined, if not emulated. Operational systems such as those of rail transporters AMTRAK, and Deutsche Bähn, but also air transporters Swissair, British Airways, air distributors such as *System One, Apollo*, *PARS, Galileo*, *Amadeus*, and also one IT supplier, Unisys, were investigated. For all potential GDS, a scoring was undertaken to find out which system performed best in the following areas [Adam and Cahen 1997:12]: which system provided the best Personal Nominal Requirement (PNR), which reflects traditional file management capacities for airline passengers, i.e. the best coupling of the ticket with different services provided, such as car rental, hotel booking, etc.; and which system was the best in terms of yield management, again borrowing from airline optimisation techniques. The AMTRAK system was the most advanced rail reservation system but didn't correspond to SNCF requirements [JPD Interview 9]. It wasn't enough to buy a CRS which is just a seat inventory system (for example Air France's CRS), or a GDS only, but both inventory and distribution systems were required. SNCF entered into negotiations with *System One*, but these failed. This provider was considered because *Amadeus* (Air France GDS) had entered in a partnership with *System One* at the time too, after negotiations with *Sabre* had failed [JPD Interview 9].

Sabre, of AMR, was chosen since it had a strong emphasis on distribution and optimisation and staff had extremely strong yield management and operational research expertise. Another reason for choosing *Sabre* was that it runs on IBM equipment and uses the TPF (Transaction Performance Facility), which is common to many GDS and therefore allows technical compatibility. *Sabre* was also the biggest and oldest (30 years old) reservation system in existence at the time. Another consideration was the eventual possibility that the system could technically host some of if not all services of other rail companies.

The choice of *Sabre*, the American Airlines system, in March 1989 only confirms the fact that, from the beginning, there was a wish to mimic the air industry. A sophisticated computerised reservation system could help SNCF fill its trains, in the same way that it allowed American Airlines to fill its planes, and make SNCF as effective as air companies [Levy, 1992]. In Metzler and Maître's words [1990:21]: "rail must reach the level of its competitors, particularly air companies. The answer to this challenge is information systems, in the form of modern reservation systems (...) International sales must be facilitated through global distribution systems such as the ones found in air companies"[2]. This strange fascination of a rail company for aerospace was also noticed in displays of trains and plane models and posters on the desks, shelves and walls in many offices during my visits at SNCF headquarters... Several members of the *Socrate* team were connected with the air and tourism industries: a project manager [SEB Interview 4] had worked for Air Inter; and Georges Vialle, the second in charge, left the *Socrate* project to work for the Club Mediterranée where he became head of information systems [GV Interview 14] and implemented yield management principles there. And Metzler, head of the *Socrate* project, believed that rail stations should be like airports [JMM Interview 1].

3.1.2 Importing *Sabre*: American Airlines' classical strategic success

One major attraction for SNCF top management was the fact that *Sabre* was claimed to have generated three quarters of American Airlines profits [Levy, 1992]. This was translated by SNCF in the potential to gain market share against road and air transport, through controlling the distribution channels in Europe, by being the first and hopefully dominant electronic distribution network, selling tickets to "all Europeans", and expanding the high-speed rail network in Europe [Anon 1992]. In Metzler and Maitre's terms [1990], market demands were seen as the driving force.

The emergence of computerised reservation systems, in particular *Sabre* at American Airlines, and their role as a 'competitive weapon' have been described and analysed by many authors since the mid-1980s. Most business information systems textbooks, business schools, academics and consultants have made ample use of *Sabre* as an example of a strategic information system (see classic papers by Porter, Millar, Clemons, McFarlan, Ives, Learmonth, Wiseman, Earl, Ward, Scott Morton and Rockart). It can be said it is the archetypal example of how information can provide strategic advantage. This however has been interpreted and analysed in many different ways and even disputed.

Three generations of airline computerised reservation systems

From basic operational support to start with, the use of computers in airlines has expanded over the last 30 years to include most functions [Henderson 1994]: passenger service (reservations, ticketing, check-in); operations (flight planning/scheduling, departure control, crew tracking/scheduling, cargo tracking/accounting); maintenance and engineering (planning, scheduling, purchasing/inventory, rotables control, performance monitoring); financial (revenue accounting, statistics); fare quotation, frequent flyer, yield management, weather, in-flight sales, bag tag, airport information, catering tracking, hotel/car/tour reservations, customer requests, human resources, fuel, message switching, cockpit

information, crew training. The world's airlines continue to spend heavily on automation, and some are reported to spend $0.5 billion a year and the most heavily automated functions are reservations and maintenance/engineering. Top companies such as United Airlines also sell applications and automation services to other carriers, and the most extensive offerings are those of American Airlines' parent, AMR Corp. which supplies both services and applications to a lengthy list of fellow carriers [Henderson 1994].

The origin of *Sabre* – and of all real-time computer systems - can be traced back to *Sage* or Semi-Automatic Ground Environment, funded by the US Air Force in 1951-to develop a real-time radar defence network to guard against surprise Soviet air and missile attacks [Schulz 1992]. The first commercial real-time venture was *Saber* (Semi-Automatic Business Environment Research) began in October 1959 after five years of analysis and design study by American Airlines and IBM, which had been involved in *Sage*. The development of the initial system took another four and a half years, over 400 man-years and cost $30 million. A common and almost mythical anecdote places the initial idea for *Sabre* as emerging from a chance meeting between an AA executive and an IBM sales manager sitting next to each other on a flight from New York to San Francisco...

The initial version (1959) was capable of handling information from and about other air carriers and AA was able to charge rent for use of its system. By then, the system could handle up to 1,800 messages per second from 80,000 linked terminals [Adam 1990]. This first mover's advantage lasted several years until Eastern Airlines launched in 1965 *PARS* (Programmed Airlines Reservations System 1), also known as *System One*, which performed a number of functions in addition to reservations (e.g. check in, fare quote, weight and balance). *PARS* also provided Eastern with outside revenues from sales of the software package. Delta (*Deltamatic*) and Pan Am (*Panamac*) also bought *Saber* from IBM, and AA changed the name to *Sabre* to avoid confusion [Adam 1990]. In 1970 American Airlines introduced an upgraded *Sabre* and an enhanced *PARS* system, which it had bought from Eastern, and which was jointly licensed by American and Eastern. They could merge modules from the two systems using PL/1 programming methods, and this new technology became an industry standard. TWA (in conjunction with Burroughs) and United Airlines (in conjunction with Univac) had bought and tried to customise their own systems based on this architecture. However, their efforts failed and, after some legal tangles with their suppliers, bought software and expertise from Eastern [Adam 1990]. By 1972, TWA had its own version of *PARS* and United had set up a system called *Apollo*. Schulz [1992] refers to these developments as the first generation CRS (1958-1974) which concentrated on system-building and competency acquisition, with airlines now customers of the CRS vendor airlines. On the other hand, the technical lead held by AA and then Eastern was no longer so obvious by the mid-1970s [Adam, 1990]. All the main carriers had stable and reliable internal systems and communications networks supporting their main operations.

The second generation CRS (1975-1985) concentrated on marketing and niche innovations [Schulz 1992]. With the deregulation of US airlines in 1978, American Airlines introduced 'name check-in' which linked passenger name records with marketing records, and allowed the introduction of the first 'frequent flyer' programme. Another innovation was the realisation of the importance of the travel agent market, which had provided 30% of bookings in 1967, compared to thrice that number in 1987 [Adam 1990]. The introduction of terminals to travel agencies had started slowly, but deregulation provided a competitive spur in the late 1970s. AA started aggressively pursuing travel agents as 'lease' customers

and installing *Sabre* terminals. Agents had access to flights of all airlines that paid AA a fee for entry onto the system. By the end of 1985 American and United had 45% and 29% of the CRS market respectively [Schulz 1992] and by 1987, 95 per cent of travel agents were automated [Monteiro and Macdonald 1996]. Gains could be achieved only by displacing rival systems. To make them switch from one CRS to another, some airlines offered agents cash incentives, extra commissions for sales on their carrier, and free use of their CRS up to five years. One particularly successful tactic was to exploit the tendency for agents to book passengers on carriers located in their local area, even if this means taking a connecting flight. In the 1983-1986 period, *System One* (Eastern) jumped from 16 to 45 per cent in Miami, and *Apollo* (United) in Orlando went from 10 to 35 per cent [Monteiro and Macdonald 1996].

Additionally, AA realised the market potential of *Sabre* and devised the 'co-host' scheme whereby smaller carriers can pay to have preferential displays on agents' terminals, i.e. for their flights to appear on the screen before those of competitors [Adam 1990]. This gave rise to numerous carriers and travel agents filing petitions with the Civil Aviation Board because of problems associated with CRS dominance. These problems fell into several categories [Monteiro and Macdonald 1996]: access to the CRS, bias in the CRS displays, monopolistic and discriminatory pricing of booking fees, and exclusive arrangements with travel agents. American and United were found to have developed algorithms that ordered the display of information that favoured their co-hosts; for example by ranking flights by carrier-specific factors rather than neutral factors such as shortest journey time, departure time or fewer connections, by adding time delay to some flights, or by failing to show competitors' lowest fares [Mietus 1989]. Even though "the regulation that emerged (...) generally eliminated the more blatant forms of anti-competitive use of CRS, it was not totally satisfactory" [Monteiro and Macdonald 1996:178]. Vendors were not prevented from making charges, which continue to make CRS ownership a "financial gold mine".

Schulz [1992] suggests a third generation of CRS (1986-1990s) characterised by smart workstations, which allowed, for instance Delta Airlines to enter the corporate travel market. The US air travel agency industry is very competitive and agencies use IT extensively to lower cost and improve service. The corporate segment in particular makes use of complex databases to manage corporate clients' travel expenses (including co-ordination of hotels, entertainment, food, meetings, baggage, shuttles, taxis, car rentals). Doll [1994] argues that corporate travel agencies will continue to grow as they broaden the range of services they offer their customers, particularly through the use of integrated reservation services, world wide databases of tours and resorts and travel management software. In the mass travel market, there will be consolidation of nation-wide 'mega' agencies that will dominate the travel service industry. Additionally, PCs and internet-based services allow passengers to book directly from home, and this may re-shape the travel agents industry now even further.

An example of a more sophisticated PC-based tool is *SMARTS* (Sales Management and Reporting/Tracking System), developed in 1990 by American Airlines, which is based on CRS reservations data and internal booking data, and which delivers agency specific revenue performance and bookings [Christiaanse 1996]. The system organises data by city, zone, territory, location and national account, supports customised revenue reporting and allows consolidated data manipulation using information from other CRS. Since 98% of US travel agencies do their bookings on one of the four

dominant CRS (*Sabre, Apollo, Worldspan* and *System One*), this means that all the booking behaviour of each of the 33,000 travel agencies is available. This enables American Airlines to carry out precisely targeted incentive programmes for travel agencies. A more recent example of an internet-based service is the Web Pets Travel Service which is a KLM online reservation system through which customers can organise for the air transport of their cat or dog [Christiaanse and Zimmerman 1998].

Another feature of the third generation CRS according to Schulz [1992] is yield management, which will be covered in more detail below. "Within the context of a deregulated environment, yield management, in combination with PC-based reservation systems, as well as the established large-scale systems, provides the airlines with unprecedented capabilities at providing customer service and 'marketplace' pricing" [Schulz 1992:71].

Perhaps most importantly for SNCF, "conservative estimates credit *Sabre* with a cumulative cash contribution to American Airlines between 1976 and 1986 of $900 million, producing an internal rate of return during the decade of 68.7%" [Copeland 1991]. In 1991, with 85,000 terminals in travel agencies in 47 countries providing access to fares and schedules for 665 airlines, *Sabre* accounted for about 85% of American Airlines' earnings [Copeland 1991]. In 1997, *Sabre* was in place in 54 countries and with some 20,000 travel agents, with estimates suggesting that some 130,000 terminals were connected to the system. Each day some 1.6 billion bookings were taken over it for some 740 airlines and it dealt with 20 times this number of enquiries about product details contained within it [Russell and Johns 1997:124].

IS and competitive advantage

The air industry has been seen as one of the best illustrations of how information technology can have an impact on industry structure. *Sabre* has been cited as an example of the use of information systems to gain competitive advantage since the mid-1970s. According to Max Hopper, vice president for IS at American Airlines and vice chairman of AMR Information Services, who joined AA as director of *Sabre* in 1972, "we helped define an era" [Hopper 1990:118].

However, he argues that it is difficult to document the claim that *Sabre* generated substantial increases in traffic by creating market-power advantages over the competition. He states that *"Sabre's* real importance to AA was that it prevented an erosion of market share"[Hopper 1990:122]. Together with Copeland [1991], he believes that most explanations for *Sabre's* success focus on the competitive advantages realised by locating terminals in travel agencies and are too shallow. The cumulative, complementary and incremental technical and organisational capabilities are a better explanation.

Factors such as well established functional and technical operating routines, and a long-standing pattern of tit-for-tat rivalry between American and United Airlines, even prior to deregulation, accounted for many necessary competitive counteractions. AA did not plan to dominate distribution channels but learnt by doing. For instance, as an incentive to travel agents to subscribe, it added functions to help them; one such function was improved passenger records, since travel agents were interested in data grouped by passenger, in contrast to traditional airline priorities where data used to be grouped by flight. Once this enhancement was complete, AA saw in this the basis for the first frequent flyer's programme. This

attracted full-fare business travellers, who subsidised the low fares AA was forced to offer when low-cost airlines such as People Express entered one of its markets [Copeland 1990]. Further, Copeland states that: "it is most unlikely that another organisation will replicate the strategic coup that American accomplished with *Sabre*"; and that "today no company would allow a competitor to gain electronic control over a distribution channel, in large part because of the example of the airlines' experience" [Copeland 1991:60].

One relevant concept underlying the strategic discourse surrounding IS is that of 'information intensity', which the air industry is said to possess. For instance, it would be impossible for travel agents to cope with the volume of information generated by constant changes in flights and fares (which originated in deregulation) without CRS. CRS played a key role in the deregulation and the management of fluctuating prices and routes (more on the links between deregulation and IT in **Chapter 4**). Another example is how frequent flyer customers want to know which route would allow them to claim the maximum mileage points. These are clear illustrations of how the technical and the social intermingle so closely that it is impossible to separate them. The technology addresses and creates information intensive, or social, problems simultaneously, for example increasing changes in flights and fares.

CRS are also seen as a market in themselves and have been profitable through fees from other air companies for using the system, renting hardware, etc. Evidently, selling *Sabre* to SNCF is an example of this secondary 'information' market, from which American Airlines benefited, and that SNCF was hoping to emulate. The intention was for *Socrate* to be in a good position for controlling the European market, thereby changing the role of SNCF towards an organiser of travel and become an international rail distribution provider: "être le leader européen du transport terrestre de voyageurs à grande vitesse"[4] [SNCF-GL 1992]. Possible arrangements were to host services from other rail companies and provide reservation access through the SNCF network (like airlines), software licensing arrangements, and consultancy, made easier through the SNCF/American Airlines partnership. AMRIS (AMR Information Services) was to explore with SNCF opportunities to license *Socrate* to other companies [Metzler and Maître 1990]. Another way in which *Socrate* was meant to emulate the success of *Sabre* was through enlarging the range of services on offer, such as hotel bookings and car rentals [Levy 1992].

Socrate as a (national?) strategic vision

It is clear that the strategic rhetoric of the 1980s was taken on board by SNCF's top executives and that they saw *Socrate* as providing SNCF with the first-mover advantage [JMM Interview 1]. According to many accounts [e.g. JPD Interview 9, GC Interview 6], the personalities involved were critical. Jean-Marie Metzler, head of the project, and Georges Vialle, second in charge, seem to have constituted a very dynamic and brilliant duo (combining a "strategic genius" and a "locomotive" according to JPD Interview 9) and shared a strongly articulated strategic vision. When interviewing Metzler, he showed me slides he uses in teaching strategy at several top business schools in France where he is a regular speaker. Metzler and Vialle envisaged a total "mutation" [JMM Interview 1] for SNCF and saw *Socrate* as an inescapable necessity to face the growth of a deregulated European market. They

[4] "To be the European leader of high-speed terrestrial passenger transport".

perceived the future core business as rail distribution rather than rail transport [JMM Interview 1] and *Socrate* as the tool of a competitive, commercial and international enterprise [GV Interview 14]. They understood the future as a matter of competing with air, and the ownership of a tool such as *Socrate* as the key success factor for survival [GV Interview 14]. Their reasoning is partly based on the fact that 50% of SNCF revenues come from ten major routes where there is fierce competition with air [JMM Interview 1]. They saw it as an "absolute duty" [JMM Interview 1] to equip the enterprise with CRS/GDS technology, seen as an "intellectual instrument with predictive power"; although they clearly articulated that, even if nothing could be done without it, it is not sufficient, and decisions are strategic by nature rather than technical. Their verdict after the *Socrate* implementation debâcle, is that fundamental strategic issues at SNCF still need to be addressed [JMM Interview 1].

It seemed logical to transfer technology and management expertise and follow the American 'model' to gain this advantage. More generally, European countries have tended to export the American model of corporate capitalism since 1945 and Djelic [1999] identifies a 'mimetic' mode of transfer. In the logic of globalising markets and increasing competition, CRS and GDS are a technological response to a commercial problem (capacity management) and a financial problem (profit maximisation) in the service sector generally. However, whether American Airlines' experience over many years could be transplanted and duplicated in a different context is an interesting question, at the core of the global/local debate. What is remarkable is the deep conviction of many SNCF top executives [e.g. interviewees JMM, GV, GC, CQ, SEB, JPD, LDM] that this was, and still is, the way forward. Many top SNCF executives were quickly convinced that Metzler and Vialle's strategic vision was the right one: "Metzler saw exactly what was coming, he was truly strategic, he anticipated that infrastructures would go and that control of distribution networks was the way to go" [GC Interview 6]; "He saw that in the future we may have to cough up two dollars per transaction to some system like *Amadeus* so he prepared for that" [JPD Interview 9].

Beyond the changing perception of advantage and survival at SNCF, and related to the global/local debate, it is clear that there are nationalist stakes too [CQ Interview 10]. Apparently, when looking for possible associates, SNCF approached British and German rail companies since they were the only two in Europe with a CRS, with the view to set up some form of European partnership [CQ Interview 10]. This failed for reasons of perceived national differences. The French felt they could not trust the British – their CRS were very marketing-oriented but their train services had a poor reputation, and their idea of a partnership was too short-term [CQ Interview 10]. The French did not trust the Germans either who were seen as "fishing for" information and expertise when shown around, with little in return [CQ Interview 10]. Perhaps from a British or German viewpoint, the French were seen as too pushy and wanting to dominate the European scene which may explain these tensions. Similar national rivalries were also present between the French and the British during the Channel tunnel project. The American partnership in comparison seemed much smoother [CQ Interview 10].

The next section examines how the software was adapted to the SNCF context and the attendant problems.

3.2 SOFTWARE CHANGES: FROM AIR TO RAIL

The *Socrate* project was decomposed into three phases [see **Figure 3.1**]. During phase 1, 'Network' (mid 1989-mid 1990) dumb sales computers were to be replaced by more powerful IBM PCs. This was required in any case. In phase 2, 'Dialogue' (mid 1990-mid 1991), the distribution software was to be implemented and connected to the existing *RESA* reservation software; this enabled all sales workstations (PC-based, Minitel access and automatic vending machines) to be linked to the SNCF distribution network (SDS, or Système de Distribution SNCF, running on a private packet switching transmission network, Rétipac). Some workstations were installed abroad, in Basel, Geneva and London [Lomazzi 1991]. Connections to a GDS were made, for instance to *Esterel-Amadeus* for travel agents. Phase 3, 'Trains', started in mid-1991 with an expected date of delivery in mid-1992. The new reservation centre was set up, working with the *Socrate* system, and trains to which the new commercial principles apply were to be added progressively to the database. The optimisation software was to be designed and implemented, and *RESA* only used for 'non-intelligent' access (e.g Minitel terminals).

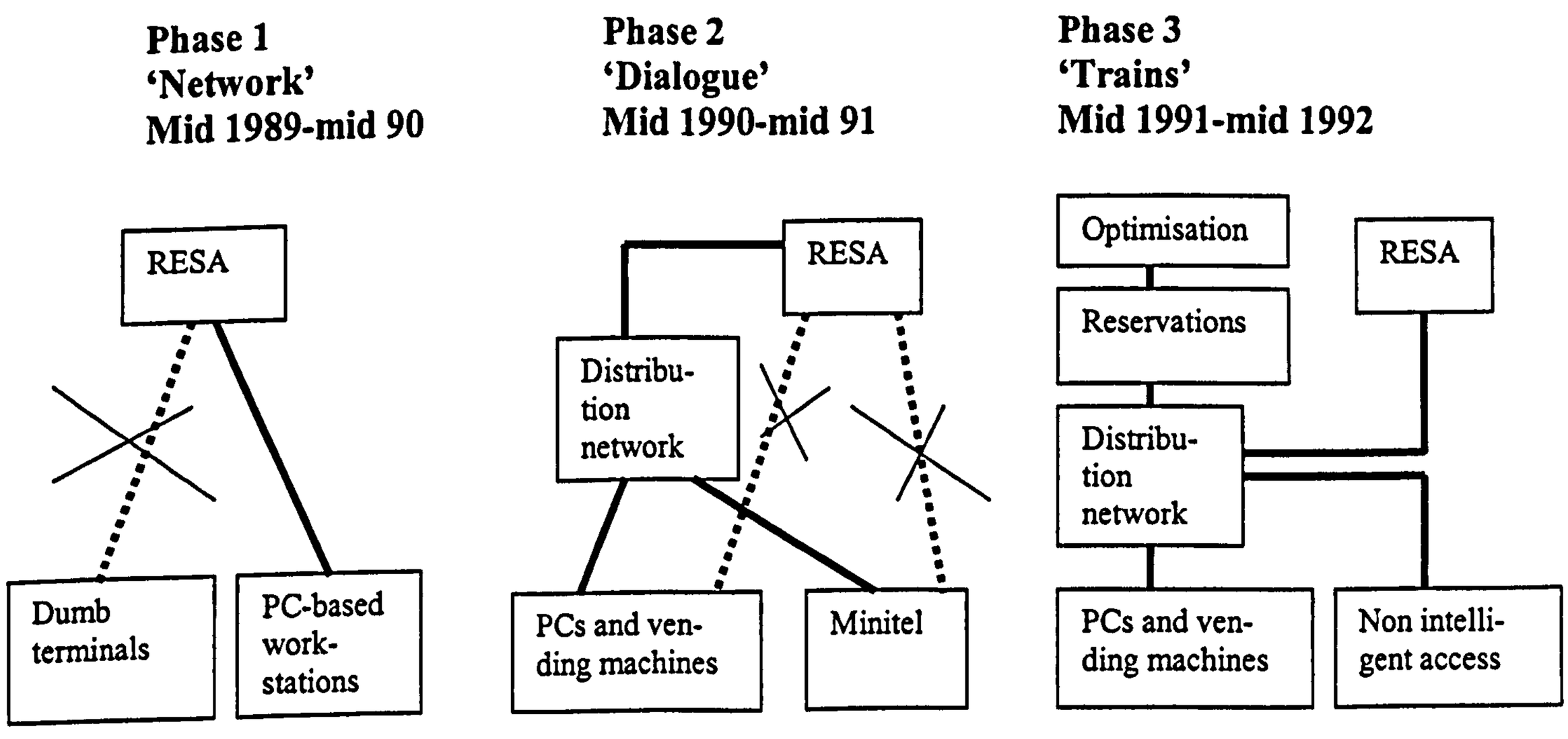

Figure 3.1 *Socrate* calendar [after Metzler and Maître, 1990]

3.2.1 Adapting software

Collaboration between SNCF and AMR was intended to adapt *Sabre* in the following ways: modify the inventory, use AMR's expertise in optimisation techniques, maintain and possibly increase the system performance. During 1989, a joint AMR/SNCF team was to establish specifications for SNCF internal software. The partnership was intended to be long-term in order to design the most powerful product on the market. The partnership is called "Groupement d'Intérêt Economique" (GIE) RESARAIL 2000 [Resarail 2000, 1992] and SNCF is tied to AMR, the American holding company that owns *Sabre* until 2007 [SNCF 1989].

Cost benefit analysis included projected traffic increases resulting from the new system (which did not materialise, see above), which would have required modifications to the *RESA* system, as follows [SNCF 1989]:

Initial costs	FF 570m
Annual functioning costs	FF 200m
Annual benefits	FF 830m

Costs included hardware and software for reservation and ticketing, timetabling and fare information, and increased distribution costs due to increase in demand. Benefits included productivity gains in sales and accounting, but primarily increases in revenue per seat sold realised through the new pricing system. The internal rate of return, compared to a simple modification of *RESA* to suit the new commercial policies, was estimated at 30%.

From a technical perspective, it is clear than air and rail differ. They vary in their operational activities, for instance in the number of connections between routes, the range of fares, the seats on offer (e.g. various sleepers or couchettes). The volume of transactions is also on a different scale; *Amadeus* (Air France) deals with 80 million transactions in the whole of Europe per year, whereby transactions in French rail alone can reach 100 million a year [Metzler and Maître 1990]. The distribution channels are mainly in stations, and less so in travel agencies (from 10 to 25% of total revenues depending on the country).

A team of 400 staff (in 1990) of SNCF and AMR computer scientists had to transform an air industry system into a railway software system, to adapt the software to SNCF norms, and to integrate the complexity of the rail network and its operational differences. Design and programming were carried out in the Paris area and in Lille where three super mainframes were centralised in May 1990. The new reservation centre in Lille, where all data are centralised, is said to have been built like a real 'fortress' [Lomazzi 1991], partly for security reasons. Phase 1 was completed in July 1990. The specifications documentation reached the grand total of 8,000 pages by December 1990 [Metzler and Maitre 1990]. The system was intended to support the provision of 400 millions tickets a year, corresponding to 840 million journeys on inter-city and suburban rail. More than 30,000 workstations and automatic vending machines were to be installed in stations and travel agencies, dealing with 1.3 million transactions a day [Levy 1992].

Project management included the following, which helped keep the software development under control: external consultancy by Coteba Management Consultants, specialists for complex project management; the use of Super Project, a project management software from Computer Associates; breakdown of the project into six primary projects to make it more manageable; the use of software houses such as Unilog; creation of two independent teams, i.e. not linked to the software developers, for quality assurance and test/validation; quality assurance was carried out by 90 staff from the Sema Group [Levy 1992]; training was supported by the technology department of Ciefop engineering consultants [Capdevielle 1992].

By mid 1992 the project involved 650 people from 24 different nationalities, half from SNCF, and 100 from American Airlines. Phase 3 was delivered approximately 10 months late (March 1993 instead of mid-1992) which is not enormous bearing in mind the size of the project. The budget was 'only' 30% more than anticipated, as *Socrate* had cost FF 1.3 billion by 1993 instead of the planned FF 1 billion, and software development took four and a half years, from 1989 to 1993.

Serious difficulties arose. First of all *Sabre* was written for a maximum of 80 'relations' or pairs of 'origin-destination' (O-D) with very few intermediary stops. It had to be rewritten to cope with the most important relations at SNCF and its 2,400 stations. Secondly the fare structures are much larger for trains than for planes. The most fundamental change was the disappearance of the station as the computing 'unit' replaced by the relation between two stations, implemented through the use of relational databases. Relational databases support the definition and manipulation of pairs of stations defining a route, leading to the notion of market 'segment'. This was not possible with previous database technology which only supported the connection of single units. These relations or O-D pairs correspond to those requested at least once a day. If the relation has not been pre-recorded (too small stations, not enough demand) the transaction has to be done manually in two steps, so takes twice as long. The concept of origin-destination allows prices to be defined not according to physical distance between the origin and the destination, but according to the nature of that O-D relation; this has many more parameters, for instance the type of train, travelling time, type of seat and time of booking. Marketing surveys about socio-economic characteristics of each relation, competition on that relation, and the value customers find in the TGV service especially, determine the price for each instance of the relation.

Initially, 160,000 'direct' relations (direct from station A to station B with no connection) and 4,000 'indirect' relations were input in the databases. This represents 80% of the traffic which was insufficient and contributed to delays as sales staff had to input station names manually instead. Another 41,000 'indirect' (from station A to station B via station C, D, etc.) relations were rapidly added by June 1993 [Moissonnier 1993:13].

Another reason for the initial difficulties was the lack of integration across three pre-existing 'sub' databases (timetables, O-D station pairs and prices) which feed the *Socrate* SDS system. These databases originate in different parts of the organisation and had been created gradually over a long period of time; they use old (and different from each other) programming techniques which are difficult to maintain and modify [Moissonnier 1993:5]. Instead of a total rethink of data management in the light of the new system, two of these existing databases (OD pairs and pricing) were redesigned to adjust to the new commercial techniques; the third database, timetables, was left as it was (partly in order to carry on feeding the existing *RESA* system which run in parallel with the new system) [Moissonnier 1993:12]. Technical integration across these databases also required institutional co-operation across departments and their different cultures, and these issues were underestimated. This led to incoherent, anomalous and missing data, which were another important cause of delays and lengthy passenger queues in rail stations at the time of the launch of the system. Centralised control of data input across the three departments was put in place by the end of 1993 and the complete redesign of these databases was also set in motion as a result [Moissonnier 1993:13].

Not a software development failure?

The extent of software customisation for reservation management was obviously large, even without considering the complexity of designing optimisation software, covered in a later section. From the evidence, the project seems to have been managed appropriately, quality assurance mechanisms were employed, budgets were not hugely overrun and slippages were minimal. Some even argue that *Socrate* was not the failure that it was said to be and that "IS projects that involve the purchase and customisation of large applications constitute a more rapid alternative to the development of new systems" [Adam and Cahen 1997:3]. It is quite clear that, once project managers decided that in-house development would not have been possible, it would also have been difficult to outsource due to the size of the project. And arguably, *Sabre* was the most robust GDS available at the time. Using multi-cultural software development teams proved successful too, maybe surprisingly. AMRIS trained SNCF staff on TPF, and the objective was that, in time, they would become autonomous. Adam and Cahen [1997:14] claim that the different work habits generated fundamental conflicts and that there were difficult cultural battles that affected the development. One interviewee mentioned that early in the development, collaboration with American partners was not easily accepted, and that apparently graffiti appeared on walls in Gare St Lazare near SNCF headquarters with "US go home" [JPD Interview 9]. According to this interviewee [*Socrate* IT director], problems were not only due to cultural differences, but also to a large mix of experiences and perspectives: *RESA* experts, TPF experts, functional experts (e.g. rail timetabling, pricing) and technical staff[5], rail public service and air private company attitudes [JPD Interview 9]. On the other hand, the French were able to adapt to English as the working language and common work procedures developed progressively; on one of my visits at the operational research group at their Paris headquarter in November 1994, staff of all nationalities (French and American but also Spanish, Vietnamese, Peruvians, etc) were organising a Thanksgivings party for the following weekend... Development teams were strongly motivated and "were working flat out for peanuts, but for personal satisfaction, in order to say 'I worked on *Socrate*', there was a 'commando' climate, a feeling that we were doing something exceptional" [JPD Interview 9].

Technically speaking, the system was delivered on time[6] and exceeded the original budget by only 30%. One reason for the delay was that the definition of requirements took longer than planned. The system is still successful and is being used by international rail companies such as Eurostar (with only a few stops for which *Socrate* is well suited), and Swiss railways (only for their international sales) [GV Interview 14]. One could therefore agree with Adam and Cahen [1997:18] that the methodological choice was judicious, and that selecting AMRIS as a partner brought large amounts of expertise and a willingness to undertake such a project. However, real life testing and implementation were disastrous. It is clear that SNCF underestimated the implementation problems. The next section describes a very similar

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[5] Mixing functional and technical staff in software development teams was also an innovation at SNCF, where traditionally computing staff had been dominating and rather antagonistic towards user departments [JPD Interview 9].

[6] The initial plan included about one year as leeway, which got used up. At the end of the four and a half years, it was decided to go ahead rather than drag on, partly to manage staff motivation and keep the pressure on, based on the experience that longer or extended projects tend to fizzle out [JPD Interview 9].

experience at Greyhound Lines Inc., to illustrate how operational differences in the nature of transport markets plays an important part in designing CRS.

3.2.2 Operational differences: the example of Greyhound Lines Inc.

Operational differences in the nature of the air and rail markets explain some of the technical difficulties faced by SNCF, and a similar case at Greyhound Lines Inc. in the US coach industry illustrates this. Greyhound Lines Inc. faced the same problems as SNCF [Tomsho 1994] in that there are many more stops during coach trips than on air routes. Greyhound's story is remarkably similar to the introduction of *Socrate* at SNCF.

Greyhound Lines Inc., with headquarters in Dallas, Texas, has long been the leading trans-continental coach company in the US. However, the company's share of interstate travel dropped from 30% in 1960 to 6% in the late 1980s, because of the rise in ownership of cars and discounted airline services. In 1991, a new chief executive and new chief financial officer began to cut costs (from 3700 to 2400 coaches), upgrade coach facilities, replace terminal workers with part-time workers, leading to 30% staff annual turnover, and computerise. One of their motivation was the view that "financial market analysts focus on computerisation as the key to remaining competitive" [Laudon and Laudon 1998:108]. Coach customers rarely reserve seats in advance, and traditionally clerks plotted journeys manually from thick bus schedule log-books, which was very slow. Computerising all the routes and stops would theoretically greatly reduce the time needed to plot journeys and issue tickets.

Trips, the new system, was intended to cover most operations, from passenger reservations to fleet scheduling and driver allocations. Management hoped that adopting a reservation approach would allow them to reduce the number of near-empty coaches. The *Trips* project began in early 1992 with a staff of 40 and a $6 million budget. However, creating a coach-oriented system proved to be far more complex than designing an airline reservation system. An airline passenger flying from Baltimore to Los Angeles might make one stop; the same passenger on a bus might make 10 or more, with a different group of people filling the seats on each leg of the journey. "Greyhound technicians estimated that they would need a system capable of managing as many as 1,800 vehicle stops a day, more than 10 times those of an average airline" [Tomsho 1994]. Additionally, the average coach passenger is much less affluent than the average airline passenger and few passengers have credit cards to enable them to purchase tickets in advance by telephone (and even how many have telephones available).

When the software was implemented in 1993 it was a disaster. It began in May using a preliminary version because there was not enough time to develop a full version. When *Trips* reached 50 locations, the computer terminals began to freeze unpredictably. Learning to use it required 40 hours of training. The system greeted ticket clerks with a disorganised, multi-screen barrage of options for getting passengers between any two points. Because its data bank didn't include all Greyhound destinations, clerks sometimes had to haul out old log-books and plot journeys by hand. The time needed to issue a ticket doubled - when the system didn't crash; the system crashed so often in some locations that agents were writing tickets manually. The passengers who arrived with manual tickets were told to wait so that they could be reissued a ticket by the computer. Long queues, delays and confusion resulted. For days

passengers missed connections, were separated from their luggage and left to sleep in terminals overnight. When the new free phone number began serving the 220 terminals already connected to *Trips* in July 1993, the system could not handle all the calls and customers often had to call as many as a dozen times to get through. Centres were told not to take any reservations.

In September 1993, *Trips* was closed down West of the Mississippi River because of its continuing problems and delays. Passenger traffic plunged 12% in August 1993 and Greyhound stock tumbled 24% in a day [Tomsho 1994]. To entice customers to reserve, in May 1994 the company offered a $68 ticket for a trip anywhere in the US with a three-day advance purchase. The crush of potential customers brought *Trips* to a halt. Coaches and drivers were not available in some cities, resulting in large numbers of frustrated passengers stranded in terminals. The Securities and Exchange Commission investigated the company and former directors, officers and employees for possible securities law violations in January 1995, suspecting insider trading and inadequate internal accounting procedures. Finally in 1995, a newly appointed chief executive officer decided to dismantle the 'airline' model which relied on reservations, in order to bring the company back [Zellner 1996].

Nowadays, Greyhound does not take reservations. People show up at the terminal and are likely to get a seat at a reasonable price. If a coach fills up, Greyhound will bring out another until everyone has a seat. The price structure was also changed. The previous regime had raised the 'walk-in' price as high as possible while lowering prices of advanced purchased tickets, to compete with the airlines. Today Greyhound's maximum one-way 'walk in' fare averages half of airline discounted prices. Other steps toward profitability include adding more people to answer telephones, adding coaches to popular routes (e.g. New York to Boston), and restoring long-haul routes to rural areas which had been nearly abandoned under the previous regime. The company is also trying to rebuild its package express service from urban to rural areas at a low cost. Revenues and sales have grown, although it is not clear how much more the company can grow [Laudon and Laudon 1998].

Almost the same incidents took place in French railway stations during the summer of 1993. Greyhound under-estimated the complexity of the task and didn't allocate sufficient resources. SNCF had to adapt an airline system to a rail system, which proved to be extremely difficult technically. In both cases, the technical problems were due to the more complex nature of rail and coach transport markets when compared to air. Perhaps the expectations were raised by the fact that *Sabre* was such a successful system; however, this was achieved with a small army of technicians spending three decades and several hundred million dollar perfecting the system.

3.2.3 *Socrate* architecture

The new site in Lille was finished in May 1990 and accommodates technical components. The choice of site was also significant and quite symbolic. It is near the TGV-Nord new station in Lille, at the junction of train routes from London, Paris and Brussels. Pierre Mauroy, Lille mayor and former Prime Minister, lobbied intensely to locate the new TGV station in his city, at the heart of a network of European cities. Euralille, a vast urban and innovative development is situated around and on top of the rail hub [Aldersey-Williams 1995]. The site consists of 6,000 square metres and can self-operate for 72

hours. It houses three IBM 9000 (340Mips, 520 gigabytes) and three parallel processing database machines NCR-Teradata (410 gigabytes); it is the second Teradata site in Europe and has an overall capacity of a terabyte.

Socrate, like *Amadeus*, which enables travel agents to book amongst others Air France tickets, is a GDS. It is linked to *Hermès*, which carries out connections with other European rail reservation and distribution channels, including Eurostar services. In fact, SNCF signed an agreement with *Amadeus* at the end of 1995 [Anon. 1995], one of the biggest electronic reservation system in the world linking 153,000 terminals in airline sales offices and travel agencies. From 1996, travel agencies subscribing to *Amadeus* were able to book rail tickets in the SNCF reservation system from their *Amadeus* terminals. Most of the components in **Figure 3.2** are located in Lille.

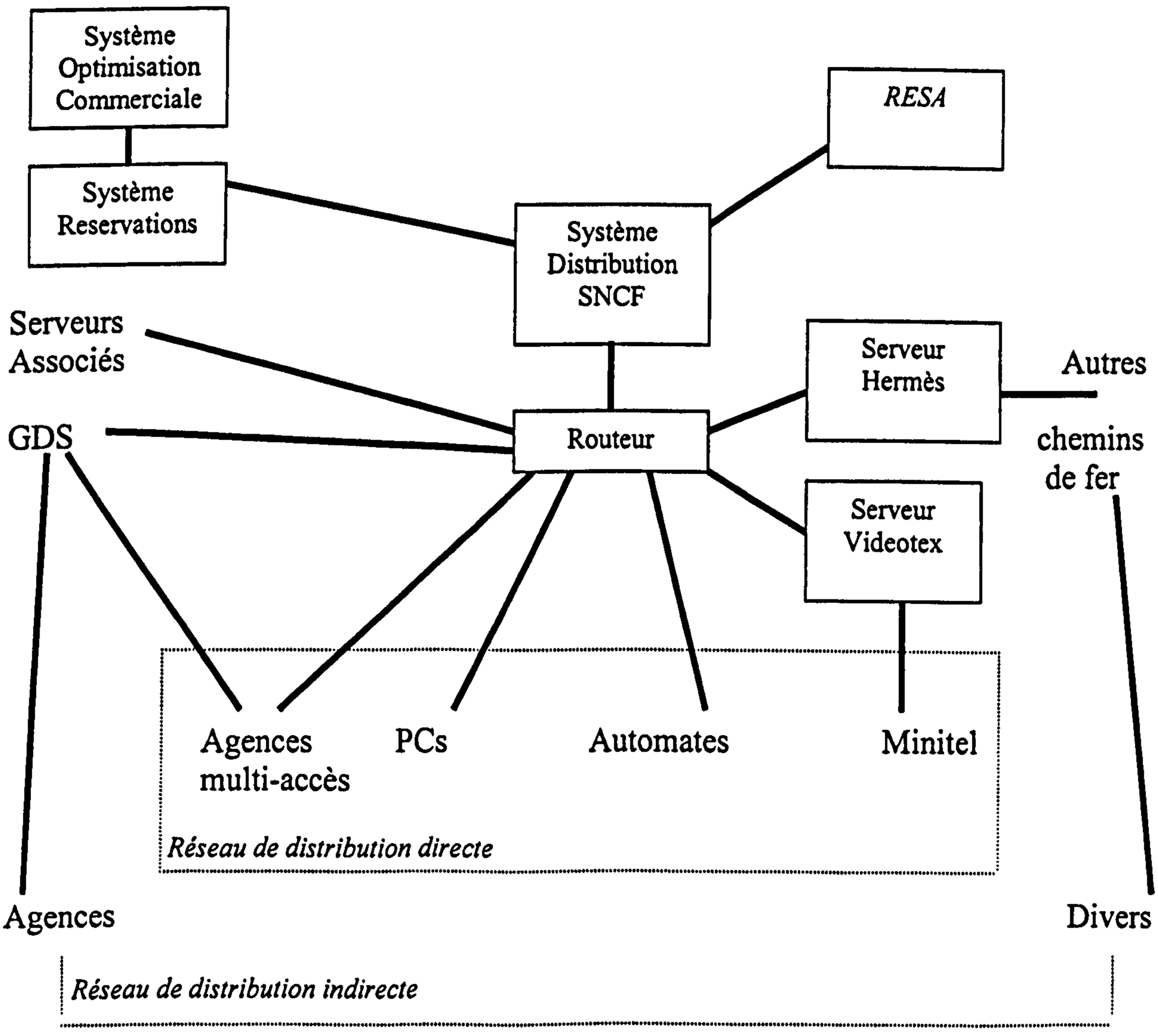


Figure 3.2 *Socrate* functional architecture [after SNCF 1992a]

Aristote: commercial and accounting software

Aristote stands for 'Amélioration de la Restitution d'Information par un Système Transactionnel Optimisé sur le Trafic de l'Entreprise', and was approved in April 1990. It cost FF 300 million and its aim

was to make commercial and accounting data jointly available. Previously, revenue management and accounting was costly and labour intensive (3,000 staff, FF 600 million a year). Furthermore, revenue analysis was slow, poorly integrated and non-exhaustive. For instance, revenues for different trains and for long distances were generally not exact figures but estimated ones. The motivation for *Aristote* was that "inter-city lines are operating in an increasingly competitive market and the growing use of IS in enterprises is making a better knowledge of revenues essential" [SNCF 1993c]. The aim of *Aristote* was therefore to provide "a better knowledge of revenues and their distribution, and a simplification of the organisation based on more appropriate staff qualifications".

Passenger traffic revenues

As soon as a sale transaction is completed in *Socrate*, a message is created. The messages are sent daily to *Aristote*. Data is processed in different ways for different purposes: quality control, distribution of revenues across units (SNCF, foreign networks, catering, etc.), calculation of net profit, tax, etc. The messages are stored for four months in a database, which can process up to 1 million transactions a night. It uses Teradata hardware (parallel processing).

Commercial analysis

Aristote communicates to the different management levels of the commercial networks (stations, travel agents, telephone and Minitel sales, sales abroad, etc.); data about their performance can be compared to their objectives. For instance, the sales team leaders of the 50 most important stations and the commercial executives of the 120 passenger units receive every day a summary of the previous day's sales. Monthly results are available on the 5th day of the following month. Commercial data analysis is also made available on the database for about 400 users (in regional or central divisions) to provide detailed information of product use, revenues, reservation traffic for each train or for each route. *Aristote* also provides information about large clients such as enterprises.

Simplified accounting

Aristote deals with accounting reports and audits, invoicing, payment and ledgers. All this used to be done manually. Through the IT networks, the accounting work was reorganised into two levels. Central accounting services now deal with large accounts (travel agencies, business clients, foreign networks), maintenance and auditing. Local accounting services (the sixty 'Bureaux de Contrôle Comptable' spread across France) deal with the 'first level' accounting control of sales staff operations. This reorganisation implied an upgrade and redefinition of jobs (e.g. account manager, accounting controller). A management dimension has also been added. For instance the local accounting services are integrated in their units and use the same management methods as those used by the sales forces. *Aristote* feeds the existing management accounting system ('*Sachem*') by calculating revenues for each passenger activity (inter-city, regional, Ile de France) and for establishing purchasers/providers contracts with regions.

Aristote was planned in the three phases below, and as illustrated in **Figure 3.3**. The implementation of *Aristote* was delayed until January 1994. This was due to the problems encountered by *Socrate*, and *Aristote* staff had to abandon their work to help solve *Socrate* problems [Barjonet 1994].

Phase 1: Commercial revenues
November 1992-March 1993: revenue management pilot
April 1993: revenue management to all

Phase 2: General accounting
June 1993: revenue accounting
Summer 1993: pilot sites
October 1993: revenue accounting to all; start of accounting control, feeding to general accounts

Phase 3: Management accounting
December 1993: allocation of revenues and costs to units
June 1994: accounting control and general accounts to all

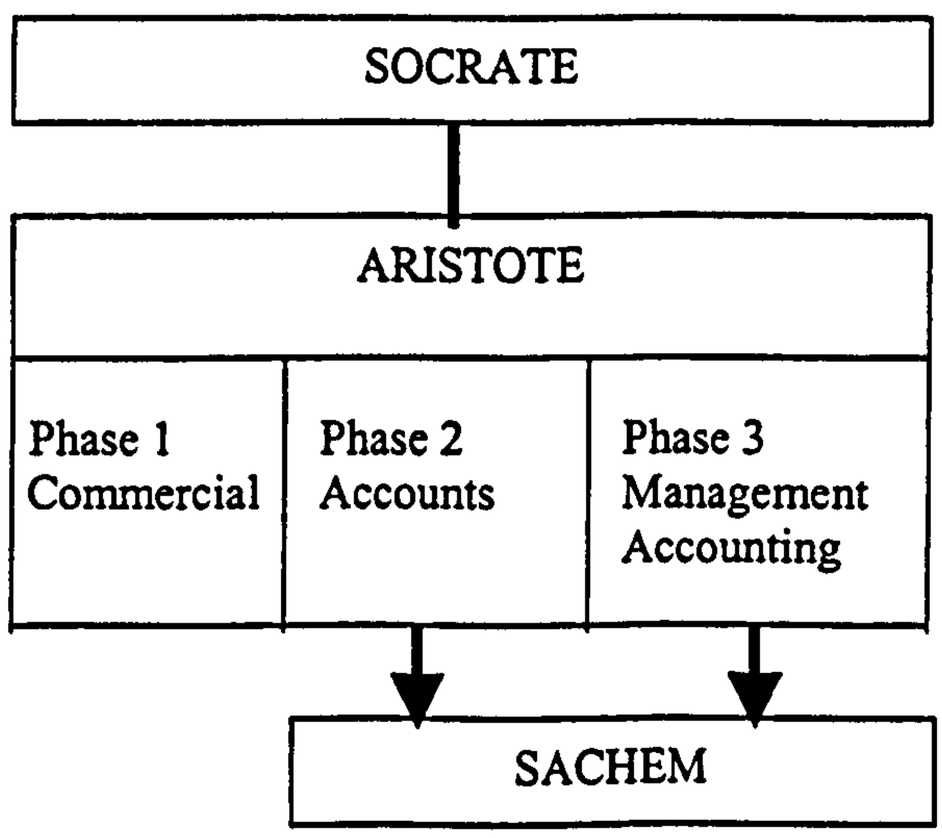


Figure 3.3 Implementation of *Aristote* [SNCF 1993c]

Thalès: optimisation software

Thalès (Traitement Heuristique Algorithmique des Espaces de Service) was derived from the optimisation software developed by American Airlines Decision Technology (AADT)[7] an operational

[7] In 1994 AADT was integrated with Sabre Development Services and AMRIS Transportation Automation Services to form a new entity, Sabre Decision Technologies (SDT). SDT is a leading provider of off-the-shelf packages and customised yield management systems and services to a variety of transport and tourism businesses. SDT's primary market continues to be large enterprises but some software may be suitable for independent, medium-sized operations, such as *HARPS*, Hotel Analysis, Reporting and Planning System [Arthur Andersen 1997].

research subsidiary of the AMR group, and implemented for American Airlines under the name *Dinamo* (Dynamic Inventory and Maintenance Optimizer). The contract signed in March 1989 between SNCF and AMR for a partnership until 2007 covers: a contract with AMR Information Systems for the adaptation of Sabre to SNCF; and a contract with AADT to use their experience of *Dinamo* to build yield management software for SNCF. The general principle is that "reservation is indispensable, and so is yield management" [SNCF 1992b].

Initially, optimisation software was to be applied to TGVs only, and to normal inter-city trains later, after the first results were analysed. From 23rd May 1993, *Thalès* was applied passively for one year (phase 'transitoire'), and recorded reservations and price data per TGV and per day, to create a history of demand. After the first year, it was to operate fully, using the data accumulated during the first year as a baseline.

For all individual trains, *Thalès* stores the changes and evolution over time of filling rates, prices paid by clients (full fares, commercial or social discounts) and routes. Combining this information with forecasting and optimisation software, *Thalès* can then propose, dynamically, train per train, the best distribution of seats to increase profitability. It can, for each train, modify seat allocation according to how this particular train is currently filling up. If the figures are less than the initial forecasts, *Thalès* can choose to increase the number of seats offered at discounted prices [SNCF 1992b]. The following is a simplified example to show how *Thalès* works.

Example:

400 seats, three stations A, B and C, two fares (full, half price)

Segment	*Fare*	*Price*	*Demand forecast*
AB	full	300	100
AB	half	150	200
AC	full	400	50
AC	half	200	150
BC	full	200	50
BC	half	100	100

Estimated demand AB=300
Estimated demand AC=200
Estimated demand BC=150

Total AB+AC= 500 when there are only 400 seats

AB is a problem segment (too much demand for existing capacity) so the software ranks different options according to profits and allocates seats in the following order:

	Price	*Maximum no. seats*	*Demands*	*Final sales*
AC full	400	400	50	50
AB full	300	350	100	100
AC half	200	250	150	150
AB half	150	100	200	100
			500	400

This limits the number of AB half fare seats and protects AC and AB full fares especially. The 'maximum number of seats' possible for each category is revised automatically or manually according to demand so far (if it diverges from predicted demand based on historical data). For instance, if demand on AC is lower than predicted, maximum numbers for half fares can be increased. On the other hand, if demand for AC increases, these can be reduced.

Obviously, this becomes extremely complicated when one introduces first and second class, an average of six stops, 4 or 5 different prices, 500 trains a day, and 60 days of sales (booking prior to departure). With historical records of reservations *Thalès* can also estimate 'no shows' statistically train by train. For instance, passengers booked on the 17h30 from Lyon are more likely to change their time of departure than passengers booked at 10h15 in Marseille. *Thalès* can therefore determine exactly the level of over-booking to allow by type of seat (first and second class); and for each category it can determine the number of seats on offer on certain routes and at different prices [Tréfault *et al* 1990].

The next figure (**Figure 3.4**) shows how *Aristote* and *Thalès* fit into the *Socrate* functional architecture. The main elements of **Figure 3.2** are reproduced and appropriate additions made in bold italics.

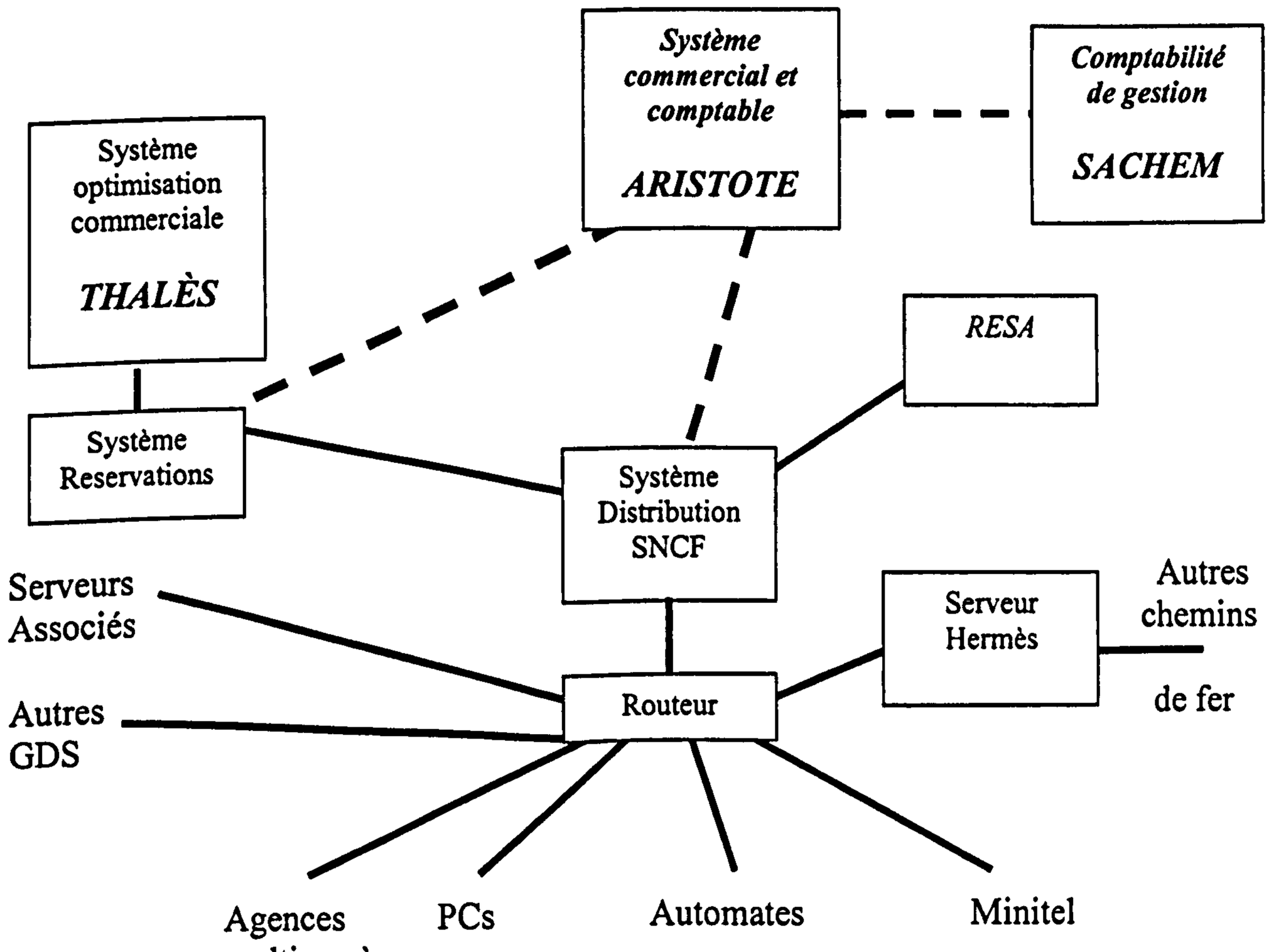


Figure 3.4 *Aristote* and *Thalès* architecture [after SNCF 1992a]

3.3 YIELD MANAGEMENT

Yield management techniques, forecasting and optimisation models are examined in further detail below, as they constitute the fundamentally new and most complex part of the *Socrate* system. It seems that perhaps more effort was put into designing *Thalès*, seen as the strategic core of the system. This may possibly have contributed towards some of the operational problems faced during the initial implementation. Yield management is seen in this thesis as the core too in the sense that it is closely related to deregulation covered in **Chapter 4**, pricing examined in **Chapter 5**, and organisational changes considered in **Chapter 6.**

3.3.1 Computerised reservation systems and global distribution systems

Reservation and distribution systems consist of a database management system centrally controlled, which manages the complexity of a fluctuating demand related to the variability of prices through yield management techniques; it provides real time information on marketing policies and fare structures of competitors and data accumulation for capacity and profit analyses. The computer networks and management techniques allow large-scale data collection in stations and distributors. They manage the complexity of the price/capacity relations and routes/times, in order to optimise the commercial and financial yields, in a context of inter-sectorial competition (air, rail, road). Yield management databases and models require certain functionalities in the reservation and distribution system. The yield management system is linked to:

- Historical databases (past reservations per origin-destination, per fare paid, cancellations, no shows);
- Databases of current reservations;
- Databases with characteristics of capacity;
- Database on competition.

Information for these databases comes from the computerised reservation system, which manages the reservations and holds information on timetables, availability, prices, etc., to which is connected, through the GDS, the points of sale terminals in the stations, the travel agencies, other companies, ticket machines, and the public access network [see **Figure 3.5**]. The yield management system manages quotas and overbooking through minimum and maximum thresholds based on predictions. Human analysts' intervention to modify these parameters is required when unusual conditions arise (e.g. the Gulf war), which can be aided through computer simulations. Models are refined through comparisons between predicted and actual demand, capacity and profit implications.

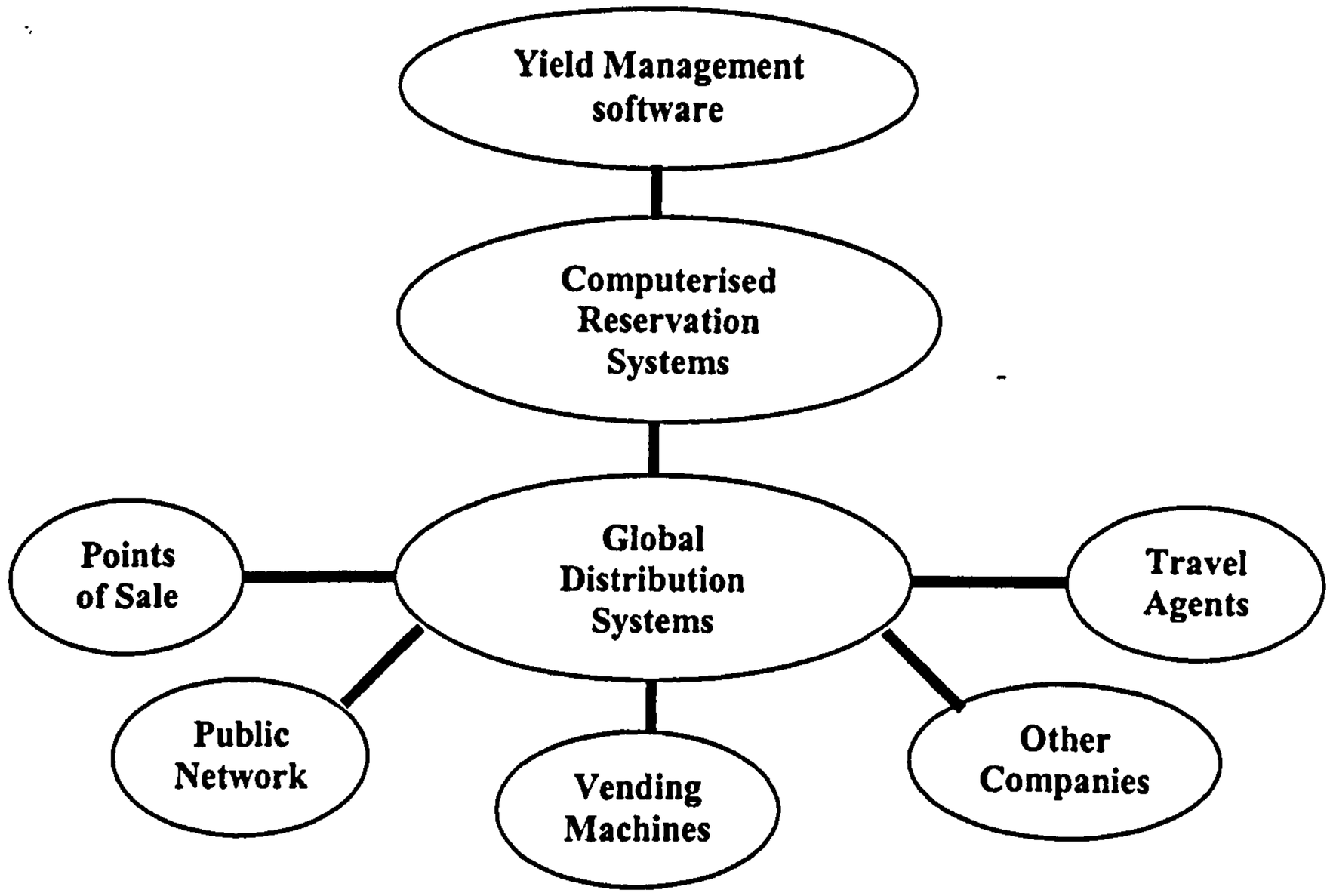


Figure 3.5 Yield management, CRS and GDS

3.3.2 Yield management techniques

Yield management used to rely almost exclusively on human expertise and has evolved to what may be seen as a science that employs more systematic analysis and decision techniques. The simplest form of yield management deals with each flight leg independently, rather than trying to optimise seat allocations over the airline's entire network of flights. Seat inventory control for a future departure only sets booking limits on discounted fare classes once, at the start of the reservations process for that flight (usually 6 weeks prior to departure), and takes no further action as reservations are accepted.

The more sophisticated forms of yield management take into account the information provided by actual reservations, through monitoring of booking trends and adjustment of discounted fare class limits, to maximise total flight revenues or flight loads. Adjustments are made on the basis of an analysis of past data, current bookings, and forecasts of future bookings for the flight.

Yield management techniques aim to know, control and predict demand, as well as manage capacity and control costs according to this knowledge. It combines differentiated pricing, profit maximisation and quota management. It balances under- and over-capacity using customers' sensitivity to prices. It determines the number of seats per flight (quotas) which are discounted, so as to maintain maximum profits from the normally priced seats. These quotas can be determined dynamically: they are revised continuously according to real time demand until then. The goal is to control and manage travelling behaviour. This is done through working out the ideal point at which a customer who does not get a discounted fare either transfers to the higher fare or to another flight at the same price rather than not travelling or using another mode of transport. It is based on the analysis of past statistics, comparisons of past and current demand so far, forecasts based on current demand, and other statistical techniques.

Yield management and optimisation, when compared to previous price differentiation mechanisms where several techniques were simply used in conjunction, represent a fundamental qualitative shift: detailed information is gathered about each and every flight throughout the day, the week and the year; information is gathered continuously on seats sold so far, so that the price mix on each flight can be modified in real time; each journey becomes identifiable, accountable and marketable as an individual and isolated product.

3.3.3 Yield management in US airlines

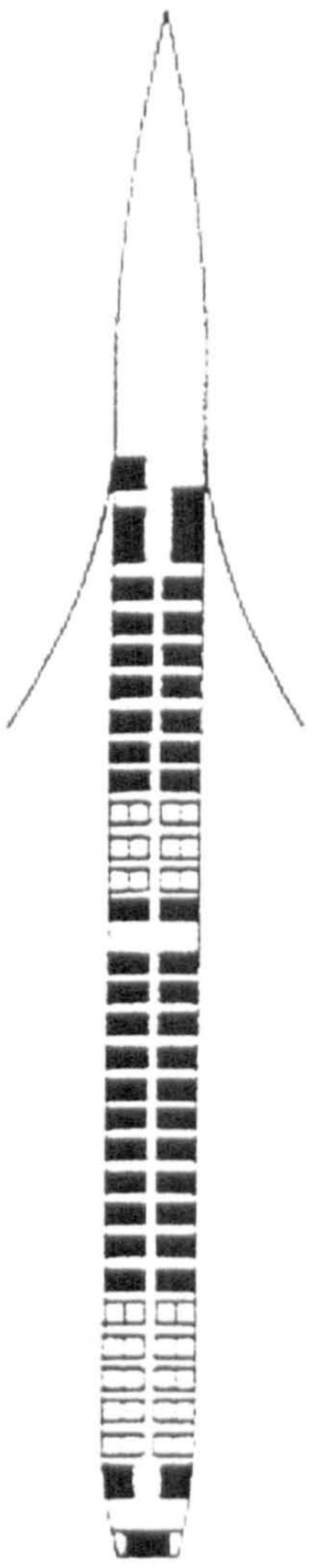
The motivation for yield management in airlines can be summarised as follows: "tell us what you can afford and we'll send you a ticket". It can also be argued that it is a pricing strategy developed at the time of deregulation so that established airlines could at least appear to be competitive in price with the new entrants, and might even be able to fill otherwise empty seats with stimulated demand. It enabled pre-deregulation airlines to respond more rationally to price-cutting by individual competitors and/or in specific markets.

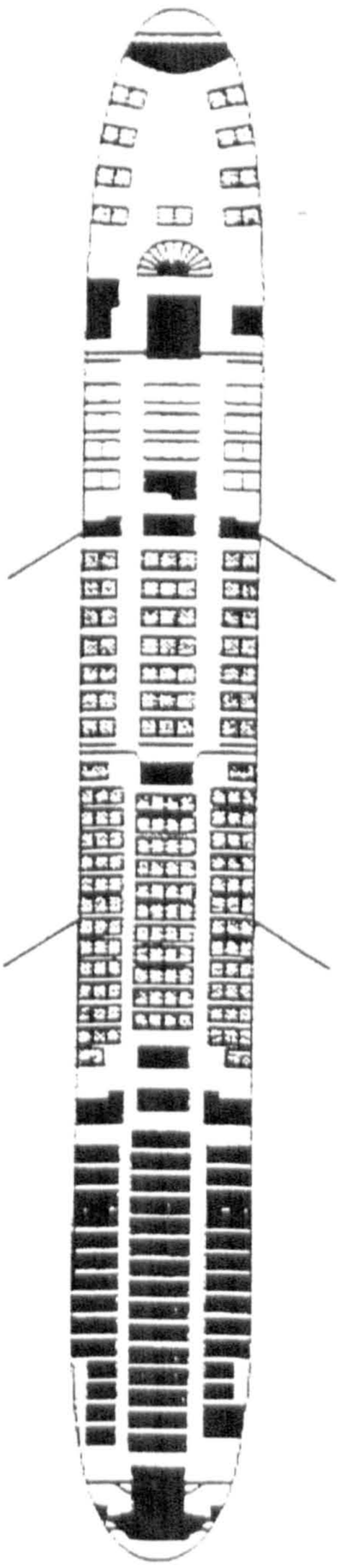
Yield management includes both pricing and seat inventory control. Seat inventory control enables the airline to influence yields and total revenues on a flight-by-flight basis, within a given price structure. For an example of price structures, see **Figure 3.6**. Controlling the mix of fares sold for a particular flight is thus viewed as by far the most important aspect of fare competition, more important than the actual prices charged. The payoff from effective seat inventory control can be substantial: Delta Airlines has estimated that selling just one seat per flight at a full fare rather than a discounted fare can add to its annual revenues [Belobaba 1987].

Practice has evolved from an emphasis on human expertise in making seat inventory control decisions to computer support. US carriers have changed organisational structures accordingly. Seat inventory control and yield management are closely related to a range of other functions in the airline corporate structure, including pricing, marketing, sales, reservations, overbooking, and payload control. Several of the carriers have combined all the functions critical to yield management into a single unit. Pricing and overbooking control are the most common functions to have been incorporated into the yield management unit, which in turn is most commonly found in the airline's marketing and market planning department. Co-ordination with the remaining related functions can pose a problem. Inventory control agents are held responsible for all flight legs that traverse a particular route or set of routes, and are accountable for the traffic mixes and revenue levels achieved on their own routes.

Concorde

Supersonic:
Normal £5030
Excursion £4220
Day return £4156





Boeing 747

First class
£3984

Club class
£2164

Traveller (economy)
Full £758 (peak)

Full £678 (off-peak)

APEX £309
(7 days in advance)

APEX £259
(21 days in advance)

Figure 3.6 London-New York return fares, October 1993, British Airways [Hanlon 1996:158]

3.3.4 Yield management and reservation systems: from simple to complex fare structures

Seat inventory control is highly dependent on the capabilities of the airline's reservation system. Strictly independent ('non-nested' or independent from each other, e.g. number of business class tickets independent from APEX -Advance Purchase EXcursion- tickets) fare class 'buckets' represent the simplest reservation systems structure. More sophisticated reservation systems have discounted fare classes 'nested' (non-independent) within the highest fare class and share the same seat inventory. These subclasses of the cabin inventory can themselves be independent (non-nested) of each other or nested serially in descending order of yield.

The major reservation systems used by travel agents (distribution systems) initially displayed seat availability by flight leg and accept bookings in a maximum of five 'buckets' [Belobaba 1987:66]. Airlines are constrained by this limit, since they need a standard to exchange availability and booking information with other reservation systems. Carriers have upgraded their reservation systems to accept bookings in up to 40 reservation buckets. This allows airlines, for example, to stop sales of extremely low-priced seats in selected markets (particular O-D relations) on a connecting flight leg, without closing down the entire fare class to additional bookings. Most systems have the capability of limiting sales to local passengers in favour of through and connecting passengers that generate more total revenue.

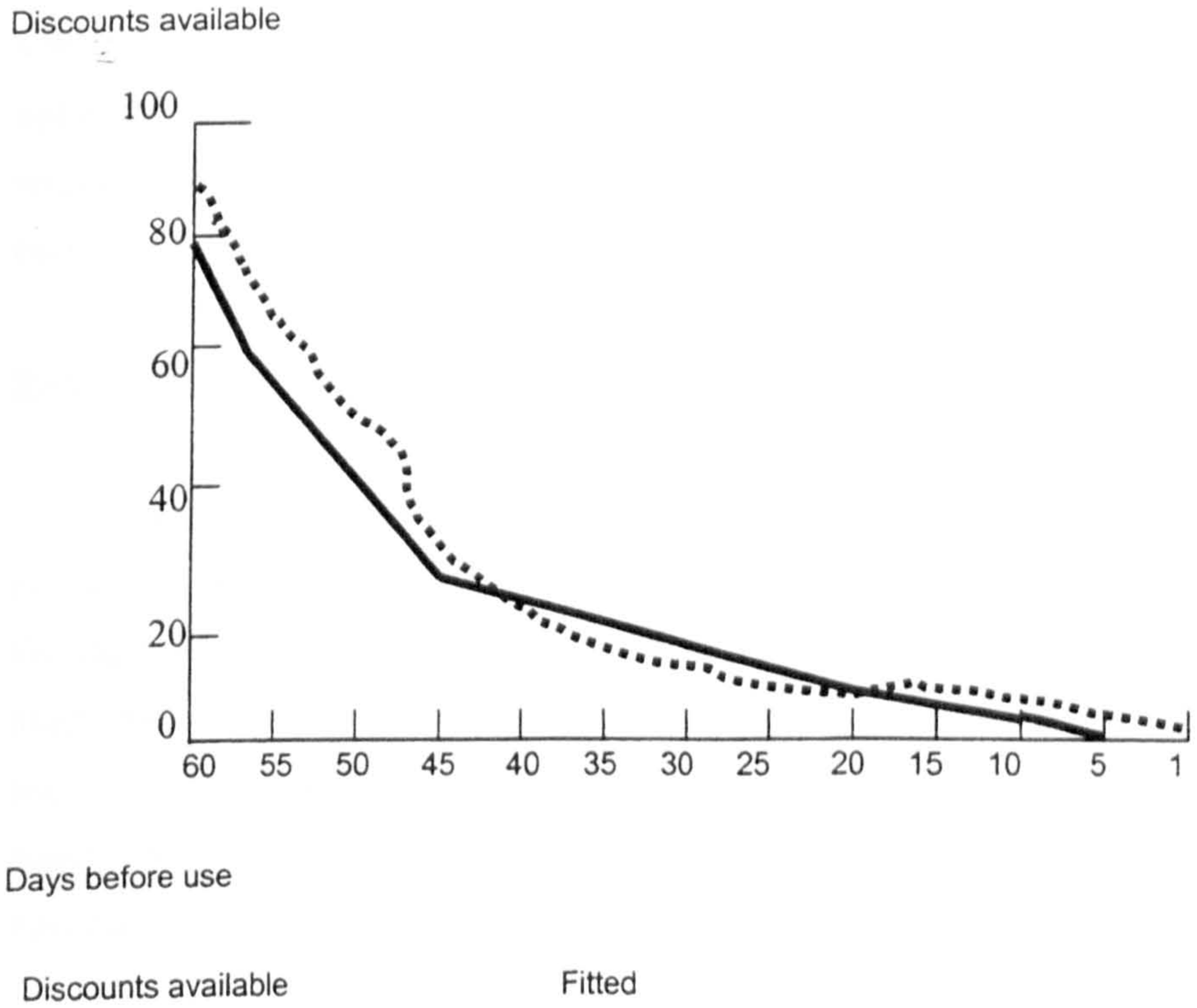
American Airlines seemed to have been the first to have such systems in place [Belobaba 1987:66]. The focus of their seat inventory control process changed to one of managing fare class inventories with respect to the revenues generated by the passengers on local, through and connecting itineraries, all on the same flight leg. The decision models required to achieve this goal are far more complex than those required for simple leg-based seat inventory control.

3.3.5 Forecasting and decision support

Reservation systems also play an important role in decision support for seat inventory control. Initial fare class booking limits potentially require revision on the basis of actual reservations and forecast demand. It is essential to be able to retrieve historical booking patterns and traffic data for the same or similar flights. Yield management software extracts data from computerised reservation systems and provides decision support for seat inventory control. It also offers an ability to monitor actual bookings relative to historical patterns.

An important decision support tool is the monitoring of actual bookings relative to fare class booking limits, so as to maximise flight revenues. On the basis of historical booking trends for a flight or group of flights, a decision support package generates 'booking threshold curves' (see **Figure 3.7**), which show the expected range of bookings at any point before departure [Raeside 1997]. When an airline' reservation monitoring system flags a flight for which bookings approach any one of the limits of the threshold set for that flight, a decision must be made either to: (a) increase the availability of seats in the relevant fare class; or (b) allow the system to close it down to additional reservations. This decision used to be made by groups of individuals on the basis of experience and judgement. Carriers have improved

this by developing optimisation algorithms for finding the fare class booking limits that will maximise expected flight revenues. Such algorithms do not entirely eliminate the need for human judgement, since there are variables such as rapid changes in the competitive market and unexpected events. These optimisation models for seat inventory control allow yield management agents to focus on these variables by making routine tasks more systematic.



The curve shows how the number of discounts available should be reduced as the date of use draws near. For observed demand the yield manager can estimate the threshold line by fitting the model. This method may not find the optimal booking level but nevertheless it is simple to use and gives good results. However, a major problem is the update of the curves when patterns of demand change. This stresses the need for good forecasting.

Figure 3.7 Threshold curve [Raeside 1997:51-52]

3.3.6 Optimisation models

Optimisation models have been developed since the late 1980s due to rapidly changing competitive conditions in the airline industry since deregulation. They built upon the introduction in the 1970s of the APEX fares in international markets. They use expected marginal revenues by fare class in finding optimal seat allocations. Solution algorithms make use of the expected marginal revenues approach to optimise booking limits in reservation systems with independent (non-nested) buckets.

The airline seat inventory management problem has both probabilistic and dynamic aspects. Probabilistic elements are the uncertainty about the ultimate number of requests that an airline will receive for seats on a future flight, and more importantly, for the different fare classes offered on that

flight. Dynamic elements are about how the total number of reservation requests accepted for a flight will change from day to day, potentially affecting estimates of requests still to come, and in turn, the optimal allocation of remaining seats among fare classes.

The (probabilistic) expected number of requests for each class fare must be estimated from historical distributions of demand. Also, the number of seats allocated to a particular class fare might not always exceed the number of requests for that fare class, resulting in rejected demand. Static models for non-nested fare classes are easier to build than dynamic models for nested-fare classes. The aim of the optimisation models is to allocate seats between the class fares so that the marginal expected revenue with respect to additional seats in each class is equal to zero. At optimality, total expected flight revenues cannot be increased by taking a seat from class 1 and allocating it to class 2 instead.

Static models

In the simplest, static, independent (non-nested) fares models, the demand for each fare class is assumed to be independent of that for the other class, and the optimal seat allocation is made only once, at the beginning of the booking period for a flight. However, in reality, demand for different types of fares might not be independent, as high demand for one fare class could be associated with high demand for another. Also, a static seat inventory management model does not account for the dynamic nature of the reservations process, in which actual bookings accepted for a flight might provide valuable additional information about the ultimate number of requests that can be expected.

Dynamic models

In dynamic models, total flight revenues are maximised by 'closing down' the low-fare class to additional bookings when the certain revenue from selling another low-fare seat is exceeded by the *expected* revenue of selling that same seat at a higher fare. Revenue-maximising booking limits are calculated for each fare class by incorporating probabilities of selling remaining seats to high-fare passengers. Losses in total expected revenue are accounted for when low-fare passengers ultimately deny space to higher-fare passengers. Non-independent demand for each fare class equates with assuming that booking behaviour has a significant impact on the optimal seat allotments (i.e. the rate of low-fare requests decreases as the rate of high-fare requests increases as departure day approaches).

Flight legs

Another dimension is allocating seats of each leg to either a through or local passenger. One solution is to determine optimal booking limits for each flight leg first, and then perform an allocation of seats among fare classes. In other words, varying the allotment of low-fare seats for different passenger itineraries. Models for multiple leg flights with multiple fare classes are more complex. One way for optimal load targets for each class fare in each O-D (origin-destination) city-pair served by the flight,

could be found by allocating each marginal seat to the O-D and fare class combination with the highest total expected revenue. But this assumes independence of fare classes, and O-D markets.

For example, on a flight operating A to B to C, a feasible sequence would be to allocate the marginal seat to a low-fare class from A to B and to save that same seat for a high-fare passenger from B to C. There would be 12 feasible combinations for a one-stop flight with three fare classes. The feasible combinations are ranked in terms of expected marginal revenue as each seat is allocated incrementally. When the problem is expanded to multiple class fares and passenger itineraries, it becomes more difficult to find the optimal points analytically (see earlier example in **Section 3.2.3**).

Mathematical programming and network flow analysis (finding the mix of passenger itineraries flowing through the airline's network that would maximise total daily revenues) have been applied to such problems to find the optimal seat allotments through more efficient solution methods. Mathematical programming techniques take into account probabilistic (rather than deterministic) demand for each fare class. Those techniques can also be used in combination. When network formulations are expanded to include multiple flight legs and passenger itineraries involving connecting flights, the number of binary decision variables required increases rapidly. Work has been done on dynamic applications of these optimisation models to the reservation process, to revise booking limits as reservations are accepted and flight departure day approaches.

Non-independence of fares

So far, these optimisation models have assumed independence of fare class inventories. Mathematical programming and network formulations also involve large sizes of formulations. In a nested (non-independent) fare class reservation structure, it is more difficult to find optimal booking limits analytically. The size issue is incompatible with a volatile competitive environment that requires efficiency and adaptability. Some other factors which complicate matters further are: the relationship between overbooking and seat inventory control; refused requests which are not necessarily lost since passengers may be allocated on another flight of the same airline, or might accept a reservation at a higher fare class; and the existence of a significant correlation of demand levels among fare classes. Simpler decision rules, which can be used dynamically to limit bookings on flight legs or in specific markets, might be a more practical approach to improving seat inventory control than large optimisation models.

Optimisation models, forecasting techniques and yield management need to be implemented in a co-ordinated way by airline carriers to be beneficial. Decision support systems that can make use of the enormous amount of historical reservations and traffic data can be implemented relatively quickly, if there are adequate numbers of trained analysts. In addition to storing historical data, reservation systems are the operational centre of the seat inventory control process, and changing their capabilities to relate them more to the needs of yield management is more time-consuming. The most complex and longest-term objective is the development of mathematical decision-making models to forecast future bookings and to optimise planeload revenues. Optimisation models require input data in the form of forecast demand levels for future flights and estimates of expected revenues. Developing forecasting models in the context of an inherent variability in air travel demand and the volatility of airline markets, is more

difficult. Statistical and econometric methods can be used to reduce the uncertainty associated with future demand levels.

Optimisation models often also include simulations that enable 'what if' analysis and manipulation of external variables monitoring the environment and competitors' actions. Generally, these variables can be classified as shown in **Figure 3.8.**

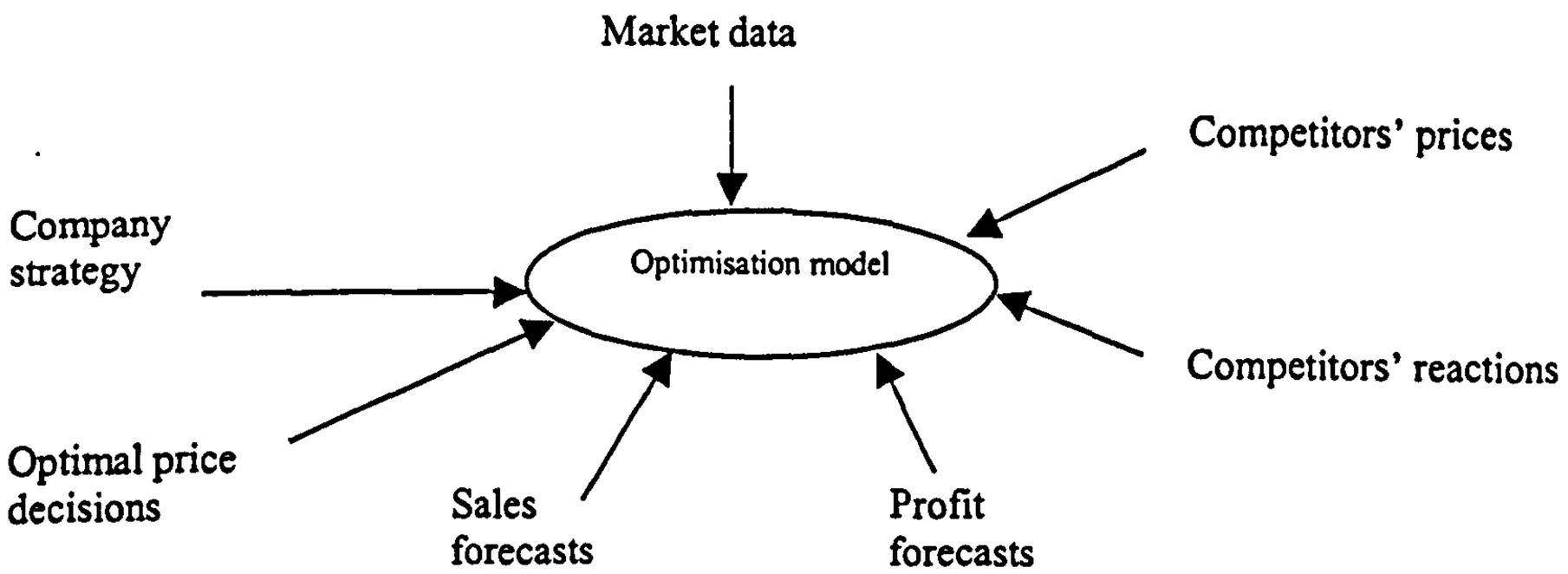


Figure 3.8 Optimisation model and variables [Russell and Johns 1997:123]

Some claim that each increase in yield can mean large additional revenues to airlines [Belobaba 1987]. Some argue, however, that measurement of yield management performance still needs additional research. Revenue improvements of 3 to 5 per cent are commonly claimed, but the method by which the improved revenue is measured is often questionable. Few controlled experiments have been performed, so managers do not know if revenue improvement occurred because of yield management or because of other factors [Kimes 1997:10]. Nevertheless, with restrictions on discounted fares, more restrained matching of competitors' low fares and limited sales of seats at low fares, pre-deregulation airlines are generally believed to have adapted successfully to the increased competitiveness of a deregulated industry and increased profitability for carriers.

3.4 Yield management at SNCF

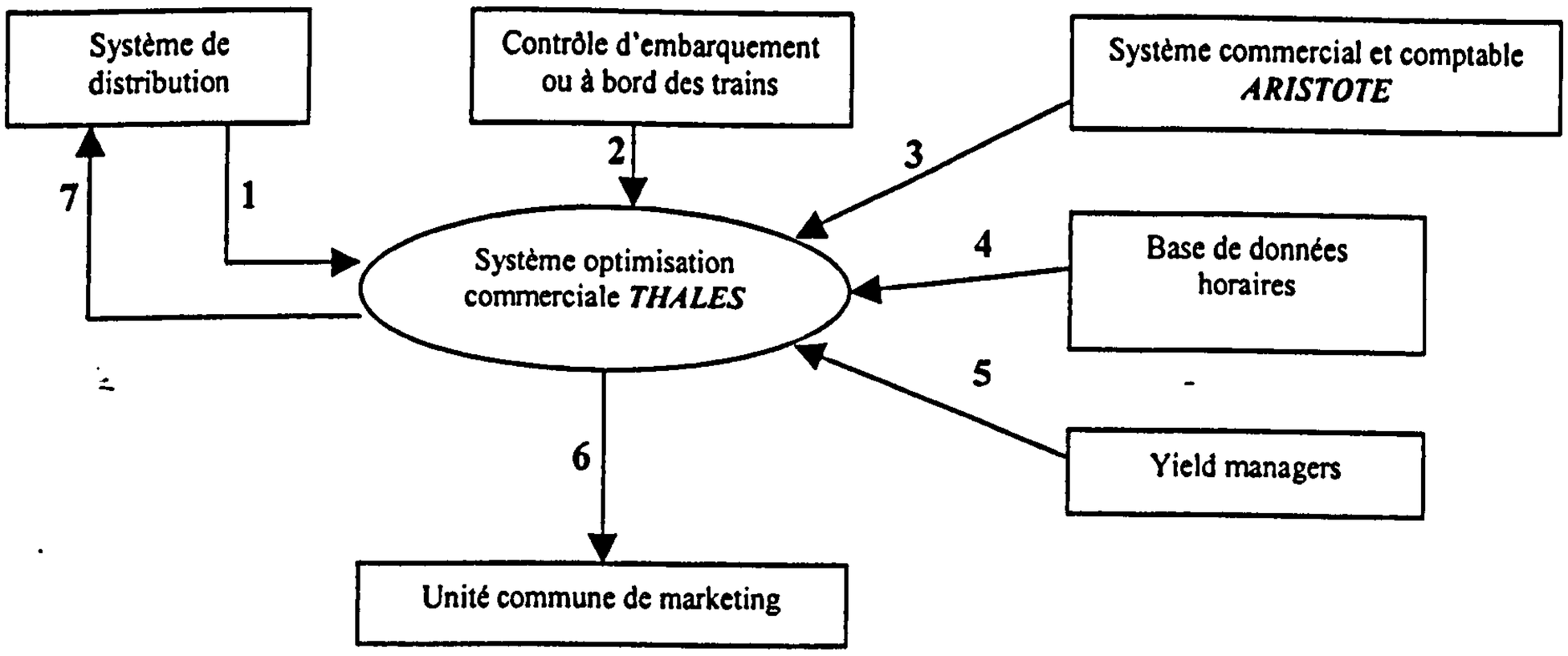
Gathering information about yield management techniques at SNCF was not as forthcoming as other aspects of *Socrate*, since it is considered the strategic core of the system. The building where the operational research group works is hidden away in the middle of tracks at the back of a Paris station, is built in concrete with no windows, looks like a second world war concrete 'blockhaus' and is very difficult to get into. Security was very tight, there is a checkpoint where I had to leave my French identity card before being allowed in, and I was accompanied in and out of the premises.

Interviewees were happy to discuss the general principles of yield management and its implications for SNCF, but didn't volunteer much detailed information. On the other hand, as yield management was a new concept in the late 1980s in France, several SNCF staff became experts in the

field. Two of them, Georges Vialle already mentioned above, and Sylvain Daudel, International Sales Manager at SNCF at the time [Daudel 1992], published the first textbook in French on the subject in 1989 [Daudel and Vialle 1989]. Other SNCF staff did express some cynicism about this exercise. Despite praising the book as a well-timed, accessible if general introduction to the subject matter, the authors are criticised for having borrowed, if not plundered, American Airlines expertise and translated it into French for their own benefit; they are blamed for not having included other team members in this venture [CQ Interview 10]. As already mentioned, Georges Vialle then moved to a new position at Club Méditerranée where he was responsible for introducing yield management [Mitrofanoff 1994]. Among European tourism and transport companies, British Airways, Lufthansa, the SNCF and Club Méditerranée are now the only ones generally acknowledged to have top-level yield management expertise in-house [Arthur Andersen 1997:26].

The previous way to calculate fares in *RESA* was straightforward. It simply multiplied the number of kilometres travelled by a unit price per kilometre [JPD Interview 9]. The fundamental principle of *Thalès* is that of commercial optimisation: not just the filling of trains, but their profitability, by limiting access to certain prices, train per train. Price quotas (the proportion of discounted fares per train) can change daily before departure according to bookings, and affects only certain seats, not whole trains. This is intended to bypass blanket restrictions (e.g. peak time). *Thalès* stores a history of all seats sold to determine pricing and number of discounted seats train per train.

Through the *Thalès* system, information about past reservations is extracted from the CRS and the demand analysed. This is also complemented by traffic information collected in the trains, and in the case of the Channel Tunnel, check-in information (which was easier to implement since there are no stops and very few origin-destination pairs, e.g. London-Paris, Paris-Brussels, Brussels-Lille [Open University 1995]). *Thalès* yield management techniques imply optimal filling of trains combined with as great a profit as possible from each seat filled, through optimising the average price/rate of occupation ratio per seat. Beyond bookings and ticketing, *Socrate* therefore provides an optimisation software which aims at redirecting demand not by altering prices but by changing (all the time) the number of train seats available at certain prices. The aim is to control and manage demand. The main information flows into the *Thalès* yield management system are shown in **Figure 3.9.**



1 → Réservation et disponibilités

2 → Trafic réel des trains

3 → Recettes réelles des trains

4 → Horaires

5 → Paramètres des modèles

6 → Analyses de performance du système

7 → Niveaux d'autorisation (N1, N2 etc or price bucket)

Figure 3.9 Information flows for yield management at SNCF [Gianfaldoni 1993:53]

Unlike the reservation and distribution parts of *Socrate* which are clones of *Sabre*, the yield management software was entirely written from scratch at SNCF, in collaboration with AMRIS staff [CQ Interview 10]. In fact, the yield management software written for *Socrate* displayed better performance and was being rewritten for American Airlines as a result, at the time of interviewing [CQ Interview 10]. The interviewee, a SNCF yield management expert, commented that AMRIS consultants also benefit from working with SNCF clients, and AA learnt from the experience. On the other hand it was pointed out that this was also a result of collaborating together on software development rather than having entered into a purely purchaser/provider relationship. Consequently, expertise was transferred to SNCF, staff feel they know what is in the system, the final system fitted their needs more closely and they can update and maintain it more easily and cheaply [CQ Interview 10]. The collaboration was not entirely trouble free, as the Americans were perceived to be patronising to start with. "They used to tell us that 'really it is quite simple, it is only because you are French'.... (...) but eventually they acknowledged that they had not thought trains were so complicated and that in fact air transport is really quite straightforward" [CQ Interview 10]. Another initial difficulty was the lack of data. Airlines have check in procedures which are almost non-existent in rail transport (apart from Eurostar, see above). "American software engineers kept asking us for more data to extrapolate from and test the prototype with. We could only provide very limited amounts and we had to reconstitute statistics through 'best guess', from the little information we had through surveys and marketing which was very difficult and time-consuming"

[CQ Interview 10]. By the time I interviewed them, operational research staff had started accumulating historical data and were learning to use their techniques better. However, problems surrounding pricing and decisions to simplify quota management taken after the troubled implementation of *Socrate* (see **Chapter 5**) biased the traffic data and was hindering yield managers' work.

According to Daudel and Vialle [1989], yield management must abide by the following rules.

- *Adaptive flexibility.* Levels of price must be established according to the price sensitivities of different client groups and competitors' prices (air and road).
- *Flexibility of initiative.* One must anticipate and respond rapidly to competitors' actions; altering reservation deadlines and tariffs must be done easily.
- *Communication.* As good a communication as possible must be ensured with the distribution channels (standardisation, norms, agents' function, contracts) and final users (understanding and acceptance).
- *Tight categorisation.* Specific constraints must be set up for client groups who are not so sensitive to prices so as to prevent them from switching to discounted tariffs (to avoid 'fare dilution').
- *Incremental rules.* Prices must be incremental, so that clients who cannot benefit from discounted prices anymore (full quota) or who do not accept constraints associated with discounted prices (booking ahead) switch to higher tariffs rather than choose another mode of transport.
- *Management.* The model must take into account risks of waste (over-capacity), refusals (under-capacity) and denials (turning away clients who have booked, if reservations are accepted beyond availability).

SNCF applies the principles of 'quota management' which must be balanced, in particular with overbooking, so that:

- if the risk of waste is higher than refusals, quota management with lower tariffs will be favoured
- if the risk of refusals is higher than waste, quota management with higher tariffs will be favoured

Through a process of trial and error, SNCF yield management seeks the optimal situation in which the cost of the risk of waste (loss of earnings) and the cost of the risk of denials (clients will need to be compensated and reputation will get damaged) are minimised. Since the more the risk of waste decreases the more the risk of refusal increases, the total cost of overbooking is at its lowest when the two risk costs are equal [Daudel and Vialle 1989]. In practice, determining this total final cost requires very complex probability calculations, and a progressive improvement of forecasting models by incorporating new data from staff experiences and historical records. The principles of quota management are illustrated in **Figure 3.10**, in which the proportion of discounted and standard prices can be altered anytime (the dashed line can move).

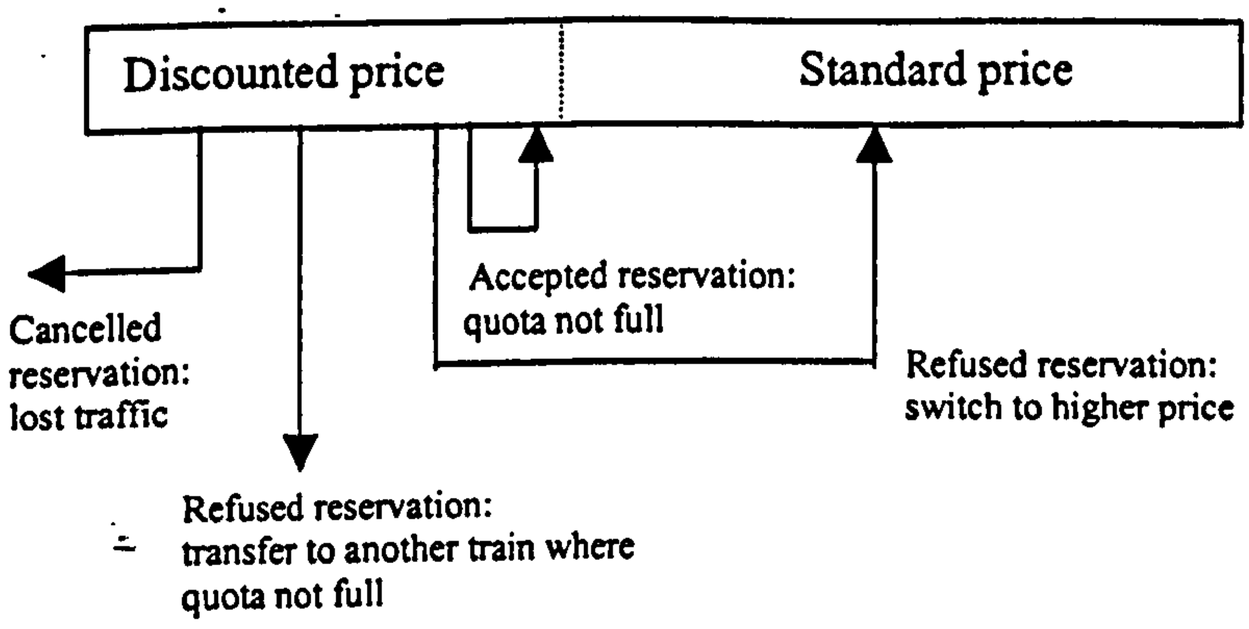


Figure 3.10 Quota management [Gianfaldoni 1993:52]

Daudel and Vialle [1989:127] also clearly state how yield management should be integrated with the marketing, distribution and operations functions, if the organisation is to become a truly service-oriented company, as achieved by US airlines (see **Section 3.3.3**). They represent this in the two diagrams below (**Figure 3.11**) , the first one showing the traditional way to organise a services enterprise, the second one having yield management at the centre of the organisation [Daudel and Vialle 1989:128-129].

A. Traditional organisation in a services enterprise (*before* yield management)

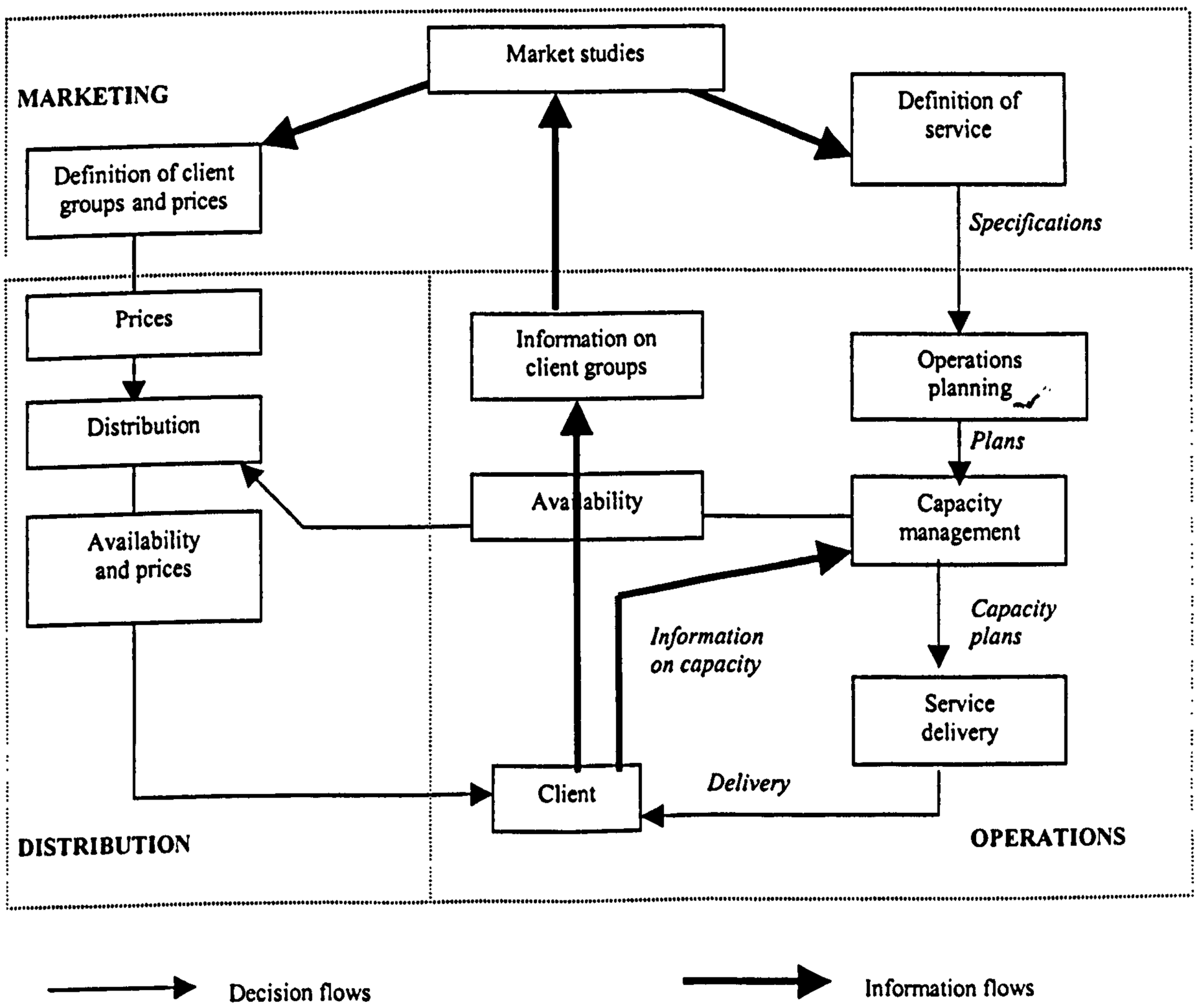


Figure 3.11a Yield management, marketing, operations and distribution [Daudel and Vialle 1989:128-129]

B. Yield management between marketing, operations and distribution (*after* yield management)

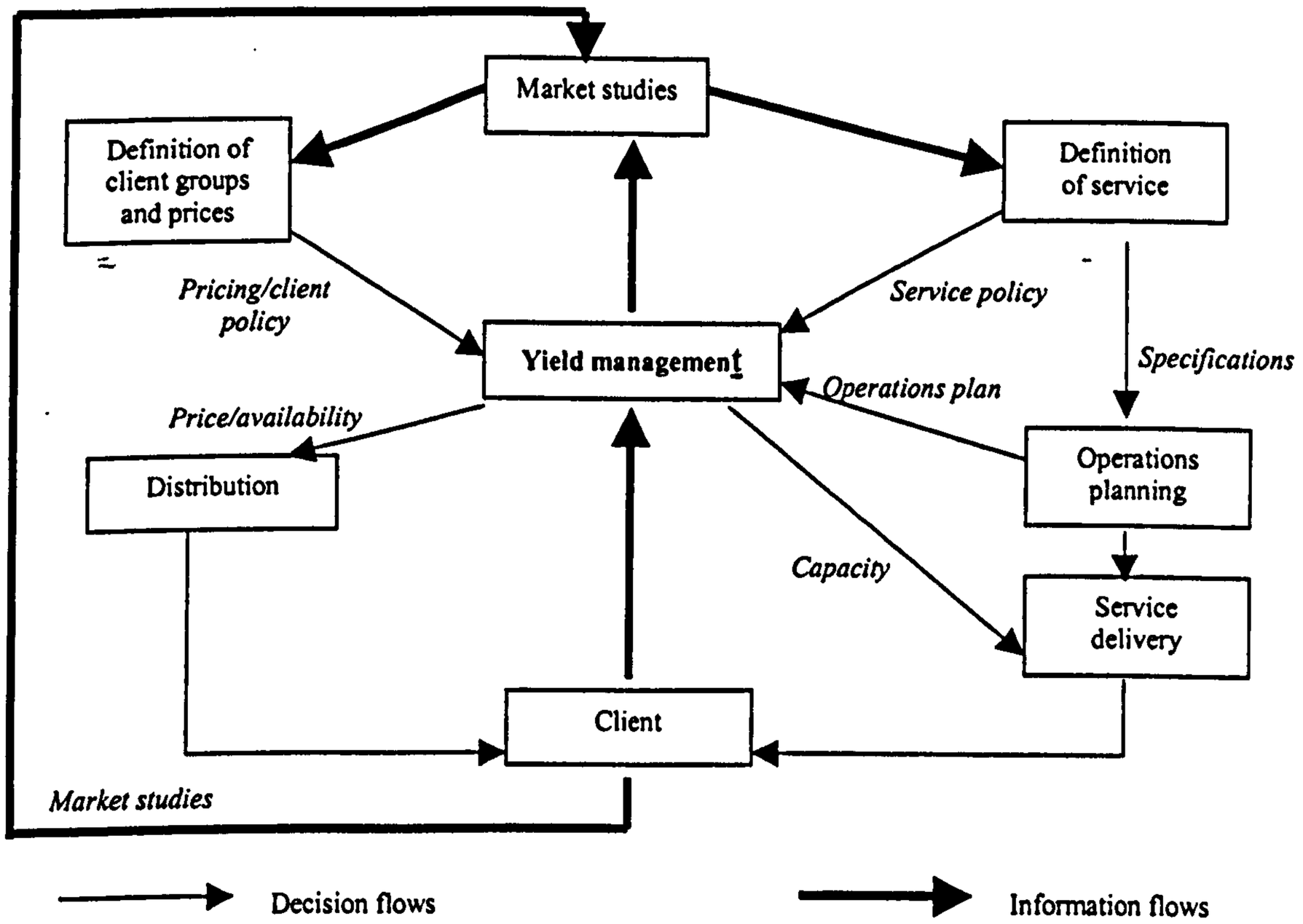


Figure 3.11b Yield management, marketing, operations and distribution [Daudel and Vialle 1989:128-129]

The heart of the system, and of the organisation, is yield management. It supports not only better pricing decisions but also planning of human and other resources. In this way, a system ostensibly designed to improve revenues also brings substantial benefits on the cost side [Arthur Andersen 1997:16] and has profound organisational implications, investigated in **Chapter 6**. Before this, broader implications of yield management in terms of pricing, regulation, politics and consumers are discussed.

3.5 Implications of yield management: the social and the technical

In recent years, the airlines have been joined at the forefront of yield management technology by the largest hotel chains, cruise lines, car rental companies and amusement parks. Increased competition in all these service industries has fuelled development of ever more sophisticated computer modelling systems [Arthur Andersen 1997:15]. Theoretically, yield management could also be of use to other service firms such as hiring of equipment (e.g. cranes, computers), labour (temp agencies), know-how (consultants), space (car parks) or even time (processing and communication time) [Daudel and Vialle 1989:137]. The necessary conditions for yield management are [Kimes 1997:5]:

- Fixed capacity. Yield management is designed for capacity-constrained service firms, for example hotels. Some industries with fairly fixed capacities use yield management to adjust the size of their capacity, for instance airlines can change the size of their planes and so can rail companies.
- High fixed costs. There is a high cost of adding incremental capacity, for example the high cost of adding capacity to an airplane, hotel or cruise line.
- Low variable costs. The cost of putting an additional customer in otherwise unused capacity is relatively inexpensive (e.g. the cost of an extra meal).
- Time-varied demand. Capacity-constrained firms cannot easily alter their capacity to match changing demand patterns.
- Similarity of inventory units. Seats or rooms are considered to be fairly interchangeable (within a fare bucket).

In the European rail industry, Danish railways already use some yield management, while the Norwegian railways are reportedly working on a major yield management project, and the Austrian federal railway is developing pricing policies that will more closely reflect yield management principles [Arthur Andersen 1997:55]. Related to yield management, there appears to be a general trend towards some discounting and greater price differentiation. However, the use of yield management raises many questions.

Market segmentation and price differentiation are technically difficult to implement in railways. The travelling public is large and complex and these techniques can misfire and lead to a mixing of segments and a failure to distribute demand more evenly. Some advocate more demand-based discounting, more differentiated pricing and more restricted discounts for instance through the choice of route, time of travel, type of train [Arthur Andersen 1997:70], as a solution to this problem. These suggestions are closely related to a belief in the elimination of regulations "which restrict the prices of otherwise freely competing businesses", as recommended by consultancy firm Arthur Andersen [1997:327]. Similarly, the following quotes use loaded and highly symbolic words such as freedom, artificial, natural, to express a liberal agenda where regulation is a bad thing since it prevents good and natural things from happening, and as if any price could be 'natural'; and where political considerations are a nuisance, probably unnatural, and a major obstacle to the clean and neutral use of yield management.

> "**Artificial** price constraints limit businesses' ability to combat the **natural** seasonality of demand and to optimise profits" [Arthur Andersen 1997:327, my emphasis].

> "The factors that impede greater yield management use by railways are of two types: operational and **attitudinal** or philosophical. The first of these generally relates to the way in which railways view their capacity, and the second to their obligations as state enterprises vis-à-vis the provision of service to the public" [Arthur Andersen 1997:55].

> "A national railway in Europe asked us for an introduction to possible yield management applications (...) The railway executives quickly determined that it would be impossible for them to implement yield management, because political considerations would prevent them charging different prices for the same service" [Arthur Andersen 1997:56].

> "Public of political obligations [are one of the problems identified]. Some state-owned or non-profit-making enterprises may feel differentiated, demand-oriented pricing is inconsistent with their mission, or may find it is politically untenable" [Arthur Andersen 1997:24].

Through this discourse and through yield management, transport is being redefined as a service industry amenable to marketing and business 'natural' principles, in contrast to old-fashioned unnatural and artificial restrictions and regulations, represented by public rail enterprises with the wrong 'attitude'. Moreover, consumer rights and customer protection legislation are perceived as obstacles to yield management applications, and the law, for instance in the travel sector, "has set traps for (...) managers who try to maximise yield" [Boella 1997:41]. Customers are resistant to overbooking (overselling?); they complain about the lack of transparency in pricing; they are unhappy about 'bait and switch' tactics, whereby a company aggressively advertises an extreme price, usually very low, but in fact has very little inventory available at that price; and they object to 'gouging' where the prices are so high that they are regarded as unfair [Arthur Andersen 1997:24].

This reflects a fundamental conflict between sellers who want the flexibility of pricing according to yield management principles, and buyers who want stability and predictability of prices and delivery. There is a movement of countervailing forces as the buyers and sellers each seek to obtain market power in their relationships. Bell and Kaven even argue that:

> "Yield management is not based upon market power equilibrium, but on an inequality between large sellers and small or independent buyers who can be induced to buy when business is soft or forced to buy a higher price when business is good. Yield management application is only really useful against the price powerless" [Bell and Kaven 1997:93]

> "The yield management tactic is not conducive to long-term mutual trust between buyers and sellers inasmuch as yield management is dependent upon sellers seeking market power advantage over buyers" [Bell and Kaven 1997:95].

Taking a non-essentialist stance, it can be said that the technical (yield management) is totally intertwined with the social (pricing), and from a critical perspective we can also see here obvious power relations. Some essentialist writers, for instance Adam and Cahen [1997:20], would analyse the issues raised above by arguing that *Socrate* "is not questioned as a technological device, but on the strategic field (...) and that it is the commercial policy that *Socrate* was carrying out that was the heart of the problem [not *Socrate* itself]". This convenient split between the technical and the social (strategic and commercial here) isolates and exonerates the technology. By contrast, a representative of passengers' associations remarked that "once they had invested in this marvellous new thing, it had to be used. They say it simplifies matters, but as soon as you do things with such a tool, everything becomes more complicated (...) Some things could not be done with *RESA*, it is not neutral" [SIB Interview 18].

The choice of *Socrate* as a strategy for SNCF was the expression, the translation, of a particular reading of the social, economic, technical and political environment, and corresponded to the development of a new actor network as a technico-commercial solution to the problems faced by SNCF. (**Chapter 4** examines that environment in more depth and highlights its complexity and contradictions). Top executives were convinced by the logic of this translation, and yield management came to represent the means of achieving that strategic vision. However, yield management is not just a technical tool and is

associated with social practices such as pricing covered in **Chapter 5**. This subsequent translation and the extension of the actor network became problematic.

CHAPTER 4

SOCRATE AND SNCF STRATEGY IN THE CONTEXT OF TRANSPORT DEREGULATION: A POLITICAL TRANSLATION (FROM MACRO...)

Placing SNCF's decision and the *Socrate* project in the context of market structures and organisational cultures enables us to understand the strategic aims, their associated management techniques and information systems. The European transport market and the evolution of national State policies, the development of fast trains, together with the propagation of the American air transport deregulation model, need to be understood in mode depth before an analysis of the pricing strategy at SNCF (**Chapter 5**) and the problems encountered by *Socrate* and its yield management techniques can be carried out. The economic climate was also put forward as a justification for the *Socrate* project by the Direction Générale at SNCF [LDM Interview 8]; budget constraints were imposed by the government, there were changes in the transport market and competition was growing with air and road. The new apparatus put in place for the management of passenger travel, through the import of yield management techniques previously associated with the US air industry and represented by the choice of the American Airlines *Sabre* software, was intended to make a public sector enterprise respond to a new market situation. The French rail industry structure is evolving from a public monopoly situation and becoming one of increased inter-sectorial competition. The complexity of these changes underlies SNCF's strategic choices and its decision to buy *Sabre*, which was seen as a mechanism through which American Airlines responded to similar market changes [Hopper 1990; Doll 1989] in the US deregulated air industry.

In this chapter, the deregulatory moves within the French Railways monopoly situation are examined in the context of European and US transport deregulation. The dilemma between competition and co-operation is an example of the controversial effects of deregulation. This is explored in the context of intermodal (between different modes of transport such as air, rail and road) competition and intramodal (within one transport sector) competition. The transferability of the deregulation model from the US to Europe, and from air to rail is questioned. This will set the scene for analysing pricing differentiation in the next chapter. It is shown that deregulation leads to new controversial notions of access to transport and pricing, towards which the new information systems are geared. The impact of CRS and GDS on the airline market structures is also examined in order to envisage what market changes they may effect in rail transport. These new information systems may have an impact on infrastructures, transport planning and intermodal competition. Deregulation and computerised reservation systems therefore relate to organisational changes at SNCF, its members and customers and their practices, explored in **Chapters 5** and **6.**

4.1 RAIL TRANSPORT DEREGULATION

The traditional co-operation between European national railway companies for cross-border rail transport is being replaced progressively by European deregulation and competition. The ultra-liberal European directive 91/440 was adopted on 21st June 1991 and published by the EC Official Journal on 29th July 1991. It aims to separate exploitation activities and accounts from infrastructure costs and

management in the name of harmonisation of the conditions of competition between rail, road and air; and to free access to national infrastructures (freedom of transit) to international operators, traditional national operators and private operators.

4.1.1 Transport deregulation in general

Regulation and deregulation must be seen as addressing intermodal competition as well as national, international and global competition. Traditionally, the State intervened in the transport industry, on the grounds of a natural monopoly, large investments and high fixed costs. In return, the State determined prices so as to regulate intermodal competition, particularly road and rail, and to control external costs such as pollution, safety, mobility, space management, regional economic development, etc. The Anglo-American tradition of industrial policy generally consists of governments intervening in markets only when it appears that transport supply *per se* could be improved by such action. By contrast, countries such as France and Germany have tended to "treat transport as an input into a wider social production function involving broader industrial matters, regional policy, social equity, etc. and transport efficiency in its narrower sense may be sacrificed in the process" [Button and Pitfield 1991:7; see also **Section 5.3.2** with reference to pricing **and Section 7.5.2**]. This is sometimes called the Continental approach although this ignores the traditional attitudes of countries such as the Netherlands. And even in the UK there have been marked differences [Button and Pitfield 1991:19] across transport modes (buses/coaches, rail, roads, road freight, cars, scheduled and charter airlines, airports, ports, ferries) and changes in policy across time (public ownership, restricted competition, privatisation, quasi-competition, subsidies).

Regulation can be seen as a way of protecting users from the undesirable effects of free competition. Deregulation, on the other hand, compensates for the effects of State intervention (particularly in order to decrease public funding and control inflation). Undesirable effects of State regulation are often seen as inhibition of progress and technical development, over-capacity, sub-optimal distribution of traffic between different modes and maintenance of unprofitable lines. But it is not clear that transport deregulation totally eliminates the cost of regulation, without lending itself to unintended or undesirable effects [Sanchez 1993].

4.1.2 US air deregulation: pioneers?

Air deregulation in the US went ahead in the late 70s despite these difficulties. Through a more rational management, the expectation was that companies would reduce overcapacity and decrease prices. The results were contradictory. One important effect was that short routes with small profits were abandoned resulting in a higher concentration of operators. It became clear that without government intervention the industry would eventually evolve to exhibit a high degree of market concentration [Williams 1994:49]. Other effects were: air routes were restructured in star-shaped networks with 'hubs' and 'spokes', leading to economies of scope[8]; fare structures became extremely complex, leading to

[8] By redesigning their route systems into hub and spoke configurations, US airlines were able, through the

gigantic reservation information systems; a decrease in prices was not found to be uniform, indeed there was even an increase of prices once the concentration of operators had stabilised. This movement is having implications for non US air companies, particularly European ones, and also modifies the competition situation within European terrestrial transport, which is not the case in the US.

Deregulation has occurred in the US air transport industry for 20 years, and similar changes are taking place in Europe. Deregulation in the US transport sector has given rise to oligopolistic markets composed of private carriers. US air deregulation led carriers to innovate technologically by creating distribution software which synthesises cost and price information in new ways, i.e. yield management.

4.1.3 Tensions in European deregulation: harmonisation or liberalisation?

Transport deregulation in Europe is different from the US in that it has to consider intermodal competition (between rail, road and air) as well as intramodal competition (within a particular sector, e.g. air). One aim of European liberalisation is to harmonise standards (technical, economic, social, financial and fiscal) so that rail and air transport companies can operate freely in any European member State. Since the late 80s the European Union (EU) has introduced measures to abolish market restrictions in the air and rail sectors [Hope 1993]. The first measures taken by the EU have been the clarification of the relationships between national States and transport companies, the emphasis on fast-speed networks [Freeman Allen 1991] and the abolition of public service obligations and compensations. Separating the accountability of infrastructures and exploitation is the logical next step, followed by the co-operation of national companies to exploit international transport and the opening of national routes to competition.

European transport deregulation is also contradictory, as there are tensions between harmonisation and liberalisation. Harmonisation (e.g. signalling, size of tracks) would need to take place prior to any liberalisation. On the other hand, there is the opposite belief that such a harmonisation can result from liberalisation and free markets. Since the late 80s, the latter view has prevailed at the European Community [Hope 1993] and the EC has introduced measures to abolish market restrictions in the air and rail sectors, without having initiated harmonisation first.

This is a controversial issue; for example, the Social and Economic Council [Comité Economique et Social des Communautés Européennes 1987] has argued, without much apparent effect, that before any liberalisation, a harmonisation of the rules of intermodal competition should be carried out. Of particular importance is the harmonisation of the financing of infrastructures, of the pricing of these infrastructures, as well as social, fiscal and technical harmonisation [Bénard 1993].

The Directive 91-440 on the liberalisation of rail transport (adopted in France in 1995) aims to revitalise rail transport through market forces; but it also believes in supporting trains since they pollute less, and envisages that increased intra-European exchanges through high-speed train networks will reduce road traffic congestion. One can discern here some tension, usually, and perhaps simplistically, taken to be a clash of views between Karel Van Miert, the EU competition commissioner who supports free market economics, and Neil Kinnock, the EU transport commissioner for several years, who wanted

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better utilisation of their aircraft and flight crews, to derive economies of density. Economies of scope were obtained through the carriage of passengers with different origins or destinations on the same aircraft,

to promote rail transport. Applying the free market model to rail transport is presumed to enable economies of scope in the design, production and operation of infrastructures, as in the US air industry. However, consequences such as the disappearance of short routes are very controversial in smaller and more densely populated countries. Other long-term consequences are the splitting of national companies into separate business units dealing with international, intercity, regional, urban and suburban transport, and the merging and/or disappearance of national companies. In fact European transport liberalisation measures have led to "uneven multimodal initiatives which continue to encourage inefficiency and waste" and a multitude of policy prescriptions which "many regard as inherently inconsistent or even contradictory" [Ross 1998:xii]. Various authors [Ross 1998; Lefèvre 1990] refer to a 'transport crisis'. Differences between the US and Europe are examined in the next section, in particular: the co-existence in Europe of intramodal and intermodal competition, European transport liberalisation measures, and the emphasis on high-speed trans-European networks.

4.2 US AIR DEREGULATION AND EUROPEAN RAIL DEREGULATION

As explored in **Chapter 3**, in choosing the computerised reservation system *Sabre*, SNCF was hoping to benefit from the same strategic advantage this technology brought to American Airlines during the deregulation of US air transport in the 80s. However, the adoption of a new transport distribution model based on the deregulated US air industry proved to be controversial, leading to implementation problems. *Socrate* represents a new form of management control, particularly in its use of yield management techniques, and has to be situated within the broader context of US and European deregulation. The new distribution system at SNCF must be seen as intervening in the competition between European rail, air and road travel, unlike the US where *Sabre* operated in the air sector only and brought considerable competitive advantage to American Airlines [Hopper 1990]. The changes effected through *Socrate* in the organisation of passenger travel at SNCF must be examined in the lights of the deregulatory changes within the European transport industry [Mietus Jr 1989; Bavoux and Charrier 1994] compared to those in the US air industry [Petzinger 1995].

4.2.1 Competition, co-operation and complementarity: comparing the US and Europe

Intermodal competition

Unlike the US, competition in European transport has taken place on an intermodal basis for many years (air/road/rail), as well as on an intramodal basis in the air sector: between European airlines primarily for cross-European flights and expanding into domestic flights, and with European and non-European air companies for international flights. With deregulation, competition will eventually take place on an intramodal basis in the European rail sector too across and within European countries. As in the air industry, the intention is to obtain economies of scope in the design, production and operation of infrastructures. At the same time, technical co-operation is essential in rail (as opposed to air) and requires complex collaborations between states, networks, operators and industrial partners. Tunnel

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resulting in 5-10% higher load factors on routes radiating from a hub [Williams 1994:18].

heights, track standards, electrification, signalling and passenger safety need to be harmonised. In fact, signalling and telecommunication systems have always been designed on a national basis, as much as the choice of rolling stock, electrification systems, operational methods, traffic command and control, rail equipment, etc. for a variety of reasons including protectionism. A particularly extreme example is that of Spain which chose a distance between tracks different from all other European standards deliberately [Descoutures 1992:136].

In terms of intermodal competition, European deregulation of air and coach/truck transport has over the last ten years exacerbated the competition for rail transport companies. Intermodal competition has many adepts as it relates to the proposition that the main form of market failure in utilities is monopoly [Bishop *et al* 1995]. However other authors argue that intermodal competition is to the detriment of rail [Troin 1995:11]. SNCF has responded to this competitive pressure by investing heavily in TGVs for passenger transport, particularly on certain routes such as 500-700 kms segments which require 3 hours by high-speed train and by plane. This strategy, partly explained by the robust engineering culture and expertise at SNCF, has been regarded as a success and the French nation sees the TGVs as a major technological and economic achievement.

Intramodal competition

Intramodal competition is a different issue. There is a long history of co-operation between national rail companies for trans-border traffic based on national geographic boundaries, with codes of conduct in a kind of 'cartel' culture between operators preoccupied with infrastructures primarily [LDM Interview 8]. Some trans-Euro-express trains function throughout Europe (private trains such as the Venice-London Orient-Express) where national companies provide a locomotive and a driver, and charge the operator. However, if this type of traffic is to increase dramatically, the problems multiply: again harmonisation, training, safety and economic co-operation, as well as the saturation of networks (too many operators on too few lines). Bearing in mind the EC objective of a high-speed train network, issues of infrastructure investments and pricing have to be considered. The EC is considering funding only a few high-speed priority projects [Blum *et al* 1992] the rest being funded by the member States or the regions, which may not be able to.

The political conflicts of European, national and regional development

Regions are also caught in a vicious circle. Their financial involvement is based on the hope of having a fast-train such as the TGV in their area; however, a TGV line is more profitable the fewer stops there are, very much like a plane route. Related to this issue, there is very lively debate[9] on what the French refer to as 'territory management' or the concerted planning of national and regional economic development (to which a government department, the Délégation à l'Aménagement du Territoire et à l'Action Régionale, is dedicated). The growth of the TGV network, contrary to expectations, is seen as

[9] It was one of the arguments brought to the fore by the SNCF employees during the massive French strikes in December 1995 to protect public services [Duval-Smith 1995].

creating a 'discontinuous' space and reinforcing rural "désertification" [Offner 1993]. Having already built the most profitable lines (particularly Paris-Lyon opened in 1981 which has been the most profitable TGV line for years), SNCF faced enormous further debts if it invested in new TGV lines without State or European aid. Consequently, there has been a series of decisions and counter-decisions concerning the construction of the TGV Est route over the last few years [Troin 1995]. The project was dropped [Le Monde Editorial, 1996; Andréani, 1996] in 1996, then relaunched in 1998 [Bélleret 1998], starting with Mulhouse-Besançon, after complex negotiations involving local, regional, national and European political actors. There are some unusual arrangements, such as the Eurotunnel financing group or the TGV Atlantique (Paris-Bordeaux) where the trains are run by a consortium of banks which rents them from SNCF. The choice of the TGV Méditerranée route has also been marred with controversy. However, private interests may worsen the "désertification" effects mentioned above. This can be seen as a direct result of increased intermodal competition.

National intermodal competition between air and rail can be seen to also create 'internal' intramodal competition within SNCF across its different products. This prejudices the planning of an integrated transport policy within and across modes, which are now seen as competing rather than complementary. TGVs and 'classical' intercity lines now compete within the same transport company. Further intramodal competition between rail companies seems to be favoured by the EU, to the detriment of co-operation between rail companies. The separation of infrastructure and operations is another step towards intramodal competition. However, co-operation and coordination are still necessary. The new industrial model implies competition rather than co-operation and complementarity and IT is expected to play a crucial role to support this new competitive environment [Heddebaut and Joignaux 1995:39].

4.2.2 A controversial translation: cultural, economic and social differences between the US and Europe, and between air and rail

Table 4.1 Comparison of US and European air and rail transport

	US	Europe
Transport Market	- Long distances - Unique liberalisation regime	- Short/medium distances - Densely populated - National liberalisation regimes
Air	- Intramodal competition - Concentration of operators - Hubs and spokes	- Intramodal pan-European competition - Many national operators - Intermodal national competition between air, rail and road
Rail	- Little rail passenger transport, mostly freight	- High-speed and traditional trains - Many stops, dense networks

	- Very little intermodal air/rail competition	- Costly infrastructures - National intra and intermodal competition - Little pan-European competition

Intermodal and intramodal competition in European transport originates in the deregulation movement in the US air market. However, the European aviation market differs in several major respects from the US domestic market, indicating that liberalisation in Europe may not produce the same results to that experienced in the US. The transferability of the US air transport deregulation experience to European air transport has been questioned. According to Hanlon [1996:37] "proponents of market contestability consider the airline industry as almost a textbook example of a contestable market". A contestable market is one in which there is plenty of potential competition, with a lot of potential new entrants. The US air deregulation experience, however, has cast a lot of doubt on this proposition [Hanlon 1996:37]. This should challenge the case for rail deregulation in Europe even further. Button and Swann [1991:104-105] have delineated some of the differences which present obstacles to the translation of the deregulation model from US air to European air. Under each following heading, the argument is extended below to the transferability and translation of deregulation from air to rail [Mitev 1997]. They are briefly summarised in **Table 4.1.**

Different national markets

The deregulated US aviation market is domestic, and so are the competing US air companies. European air transport is mainly cross-border, and rail transport is mainly national. Air and even more so rail companies have strong national identities. There is a large variety of economic, social and political objectives which underline different nations' aviation and rail policies.

Geography, demographics and historical infrastructures have to be taken into account. The physical size of the European air market is significantly smaller than the domestic US air market. The average route length in Europe is some 750 kilometres, whereas in the US it is 1300 kilometres [Hanlon 1996:19]. Airline operating costs increase enormously as flight lengths shorten (many of the costs are incurred in take off, landing, climb and descent). Shorter distances also mean that road and rail can be much closer substitutes. If routes are short there is much less scope for hubbing because any time spent changing plane (or train) during a trip takes up a relatively long time. Hubbing may be an option for rail in some countries but not others. Different countries also have different geographic network configurations e.g. a star shaped network in France vs. a federal structure in Germany. The existing star-shaped centralised rail network in France with Paris at its centre, and the resulting emphasis on a few TGV fast routes, seems to have predisposed SNCF towards an air-related model of transport.

A major difference between air and rail that affects transport policies is the enormous cost of rail infrastructures, particularly for high-speed trains such as the TGV. There is growing emphasis in Europe on high-speed Trans-European Networks (TENs). High-speed trains cannot be boarded without a reservation, like planes and unlike the 'classical' intercity trains, and planes compete with fast trains on certain routes, in particular 500-700kms segments. Europe is much more densely populated, routes are

shorter, and there are many more stops on a train line than on an air route, which makes railways more complex operationally.

European transport policies: different liberalisation regimes

The rate of adoption of liberalisation measures varies from country to country and over time; for instance, a president of Deutsche Bähn, Heinz Durr [in Jakubyszyn 1996a] decided not to separate infrastructures from operations, unlike SNCF and British Rail. On the other hand, he was planning to open DB's rail infrastructure and domestic market to competition from other operators[10]. His successor, Johannes Ludewig [in Jakubyszyn 1997a], by contrast, has now stated that the real competitors to rail are road and air, and has initiated co-operation between SNCF and DB on the Paris-Metz-Frankfurt route TEN.

Sweden was the first European country to vertically separate infrastructure from operations in accounting terms in 1988 [Alexandersson and Hultén 1999]. The first European rail company to fully adopt the European directive 91/440 was British Rail which split into Railtrack and a number of train operators in 1994. That year also saw the merger of Deutsche Bundesbähn (DB) and Deutsche Reichsbähn (DR) into Deutsche Eisen Bähn AG (DB AG), a private consortium owned by the German State, due to split into three companies running freight, passenger traffic and infrastructures separately, with regional transport left to the Landers. In Italy, Ferrovie dello Stato (FS) was dismantled into a private company (FS spa) that holds specialised subsidiaries (with various private interests) and has a majority (60%) concern in Treno Alta Velocita (TAV) which concentrates on building and running a new high-speed train (HST) network.

There is substantial inter-modal competition in Europe over medium distances between road/air/rail, especially between high-speed trains and plane services. The US rail system is essentially a freight system, with the exception of some passenger services such as the North-East Washington DC-Boston corridor, where some intermodal competition with air takes place. The US passenger transport market is well segmented into cheap long-distance coach services, more expensive long-distance planes, and roads for medium-distance travelling. In Europe, rail services can compete with air on the basis of door-to-door journey time for trips up to 500 kilometres. High quality roads in Europe, also mean that road transport competes rather more effectively on some corridors with rail than would be the case in the US.

European policy-makers already have the US experience to guide them and they are, therefore, likely to react against some of the perceived difficulties, for example conglomerates and company mergers or alternatives such as flight code sharing and domination of CRS systems. There are many industrial, institutional and social reasons which are likely to preclude the full adoption of US-style deregulation. **Table 4.2** summarises the contextual factors which make the transfer of the US air deregulation model to European rail transport problematic.

[10] He provoked some anxiety in France when he declared that he wanted the German high-speed train, the ICE, to reach Paris.

Table 4.2 Summary of deregulation contextual factors

Market	- Rail operations more complex than air
Economic	- Intra and intermodal competition in Europe - Cost of high speed trains infrastructure
Political	- Different national liberalisation regimes - National and regional development issues - Pollution, social costs, complementarity/multimodality
Cultural	- National identity and cohesion - Public access to transport - Organisational changes and public service mission
Technology	- Yield management - Impact of CRS and GDS on market structure

4.3 SNCF, THE FRENCH GOVERNMENT AND EUROPEAN TRANSPORT

SNCF has the monopoly of rail transport in France, and is in competition with road and air transport at mainly national level. Until the early 80s, SNCF was a public monopoly and had to fulfill performance criteria and procedures set by the French government. The Ministry of Transport set limitations in terms of pricing and in return protected its monopoly. This was also expressed as the notion of equality of access to transport and the collective national good (whereby the pricing is directly proportional to the distance travelled, or the principle of "péréquation géographique" or geographic cross subsidising). At the same time, financial deficit was common and, more often than not, settled by the government.

SNCF and the French government have been, and still are, hostile to the liberalisation of European rail transport [Jakubyszyn 1996b] on the grounds that the national rail network would be weakened if split; and that deregulation ignores the practical realities and the cultural and public service differences between countries. Various French governments (under Juppé and Jospin) have appeared publicly to protect France from the ultraliberal EU agenda. Louis Gallois, current president of SNCF, has expressed his desire to delay the EU plans to deregulate passenger and freight rail traffic. He opposes any "unreasonable liberalisation which would destabilise SNCF" [Tillier 1996]. The dominant view expressed by the SNCF top managers interviewed is that a neo-liberal EU runs the risk of 'putting its foot into an anthill' [LDM Interview 8] and thus disturb the situation with unpredictable effects; and that even though co-operation (as opposed to competition) can be criticised, it has its advantages. Another interviewee [GV Interview 14] for instance claimed that the English have been too extreme and have gone too far with negative effects for rail transport.

This specifically French attitude towards European liberalisation can also be commented upon culturally and historically. Most SNCF top managers interviewed [e.g. JMM, GC, LDM, JPD, CQ, GV] brought the subject up with little probing and explained it in similar terms. SNCF, but also other French public and private long-established institutions, have had a very strong 'French State' culture for several centuries. It is strongly associated with the influence of the "grandes écoles", the French elitist colleges where the very best civil servants, engineers and executives are educated (e.g. Ecole Nationale d'Administration, Ecole Nationale des Ponts et Chaussées, Ecole Polytechnique, Ecole des Hautes Etudes Commerciales, Ecole des Mines, Ecole des Sciences Politiques). They often obtain positions in important State institutions such as the Ministère des Finances or the Cour des Comptes, as well as companies such as Electricité de France, Elf Aquitaine or Rhône Poulenc and many SNCF top managers come from these elite colleges, including several of my interviewees. Their ethos has been for a very long time (going back to Napoleon and Saint Simon [Guigou 1997][11]) a belief in the "grandeur" and pride of their country, which has resulted in many major achievements in terms of national infrastructures, social, cultural and technical progress [Suleimann and Courty 1997]. This French 'model' has flaws (it is not very democratic) but it has strengths too; it pervades the perspectives of the elite, and it is very unlike other European models. Interviewees were of the opinion that this model should not be disposed of too quickly and in a sense this State culture ("culture étatique") feels aggressed by European liberalisation principles [LDM Interview 8]. This interviewee commented that such considerations might initially seem quite remote from the *Socrate* project but that they were in fact related to it.

Nevertheless, since the early 80s, SNCF has had to respond to competition and increase its profitability. It has become more accountable and, in its 1990-94 contract with the French State, had to reorganise its activities into purchaser/supplier relationships. More recently, the government has decided to divide infrastructures and trains operations into two companies on 1st January 1997 [Jakubyszyn 1996c, 1996d]. This division fits into the logic of liberalisation. Separating operations from infrastructure aims to overcome the issue of transport firms as multiple products and joint costs enterprises - though this forces a stance on the nature of joint costs, and the basis for this is contestable and contested (for instance in the UK post-privatisation between Railtrack and the freight company EWS). Nevertheless, using yield management techniques contributes to this new logic of accounting for the profitability of each route, and thereby transforming them into individual, potentially competitive, products. Yet in the face of current opposition in many countries, it remains unclear whether the EC will achieve its aim of opening all European freight, international and domestic passenger rail transport to competition. SNCF, for instance, has expressed strong opposition to the opening of domestic routes to competing operators (Gallois, SNCF president, in Jakubyszyn and le Boucher [1996]).

4.3.1 French rail and SNCF

The French rail situation has been highly uncertain and fluctuating over the last decades and can be characterised by: large decreases in passenger traffic in the 90s, with slow re-growth in the late 90s, many planning changes to the building of new infrastructures, financing difficulties and series of contradictory policies. This has led to a constant flow of government and research reports [e.g. Bourdillon

[11] Jean-Louis Guigou is a delegate at the "Délégation à l'Aménagement et à l'Action Régionale".

1991; Descoutures 1992; Commissariat Général au Plan 1992; Haenel 1994 see also Gayda 1993; Merlin 1994; Cuq and Bussereau 1994; Perrod 1998] reflecting the fact that the challenges and controversies are considerable. On the other hand, a strong 'faith' in rail has led to impressive achievements: several highly performant TGV lines, including the Channel tunnel rail link, comprehensive connections between South East, North and South West TGV trunks, many new TGV stations (Lille, Marne-la-Vallée, Paris-Roissy, Lyon-Satolas) and new developments (TGV East, South, towards Italy, growth of multimodal and, recently, freight transport). This expansion must be seen in the context of a decline in European rail: a 4% decrease of the network capacity of OECD countries over the period 1970-1985 [Ross 1998:8]; passenger transport use of rail decreased from 10% in 1970 to 6% in 1990, compared to an increase in auto traffic of at least 75% between 1970 and 1987 [Ross 1998:8]. Moreover, total capital invested in transport infrastructure declined some 22% in real terms from the mid-70s to the mid-80s, with the overall percentage from national budgets declining from 1.5% to around 1% [Ross 1998:22].

SNCF was nationalised in 1937 and its status has progressively evolved from being a 'mixed economy' company in 1938, a private limited company with shareholders (51% public shares and 49% of shares belonging to the original private companies), to an industrial and commercial public enterprise (EPIC), a semi-commercial status under State financial control in 1983. Covering 33,000 kms, the French rail network is the second largest in Europe after Germany. 14,000 kms are electrified, the rest uses diesel traction. Despite heavy cuts, it still has large assets amongst which 5,500 freight and passenger stations and 114,000 hectares of land. In 1994 it employed 182,700 staff, reduced from 500,000 in 1939 and 252,000 in 1980. Productivity has increased from 201.8 units (kms per hour worked) in 1972 to 348.4 in 1990. SNCF had cleared its financial deficit in 1989, 1990 and 1991 but it worsened in 1992 (3 billion francs) and reached 8 billion in 1994 when traffic decreased and investments were high - 16.7 billion francs in 1994 for new TGV infrastructures, new rolling stock, and a new urban underground rail link in Paris (EOLE). Rail is claimed to be environmentally efficient in terms of space and energy, and SNCF energy consumption represents 1% of French energy needs compared to 78% for road transport [Troin 1995:15].

The passenger network decreased from 42,000 kms in 1950 to 34,000 kms in 1982, creating empty areas in between the main axes: Brittany, Poitou-Vendée between Nantes and Poitiers, the Garonne area between Bordeaux and Toulouse, the Massif Central between Clermont-Ferrand and Toulouse, the Champagne region North of Dijon, the Southern Alps between Grenoble and Nice [see **Figure 4.1**]. Reduced regional traffic affected national traffic adversely. Many transversal inter-regional connections disappeared reinforcing the main axes and the star shape of the network concentrated around Paris primarily.

The 1983 "Loi d'Orientation des Transports Intérieurs" (LOTI) determines the constraints under which SNCF must operate, i.e. management rules for its public and private activities, service requirements for regional and urban transport and its contractual and financial relationships with the State [Descoutures 1992:176]. The latter include: pension contributions to compensate for large SNCF staff reductions and the subsequent imbalance in active and retired staff numbers; State contribution to infrastructure costs; contribution to social fare discounts (e.g. old age pensioners, soldiers, children, holiday discount entitlements); contribution to suburban and regional transport costs. This is instituted

through five-year contracts between the State and SNCF called "Contrats de Plan" which specify SNCF business objectives, public service obligations and the State financial contributions.

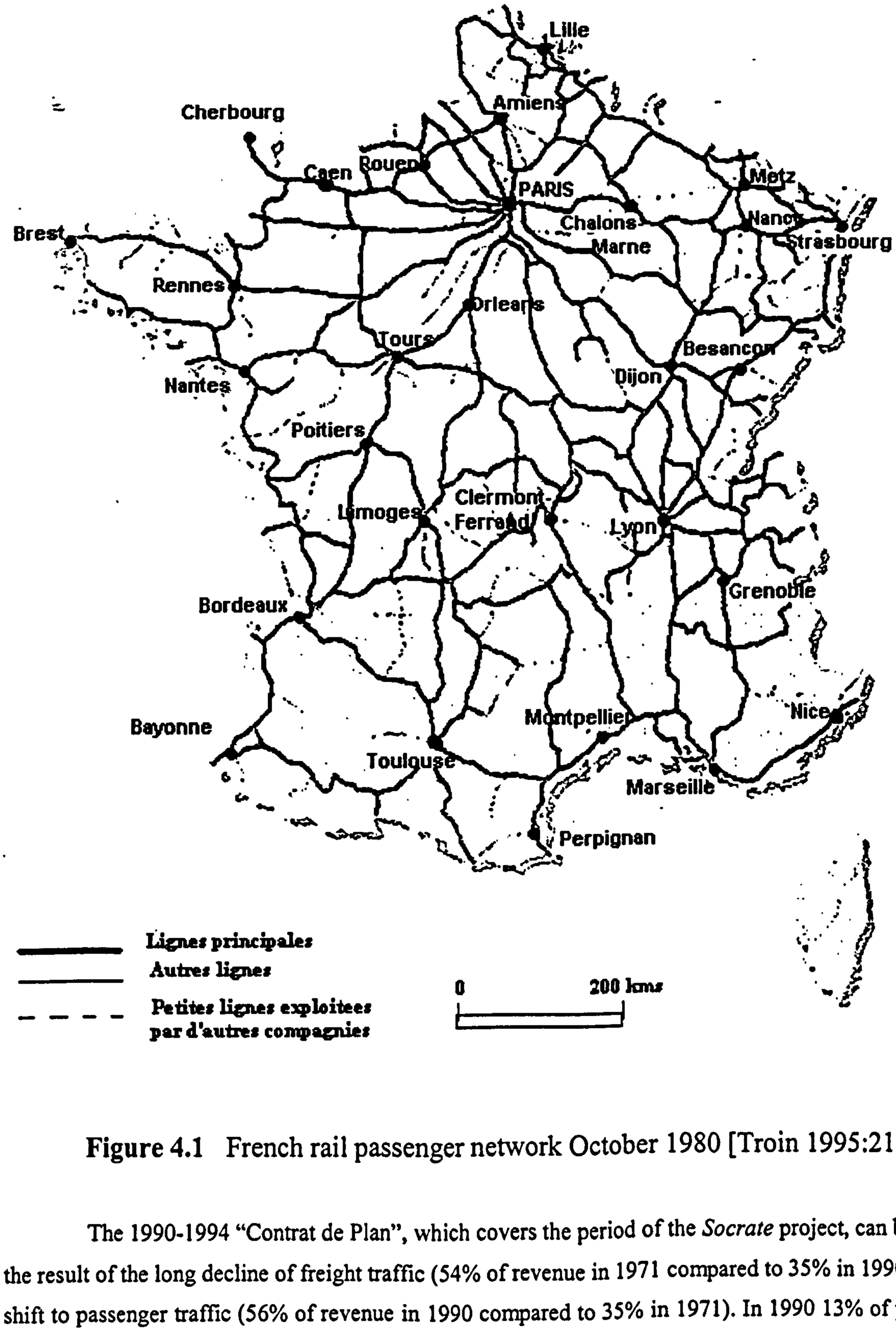

Figure 4.1 French rail passenger network October 1980 [Troin 1995:21]

The 1990-1994 "Contrat de Plan", which covers the period of the *Socrate* project, can be seen as the result of the long decline of freight traffic (54% of revenue in 1971 compared to 35% in 1990) and the shift to passenger traffic (56% of revenue in 1990 compared to 35% in 1971). In 1990 13% of passenger traffic was on the TGV, 27% on intercity trains, 10% on Paris suburban trains and 5% regional transport [Descoutures 1992:177]. An important influence on the 90-94 "Contrat de Plan" was the geographic evolution mentioned above, i.e. the concentration of activities on the main axes and major urban centres.

The 1990-94 "Contrat de Plan" was primarily concerned with developing fast intercity services (the TGV Nord, improved infrastructures for Lyon North-South rail stations, connections between TGV and other transport modes in the Paris region) and consultation with regional partners regarding public service obligations for local and regional transport.

Another important contextual factor in establishing priorities for 1990-94 must have been the success of the TGV in competing with air on the Paris-Lyon segment: after the TGV line was opened in 1981, the air traffic between Paris and Lyon nearly halved during the 1981-1989 period [Bourdillon 1991:99]. In fact, it slowed down air traffic growth further South (Paris-Nice, Paris-Marseille) significantly too. In his report to the French government, Bourdillon [1991:99-100] however moderated these TGV effects by arguing that:

(a) it only applies to a maximum of 700-800 kms travelled (or 2-3 hrs by TGV), distance beyond which the plane is generally preferred[12];
(b) air/rail competition is influenced by ease of access to stations and airports and by the initial and final locations of the traveller in relation to these;
(c) it was very difficult (in 1991) to estimate the effect of future TGV infrastructures on the overall French air traffic which was likely to grow regardless.

Bourdillon [p.101] also advocates that air and rail policies should not be carried out independently, even though he believes that intermodal competition is a "healthy" practice. In addition to national factors, there was also a growing realisation of a changing European context.

4.3.2 SNCF and European transport infrastructures

Following the Single European Act (1987) the Single Market took effect on 1st January 1993 and strongly relates to transport and ensuing expectations of increased traffic: free movement of goods and people within the EU and development of the open market; opening up of Eastern Europe; growth of long distance professional mobility; growth of leisure time and tourism; more sophisticated tourism requiring better client/operator relationships; demand for speed, comfort and quality [Descoutures 1992:185-86]. Additionally, the EU also had (and still has) a "schéma directeur européen" to plan the co-ordination of high speed transport links in Europe which concentrates on 'missing links'; these are selected weak connections necessitating investments to facilitate cross-border movements. Due to its central geographic position in Europe, French links are important and competitively significant [Martinand 1997][13]; European priorities have included French multimodal platforms for national and European passenger traffic – e.g. TGV, air, RER (Paris urban/suburban express train) and motorway connections in Roissy (Paris Charles de Gaulle airport) in order to support French airports, multimodality and air competitiveness [Descoutures 1992:192,195].

The EC instigated a far-reaching Action Programme in 1988 in the sphere of transport, including intercity links and efforts to integrate the European periphery. As a result, the EU has contributed towards

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[12] Depending on fare structures too, as well as overall economic stability.
[13] Claude Martinand is the president of Réseau Ferré de France.

costs of infrastructures of 'European interest'; however these amounts, for instance 130 million ECUs in 1988/89, are usually quite modest as they represent a maximum of 25% of total costs [Descoutures 1995:95]. In 1991 out of 148 million ECUs, 30 were towards the cost of German reunification, and the rest was dedicated to seven (scaled down from the initial ambitious Action Programme) 'grand' projects [Ross 1998:53] below, also illustrated in **Figure 4.2**:

- The high-speed rail link PBKAL;
- The HST Lisbon-Seville-Madrid-Barcelona-Lyon;
- Modernisation of the Alpine transit axis;
- Improvement of the European air traffic control system;
- Modernisation of the British road axis towards Ireland;
- Completion of the Scanlink;
- Reinforcement of land links in Greece.

There are obvious clashes of interest between Northern and 'peripheral' countries such as Greece in the allocation of infrastructures funding, as well as conflicting priorities between rail and road. The European Investment Bank also lends funds for financing infrastructures; for instance over 1986-1990 SNCF borrowed 739 million francs for the Eurotunnel, 1.2 billion francs for the TGV Nord, and 547 million francs for the TGV Atlantique, a total of 2.48 billion francs; the French government on the other hand borrowed 1600 billion francs for its motorway construction programme [Descoutures 1992:96]. To put rail infrastructure costs into context, the following figures compare the percentages of rail, road and air infrastructures investments (out of total transport infrastructures investments e.g. ports, canals etc.) between 1970 and 1990 in France [Descoutures 1992:89] and show that road infrastructures costs are the largest by a long way.

	1970	1980	1990
Road	38.8%	49	48.4
Rail	16.7	15.8	14.9
Air	6.2	3.3	3.1

> "Whereas rail suppliers have carried the bulk of their own costs (a major reason for the heavy debt load of Europe's national rail systems), road use carries significant non-internalised social and economic costs (pollution, time lost, energy consumption) borne by society at large" [Ross 1998:31]

Financing and environmental concerns have been voiced for instance by Green parties at the European Parliament for some time, highlighting the political nature of European transport. Politics have an impact on transport priorities and policy-making and vice versa [Ross 1998:26]. National transport planning has a strong social distributional function and European transport policy-making adds several layers of complexity to the politics of transport as illustrated in **Table 4.3** below. For instance, transport subsidies may relate to member States national debts or to belonging to the Euro-zone and are affected by EU voting and vetoes [Ross 1998:24]. Non-economic issues have played a secondary role to the internal

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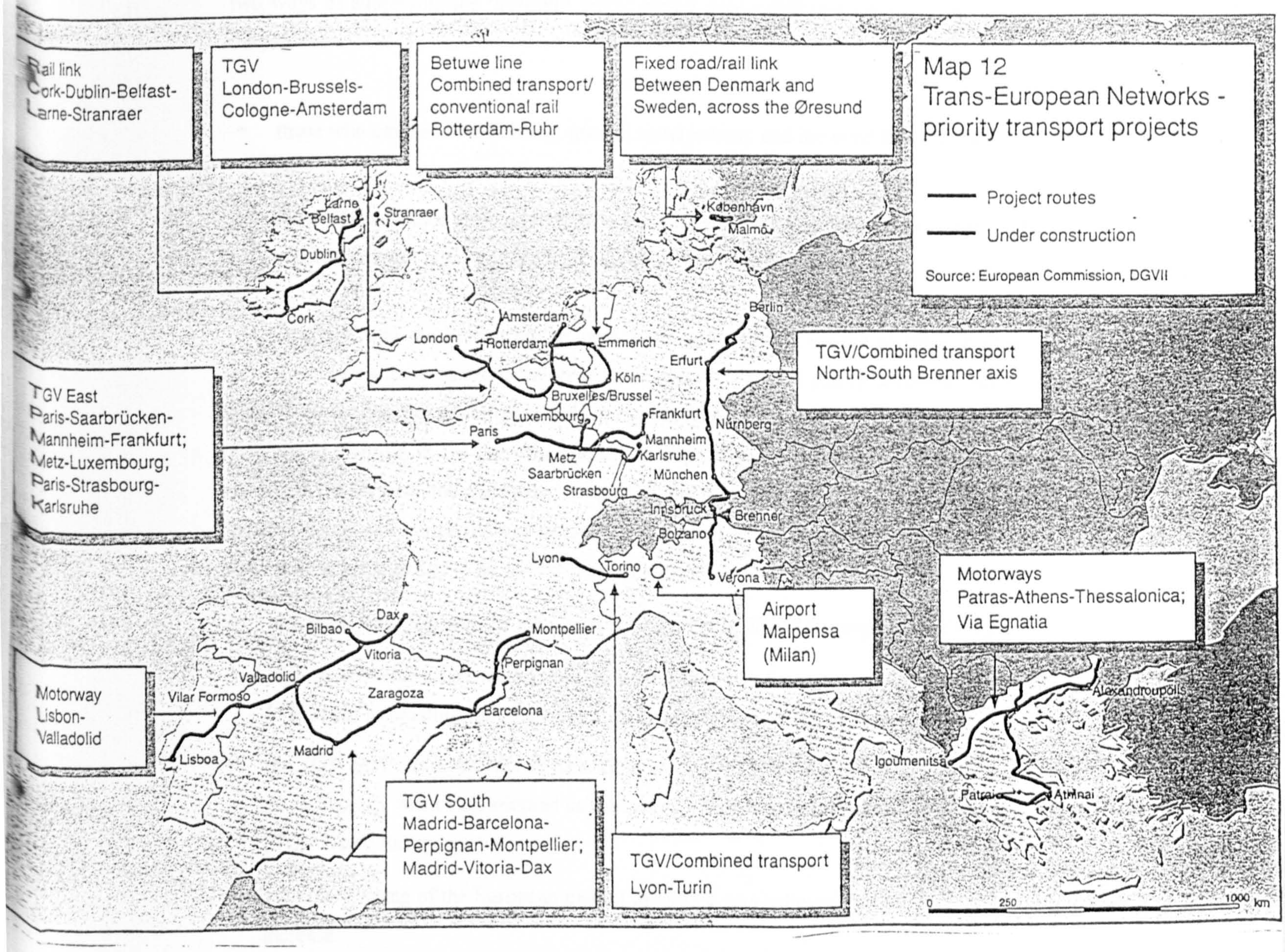

Figure 4.2 Trans-European Networks [European Commission 1994:58]

market project's rationalisation, cost-saving and competitiveness objectives, even under a supposedly left-leaning European Commission under the Socialist Jacques Delors, and despite the advocacy of the Social Charter in the late 80s. "Some States, notably Britain, managed entirely to remove transport elements from social policy in their European calculations" [Ross 1998:27]. According to Ross [1998:21] there are two ways of addressing the 'transport crisis' which mirror different priorities and perceived urgency of the problems:

- those who emphasise efficiency, growth management, and the need for each mode to reflect its true costs;
- those who advocate more rapid reform aimed at addressing social and environmental concerns in accordance with notions of redistribution and sustainability.

SNCF and the French government were, and still are, caught in these dynamics and the next section examines more recent developments in French transport policy decisions, some of them turning away from the *Socrate* experiment and its implications. **Section 4.3.6** in particular situates passengers' reactions to *Socrate* in the political context of French rail, itself part of European tensions. Having examined the French and European context of the late 80s-early 90s, time period during which the *Socrate* project was conceived and initiated, it is clear that SNCF strategy and its 1990-1994 "Contrat de Plan" responded logically to an environment in which:

- passenger transport was the main source of income at SNCF (as opposed to freight);
- high speed transport networks were the main priority in Europe and France is geographically central in Europe; its existing star-shaped network also favoured a HST solution;
- the TGV Est Paris-Lyon was an incredible success, had ensured rail competitiveness against air and its technology was being adopted as the basis for the Northern European cross-border network (TGV Nord, Eurotunnel);
- with the opening of the European market in 1993 it was believed that mobility and demand would increase.

Table 4.3 European transport politics: eleven dimensions [Ross 1998:28]

International dimension	- Inter-regional conflict (US-Europe-Japan/East Asia) - European intergovernmental conflict, including: Large vs small States; producer vs non-producer States; central vs peripheral States; EU States vs non-member States
European Union dimension	- Intergovernmental vs supranational interests (European Council vs European Commission, Parliament, Court)

	- Parliamentary vs collective/consensual interests (European Parliament vs European Commission) - Intra-Commission rivalries, including: - Between the Directorates-General (Transport, Energy, etc.); - Within DG VII (Transport) over modal priorities
Intra-state dimension	- Government vs opposition priorities - Intra-coalition pressures (both across and within parties) - Inter-departmental rivalries (e.g. Transport and Treasury) - Local and regional vs national priorities
Modal dimension	- Intermodal rivalries (rail vs road) - Intramodal rivalries (large vs small carriers; State vs private operators)

4.3.3 SNCF: recent developments post *Socrate*

Continuing public deficits at SNCF over the last ten years or more [Lefèvre 1990] and organisational difficulties [Ribeill 1994] have led to several government reports commissioned to examine the 'catastrophic situation'. The latest, the Martinand report [Malingre 1996] identifies three causes for this situation: decreasing revenues, low productivity and poor returns on investments. The Rapport de la Cour des Comptes [Grosrichard and Jakubyszyn, 1996] criticises SNCF for its inflated traffic estimates on the TGV Nord (Paris-Lille opened in 1993 at the same time of the *Socrate* launch): actual figures were less than half the forecasts. It argues that this serious overestimating was not accidental and was carried out to obtain a return which could justify the investments. Interestingly, the costly TGV building programme (1981-1994) itself is not blamed, but its financing. Several governments are seen as having neglected to bring proper finance structures (at advantageous rates) for this investment. This has led to enormous financial costs calculated to reach a level of 400 billion francs of debt by 2005, corresponding to a third of SNCF revenues. On the other hand, there is recognition that SNCF pushed TGV technology to the detriment of its 'classical' intercity network [Domenach and Teurnier 1999]. Moreover, it is alleged [Jakubyszyn, 1996e] that: GEC-Alsthom (the TGV manufacturer) benefited from these investment decisions; possibly overcharged a captive SNCF buyer; and ignored requests by SNCF (as early as 1971) to look into alternative and cheaper technologies such as tilting fast trains which can run on existing tracks (TGVs need new tracks to reach high speeds).

It is clear that decisions, roles and responsibilities about rail infrastructures and their costs are crucial and there has been an ongoing and very heated debate between the company, the government, the unions and public opinion. Unions reacted to the first Chirac government's (headed by Juppé) plans to decrease public sector budgets with massive strikes and large demonstrations in November-December 1995. The social security cutbacks instituted by the Juppé government were contentious and in turn had transport implications via proposed reforms of SNCF. And SNCF unions rejected the proposed 1995-2000 "Contrat de Plan", arguing that it should include a clear involvement from the government to clear the debt and take responsibility for infrastructure costs, rather than impose job cuts and continuing budget

deficits. The government proposed a SNCF reform in early 1996, which drew to a halt late 1996 after strong opposition [Jakubyszyn, 1996f and 1996g; Anon. 1996]. This reform intended to split infrastructures from operations, which also corresponds to the EU liberalisation logic. This was eventually relaunched in January 1997 after arduous negotiation and bargaining [Jakubyszyn, 1996h and 1997b]. The newly created public infrastructure company, the Réseau Ferré de France (RFF) took on the SNCF debt (125 billion francs) and inherited assets worth 135 billion francs, therefore freeing SNCF from a future of uncertainty and continuously increasing levels of deficit. RFF is in charge of investments and maintenance for the whole rail network, and charges operators (only SNCF so far). A deal was struck to freeze SNCF's fees for two years at 6 billion francs a year until 1999. And RFF received 26 billion francs from the French government in 1997, and received progressively less in 1998 and subsequent years, as it is intended RFF will bring in more revenues from operators. In exchange of resolving the financial debt crisis, the government negotiated cost reductions at SNCF through: reorganisation and productivity improvements, and future increased calculations of payment for using RFF tracks, as well as banking on privatisation benefits [Jakubyszyn, 1997c]. Some problem areas still remain on the future payments SNCF will have to make to use the tracks, and also about who will maintain the tracks, run triage and telecom activities (maintenance is delegated to SNCF by RFF) and for how much. Overall, however, the network remains intact, the national monopoly is preserved and the public service is still in place and through lobbying, SNCF was granted two years' grace. On the other hand, it is now up to RFF to negotiate with the government on matters of infrastructures and regulation of rail and other transport modes, but with little bargaining power (much less than when SNCF was as single company).

4.3.4 A redefinition of public rail transport?

During these recent events, the role and public mission of SNCF have been reconsidered. This also reflects the current climate of questioning the role and performance of the public sector in general[14]. One possible redefinition of SNCF is as a multimodal, intermodal, combined public transport company [Caniaux 1995; Savy 1997; Troin 1995; Malingre 1996; Ross 1998].

The TGV and regional development

An important aspect of the ongoing restructuring of French rail transport is the controversy surrounding the cost of infrastructures and the choice of the TGV technology. As in the air industry, the intention is to obtain economies of scope in the design, production and operation of infrastructures. However, consequences such as the disappearance of short routes, as in the US air market, are very controversial in a smaller and more densely populated country. This is particularly manifest in the decisions surrounding the TGV routes. The TGVs are regarded as a great technological success in France, but financing TGV infrastructures is extremely costly, and opinions are split on its benefits. Regions are also caught in a vicious circle. Their financial involvement is based on the hope of having a fast-train

[14] For instance, the Rapport de la Cour des Comptes (the French national audit office) mentioned above, examined Electricité de France as well as SNCF.

such as the TGV in their area; however, a TGV line is more profitable the fewer stops there are, very much like a plane route. It is related to the issues of regional development outlined earlier.

"Plan Rail"

Perhaps more significantly, there is evidence of a rethinking of a global transport strategy, with a "Plan Rail" which is moving away from the strong emphasis on TGV technology or "Tout TGV" as well as from the "Tout Autoroute". This is some achievement since the French are still extremely proud and fascinated with the TGV, a classical example of techno-nationalism. A more balanced view is present towards road infrastructures [Carroué 1997] and high speed rail; for instance in the consideration of new tilting TGVs which can use existing regional and intercity tracks for extensions West and South-west beyond le Mans, towards Brest and Bordeaux, and in decisions to increase substantially budgets for the classical and regional networks. Other ways of using the TGV, such as less coaches on less busy routes, have also been suggested [Le Monde Editorial 1996]. The associations between rail transport, regional development and national identity are strongly expressed through these transformations, but in new ways: the irrational and technocratic reverence towards the TGV is condemned, and its destructuring effects (pauperisation of the State and regions, desertification) acknowledged. Interestingly, the unions had already argued some of these points for some time: that SNCF should not use the TGV to compete with planes over wealthy business customers on a few profitable segments, but should make trains accessible to all in order to cover for fixed costs (network and rolling stock) and offer a true mass public transport service [Jakubyszcyn 1996g] which can compete with road. Similarly, SNCF has demanded for some time an equalisation of rules between rail and road transport [Bénard 1993].

4.3.5 Liberalisation via the back door?

These changing priorities in French rail transport have been realised to accommodate (or it could be said, to counteract) some of the EU liberalisation objectives, which have now been reached: accounting for infrastructures and operations separately, getting rid of public debt, and recognition by the State of its responsibility in financing infrastructures. Further changes are taking place in a new direction: the opening up of rail 'freeway corridors' to competition from operators, initially in freight transport. French, Luxembourg, Belgian and Italian railways have opened a 'rail freight corridor' across their countries which they are operating together since January 1998 and which is not open to competitors, and which they are planning to extend to Valencia in Spain. Interestingly, this corridor uses a single, centralised reservation bureau. On the other hand, Austrian, German, Dutch, Swiss and Italian railways have also opened in January 1998 a North-South rail freight corridor, which is open to operators and which could be extended to Sweden and Denmark [Jakubyszyn, 1998a]. Further developments may occur on East-West freight trunks. In terms of passenger transport, national monopolies have so far preferred to co-operate on certain segments: the Paris-London *Eurostar* and the Paris-Brussels-Amsterdam *Thalys* with Société Nationale des Chemins de fer Belges; SNCF and Deutsche Bähn on the *TGV/Thalys* Paris-Brussels-Koln-Amsterdam-London (PBKAL) and *ICE* Paris-Metz-Francfort routes, extending eventually to Paris-Strasbourg-Stuttgart [Jakubyszyn, 1998a]. These collaborations tend to contradict Brussels'

liberalism, whilst the EU is hoping that it will be able to impose a real competition if monopolies cannot stop a decline in traffic [Jakubyszyn, 1997c].

However, SNCF deficit was less than 1 billion francs in 1997 and passenger traffic is increasing [Jakubyszyn, 1998b]. One major reason is a pricing revolution, which has accumulated revenues through decreasing prices. This low-price strategy had been abandoned for several years when the primary aim was a search for the highest yield per unit. *Socrate* and the TGV were the means to do this, and this resulted in a decrease of 15% of passenger traffic in three years, from 1994 to 1996 [Jakubyszyn, 1998b]. Now revenues are increasing because of traffic increases (all categories, intercity, TGV and regional) rather than price increases. The pricing tactics have also been simplified (from 4 to 2 levels, therefore making parts of *Socrate* software redundant) and discounts have been introduced for the 25-59 age group, who are usually excluded. These pricing changes follow from the revised conception of rail transport mentioned above, rethought of as a mass public transport system. Whether this is the alternative to rail liberalisation that SNCF is seeking to challenge EU deregulatory moves remains to be seen.

4.3.6 *Socrate*, politics and liberalisation

Socrate was perceived by many, for instance some members of the SNCF "Comité Central d'Entreprise" [Bouché *et al* 1993; JMP Interview 12], union representatives [Interviews 16 and 17] and passenger associations [Interview 18] as an opportunity taken by SNCF management and the government to realise their own political objectives. On the other hand, in his official government report on the *Socrate* 'difficulties', Moissonnier [1993] states that the system, if ambitious, was economically necessary and that the initial difficulties were due to the combination of a series of unfortunate circumstances: an early launch to coincide with the opening of the TGV Nord line; the unfavourable timing of a price increase (2.8% average annual increase which took effect on 1st February 1993); new differentiated pricing methods; the unusually high number of cancellations of skiing holidays (due to lack of snow in March 1993) leading to technical difficulties. The main conclusion of this official report is that the remaining task is to rebuild trust with users and passengers. SNCF is blamed for underestimating the importance and extent of the change imposed upon staff users, passengers and the media, and that measures to prevent or soften these effects were not taken.

This diagnosis of a "conjunction of unfortunate events and circumstances" [Moissonnier 1993:8] enabled the government not to question the system itself or its commercial principles; in fact the official report recommends that SNCF pursues its chosen commercial policy and keeps the *Socrate* system [Moissonnier 1993:19]. The government therefore endorsed SNCF's new commercial policy and emphasis on TGV profitable long distance lines at one end of the spectrum, complemented politically by partnerships with regional authorities for local transport at the other end of the spectrum[15]. However, these are two extremes and in between the two, there is 'transversal' transport on 'secondary' lines which feed into the rest of the network ("maillage" or meshing is a term used in French transport planning); it is

[15] The latter corresponds to the political vision and efforts (initiated by the Mitterand administration progressively put in place during the mid-80s and 90s) to decentralise political power to the French regions.

an important symbol of public transport, but it falls between two stools. One interviewee [LDM Interview 8] added that although *Socrate* concentrated on 'grandes lignes' (long distance) traffic for financial reasons, it was problematic statistically as regional traffic (in passenger numbers but not revenues) is as large as long distance traffic (for instance Ile de France traffic represents 400 million passenger journeys). Union representatives argued further [Interviews 16, 17; CFDT 1994:4] that regional and transversal traffic only survives as a feeder to the TGV network and that the formula "On ne s'arrête pas partout"[16] emulates air transport.

SNCF executives [e.g. LDM Interview 8; GV Interview 14; JMM Interview 1] not only saw *Socrate* as justified and appropriate economically, but also as a 'carrier of change' symbolising a profound and structural mutation. They believed that the strategic vision embodied was the right one; had not been jeopardised by events; and that in fact, and thanks to sophisticated analysis by SNCF business intelligence experts [MJA, BT Interview 5], it was ahead of its time which is what led to 'turbulence' [LDM Interview 8].

In a book entitled "Le train, l'Europe et le service public" published before the events [Fournier 1993], Jacques Fournier, president of SNCF during the *Socrate* project[17], adopts a slightly different perspective. He asserts that the notion of public service and the strength of SNCF can be maintained even in a climate of competition and deregulation, and that this is achieved through modernisation and technical progress. *Socrate* represents one of these initiatives [Fournier 1993:52]. This is translated by *Socrate* key yield management expert [CQ Interview 10] into:

> "Adoption of yield management by the railway industry is a <u>natural</u> progression, essential as competition grows between high-speed railways such as SNCF's TGV network and key air corridors" [Queille and Silva 1994:669, my emphasis added].

Yield management as a technical object is endowed with the capacity to address a particular economic and political objective ('natural' competition with air) but ignores another less vocal activity, intramodal competition across trains. It could be said that the former 'hides' the latter, resulting in an 'unintended effect'. Passenger associations representatives [Interview 18; FNAUT 1994a] argue that: instead of unbridled competition with air, the competitive conditions between transport modes must be re-examined by the State; that 'free' competition does not exist and is affected by fiscal and regulatory measures; and that 'fairer' competition will only occur when all economic and social costs will be harmonised . More specifically, they establish links between price deregulation and the fact that SNCF has absorbed 90% of infrastructure costs (100% of TGV Sud-Est and Nord, 70% of TGV Atlantique) whereas the State and regional authorities heavily subsidise roads, motorways and airports [FNAUT 1994]. Fournier [1993:67] similarly asks that: competitive conditions are harmonised to allow a battle with equal 'weapons' between competitors; that the rules of the game are known and agreed upon by all; and that decisions about 'general interest' are made in the right place, that is at political level (p.43).

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[16] "We do not stop everywhere", attributed to Jean-Marie Metzler, Directeur Commercial Voyageurs and head of the *Socrate* project.

[17] As well as negotiating the 'Contrats de Plan' with SNCF, the government nominates the president and the director general, and Fournier was appointed by the Mitterand socialist administration. His previous appointment was as president of Gaz de France.

There is an obvious conflict between words and deeds on the part of the French Ministry of Transport and the constraints imposed upon SNCF by the government (financial gains and competitive conditions) contradicted its political discourse (public service). *Socrate* was seen by many [Interviews 16, 17, 18] as a way to replenish the coffers of the State. SNCF almost balanced its budget from 1990 to 1992; with economic recession, it had a 3 billion francs deficit in 1992 and 7,8 in 1993. From an economic and financial perspective, not only does the use of yield management techniques and sophisticated information systems fulfill a need to balance the books, it can also become a management tool for maximising profitability in a context of conflictual regional, national and European priorities.

These issues strongly coloured the public reaction to the introduction of *Socrate*. The price differentiation policies enabled by the new system were interpreted as forcing passengers onto the more expensive TGVs to recoup the infrastructure costs and compete with air, and to the detriment of the 'classical' national intercity lines, which the French public and SNCF employees (the "cheminot" culture see Ribeill [1993]), who are very attached to 'their' national rail network, are very keen to protect. This is vividly illustrated in the following cartoon published in *Le Monde* in the context of the failed implementation of *Socrate* in May 1993 and the launching of TGV Nord [**Figure 4.3**]. It mirrors what Troin [1995:113] calls a 'two speed' railway or dichotomy between: (a) on the one hand an efficient, modern and fast TGV network between major and dynamic urban centres and (b) the older network (intercity 'classiques' and regional TER trains) which serve isolated and backwards regions such as Brittany and the Massif Central. See also a CGT union poster published at the same time in **Appendix 5**.

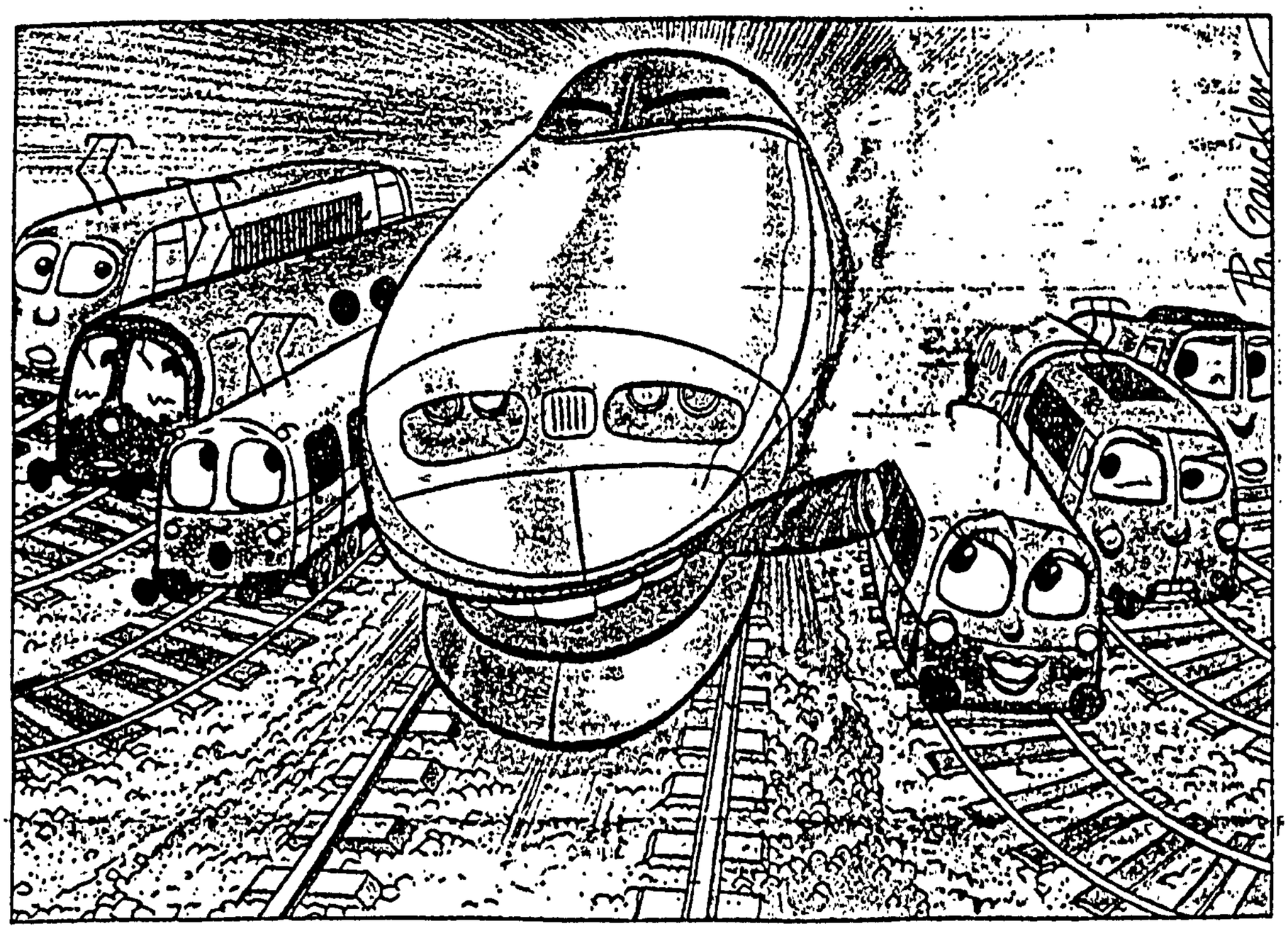

Figure 4.3 The TGV and classical trains [Philippe Gauckler in Faujas 1993c]

4.4 DEREGULATION AND CRS

4.4.1 Computerised reservation systems for air and rail

US concentration

The CRS in the US are owned by the largest airlines (e.g. United Airlines with *Apollo,* Delta Airlines with *Worldspan*) while in Europe they are owned by a number of airlines; for instance *Galileo* is owned by British Airways, KLM, Alitalia and several other airlines, and *Amadeus* is owned by Air France, Lufthansa, Iberia and SAS (see **Table 4.4** for an overview). European air CRS are therefore weaker firms than the largest American firms, which display a more predatory behaviour [e.g. Ott 1994; Anon 1994; Feazel 1986]. In fact, links between US and European air CRS have been under development for several years and in March 1992 the *Apollo* and *Galileo* systems were merged. It is very likely that, taking into account of alliances with Australasian, Canadian and Far Eastern air CRS, the world air CRS industry will eventually consolidate into perhaps three or four global systems [Williams 1994:36; Kärcher 1996; Schulz 1996]. In fact, four airline GDS were shaping up to be the most dominant players by 2000, namely *Amadeus, Galileo, Sabre* and *Worldspan* [Veil *et al* 2000a:25]. It is not clear how this global consolidation of airline GDS will affect rail CRS when considering the differences between the US/European and air/rail operating characteristics explored in this thesis.

The situation in terms of CRS for the rail industry, in which SNCF wanted to play a pioneer role by designing *Socrate*, is far less developed than in the air industry. CRS are usually developed by national railways, and SNCF failed to sell its system to German Railways, which concentrated instead on designing its own, simpler, system. The consortium between SNCF, British Rail and SNCB which runs the Eurostar channel service, does use *Socrate*; however, this particular route, unlike most other rail routes, has very few intermediate stops (i.e. London-Ashford-Calais Frethun-Paris with only some trains stopping in Ashford and Calais Frethun) and is therefore more akin to an air route; electronic check-ins also make it much easier to gather data, control passenger flows, apply yield management techniques and constantly modify pricing tactics, borrowing these techniques from the deregulated air industry.

National rail CRS may be less open to the same degree of potential exploitation (e.g. by accessing rivals' data) than large global air travel CRS. However, SNCF signed an agreement with *Amadeus* (Air France GDS) in November 1995 [Anon 1995]. The purpose was to make French and Eurostar trains reservations possible via the *Amadeus* distribution network in travel agencies and air companies' booking offices. *Socrate* is thus accessible through *Amadeus* point-of-sale computers. The purchase of *Sabre* by SNCF could also be seen as facilitating an inroad into the European market for American Airlines. On the other hand, SNCF recently set up a partnership with United Airlines to provide intermodal air/rail reservations through the Paris-Roissy Charles de Gaulle airport/TGV hub [Veil *et al* 2000b:117]. It is probably too early to assess relations between air and rail GDS and the situation is still fluid and unsettled. The recent growth of Internet-based services such as *Travelocity*, developed by the *Sabre* GDS, also add another layer of complexity and uncertainty.

Overall, judging from the growing global concentration of the world air CRS as indicated above, it is possible that similar moves may take place in the rail CRS market, and that the large US airline CRS may act again as the major predators. It remains to be seen whether the concentration of CRS in the

European rail transport industry will be mirrored, as in the US industry, by a concentration of transport companies themselves. An interesting if unanswerable question is whether the concentration of companies leads to a concentration of CRS or vice versa. Instead of seeking cause and effect relationships one can state that the technology is a condition and a consequence of market changes at the same time, or in other words it both allows and arises from market changes.

Table 4.4 Major computerised reservation systems in airline companies

CRS	Owned by/Used by
APOLLO	UNITED AIRLINES
GALILEO	- *Apollo/Galileo* joint venture in Europe: British Airways, KLM, Swissair, Alitalia. - Other European users include: Austrian Airlines, Aer Lingus, TAP, Olympic, Sabena, British Caledonian. - Joint venture in Australia: Ansett, Australian Airlines.
SABRE	AMERICAN AIRLINES Joint venture in Australia with Qantas.
WORLDSPAN	DELTA, Northwest, TWA and ABACUS (Northwest and TWA had PARS, Delta had DATAS2). Joint venture with Lufthansa and Cathay Pacific.
SYSTEM ONE	CONTINENTAL AIRLINES (inherited System One from acquisition of Eastern Airlines).
AMADEUS	*System One/Amadeus* joint venture with: Air France, Iberia, SAS and Air India. Users include: Linjeflyg, Adria Airways, JAT, Finnair, Air Inter, Braathens, Icelandair, Emirates.

As a comparison, the changes in the European air industry listed below have followed the US model over the last two decades [Ross 1998:23]; it is unclear whether similar changes will occur in the European rail sector.

- partial or wholesale privatisations of State-run operators;
- stringent cost-cutting (pay freezes, early retirements, etc.);
- bankruptcies and receiverships;
- corporate restructurings

- introduction of profit incentives and attention to shareholder value;
- global alliance formations
- the ending of 'full-service' companies with significant outsourcing and franchising.

In fact, when these events took place in the US air industry in the late 70s-early 80s it was often brutal and ruthless. As US business journalist Petzinger Jr. [1995:xx] describes it in his extraordinary, if journalistic and highly personalised epic: "In short order in 1978, for reasons that few fully understood at the time (...) the airlines were loosed into a capitalistic free-for-all. The name given to this change was deregulation". He relates [p.xxi] how Frank Borman, Chief Executive of Eastern Airlines "strapped to his ankle a 9mm handgun as labor strife mounted"; how Richard Ferris of United Airlines "told his workers to do things his way or not at all"; and how Donald Burr of People Express "sought to manipulate his workers with promises of love and trust in the workplace", for instance by involving pilots in the affairs of the company to make them less prone to unionisation [p.116]. The process of elimination was ruthless and many carriers, e.g. Braniff, Pan Am, National Airlines, Western Airlines, Air Florida, AirCal disappeared in hostile takeovers [p.99]. Bob Crandall, CEO of American Airlines, is quoted as calling the game "closest to the game of Christians and lions" [p.124]. In 1981, 13,000 air traffic controllers went on strike. President Reagan fired every last one of them. Reagan's action would utterly transform relations between organised labour and management in the US, and "in no industry would that become more apparent than in aviation" [Petzinger 1995:117].

Interestingly, Petzinger Jr. [1995:50] also recounts how Bob Crandall not only brought a passion for computers when he joined AA, but also a business and marketing experience in the fast moving consumer goods sector, especially pricing expertise, as he had worked at Eastman Kodak and Hallmark Cards before. In the new cut-throat context, airline seats began to be seen as fresh 'perishable' goods valueless upon departure; matching passengers with seats before the latter 'perished' became paramount; and the sale of one last seat could easily decide whether the plane flew the entire distance in the red or the black [p.52]. Nevertheless, minimising costs and maximising revenues in the context of airline marketing is much simpler than in the context of land transport in general and rail in particular. Amalgamating air and rail transport cannot be problem-free, as shown in this chapter. SNCF top managers argue for instance that constant series of mergers, concentrations, demergers, new entrants, alliances, remergers etc. may be fine in the air industry but would bring instability and chaos in the rail sector [LDM Interview 8].

4.4.2 CRS and electronic markets: a model?

Computerised reservation systems cannot be dissociated from the transport deregulation context. The CRS/GDS strategy adopted by SNCF fits in with, and contributes to, deregulation. It optimises the commercial and financial yields, in a context of inter-sectorial competition (air, rail, road), provoked by, and contributing to, European and national deregulation. As an SNCF top manager stated it, GDS force to think beyond the 'hexagon'[18] and across various borders, alliances, travel agents networks, other partners such as American Express etc. on a global scale [LDM Interview 8]. European rail transport already

[18] The map of France is usually sketched as a hexagon and the French refer to an 'hexagonal' mentality to mean small-minded.

competes with air (and road) on a national basis (i.e. national intermodal competition). Increased national and European rail deregulation will create Pan-European rail intramodal competition, as well as 'internal' competition within SNCF across its different products. This prejudices the planning of an integrated transport policy within and across modes, which are now seen as competing rather than complementary. TGVs and 'classical' intercity lines compete within the same transport company. The separation of infrastructure and operations is another step towards increased intramodal and internal competition. However, co-operation and coordination are still necessary: for instance, the allocation of timetables is very critical to network integration [Railway Reform Group 2000]; the priority given to one's trains running on one's own network, vs trains belonging to another company; what happens in the case of limited capacity on a line, maintenance and safety, etc.

High expectations are held for the capacity of information technology and telecommunications to help solve some of these problems (traffic control, signalling, etc) and for the CRS and GDS. The latter techniques are at the heart of the competition/co-operation dilemma. GDS and networks are carriers of economies of scope. After the US experience, European companies are well aware that domination of the GDS is part of winning the battle, in that they can provide a global control of travel, tourism, and distribution (as well as being a source of income themselves). But they also require technical compatibility which may be achieved through co-operation and alliances or, much more likely, mergers and acquisitions, as was the case in the US air sector.

The techniques of yield management and commercial optimisation correspond to a deregulated transport model in which operators compete on yield per unit. Imposing that model to rail has proved problematic. The "Cour des Comptes" report [Grosrichard and Jakubyszyn 1996] found that, although an interesting modernisation exercise, the optimisation part of *Socrate* was introduced without a reliable way of analysing passenger data and of measuring the impact of these commercial changes. It criticised SNCF for 'playing' with its new computer system, for paying too much for it and becoming too dependent on its provider, American Airlines, whilst running the risk of destabilising its clients, and banking on differentiated pricing strategies based on speed (TGV) with disastrous effects.

It would seem that SNCF, having tried to link a complex pricing strategy to high yields on TGV routes particularly, has learned the lessons from the implementation of *Socrate* and has gone back to earlier principles, for the time being. However, the issue of deregulation has not disappeared and is being replaced by the notion that differentiated charging of operators, i.e. higher fees for using busy and modernised tracks, will act as a market regulator. It is not clear how this will affect passenger pricing. Using yield management techniques also supports the new logic of separating infrastructures and operations, which leads to accounting for the profitability of each route, thereby transforming routes into individual and potentially competitive products. Karel van Miert, the European competition commissioner, articulated the same logic when saying that SNCF, with its 'high tech' TGVs and sophisticated computerised reservation systems, would be able to attack other European markets [Jakubyszyn 1997c]. CRS and GDS were seen in government reports [e.g. Descoutures 1992:182] as a way of controlling the 'travel chain' for consumers in a new national space 'open' to Europe.

Technology does make certain social relations stable. Information technologies and electronic markets are intervening in the management of commercial and non-commercial multimodal transport

activities. Information is being used as a surrogate for free and contestable markets, as exemplified in the rhetoric that online systems can enable free competition on the same tracks in the UK rail sector. Technology is, if not a causal explanation, at least a condition of possibility for global market restructuring [Mitev 2000a]. What remain unknown are the future effect of global electronic travel markets on European transport industries [Mitev 1999] and the role of national policy-makers. In a political context of conflicting market and non-market principles, will national policy-making be replaced with technology-supported free global markets?

The next section explores in more detail the effects of competition on transport pricing mechanisms in the rail industry. It shows how it became logical for SNCF to borrow pricing techniques from the air industry and how *Socrate* became associated with the TGV.

CHAPTER 5

CONTROVERSIAL PRICING: TRANSLATION TO A CUSTOMER ETHOS AND ASSOCIATING *SOCRATE* TO THE *TGV* SUCCESS (MACRO TO MICRO)

The new commercial techniques used by *Socrate* to manage passenger travel can be traced back to differentiated pricing techniques initiated by SNCF when it launched its fast TGV trains in the early 80s. More sophisticated differentiated pricing was made possible with *Socrate* and its yield management techniques and is intrinsically related to the TGV high-speed trains network.

New principles of differentiated pricing presuppose and imply a cultural change for users since they assume that passengers will behave rationally and modify their buying habits so as to bring higher profits, particularly from the TGV network; and they still maintain cheap fares (at certain times) so as to fulfill SNCF public service mission. This seemed the ideal solution, a perfect political compromise for SNCF. As Belobaba [1987:64, my emphasis added] remarks about air yield management: "[it is] a pricing strategy developed since deregulation so that established airlines can at least appear to be competitive in price with the new entrants and might even be able to fill otherwise empty seats with stimulated demand" [see **Section 3.3.3**]. By maintaining some cheap fares, it would seem that SNCF also saw the importance of appearing to be competitive, but in a situation of internal competition between all of its own trains, particularly the TGVs and the classical trains, as detailed in **Section 4.3.6**; whereby the original intention of yield management was for big US air companies to protect themselves from intramodal competition.

This chapter first provides a brief history of SNCF pricing tactics, details the application and effects of yield management to more sophisticated price differentiation and to the identification of market segments [Mitev 1997], and outlines the new ticketing put in place when *Socrate* was implemented. It then describes the effect this is having on passengers' buying behaviour, on a different customer ethos and culture of access to transport. A clear link is established between advanced pricing techniques and the high-speed trains; the success of TGV technology is revisited in order to compare it with, and provide further explanation for, the problematic *Socrate* technical innovation. The success of the former may have led to high expectations for the latter but at the same time it effected a transformation of rail transport which set the scene for the troubles *Socrate* encountered.

5.1 PRICING DIFFERENTIATION, MARKET SEGMENTATION AND TICKETING

5.1.1 History of SNCF pricing tactics

As a public monopoly, in order to keep and possibly increase the number of its customers, SNCF has historically been caught between the notion of public service and budget constraints. Traditionally, the aims of managing urban and rural development, maintaining a national identity and ensuring a good quality of life, formed the basis of cross-subsidising in French rail transport. Accordingly, a kilometre had the same price all over the country, which was seen as fair and equal to all-French citizens, and a ticket price was calculated on the basis of the distance travelled, whichever train or line was used and whatever the costs. Therefore, profits realised on some lines could be used to subsidise losses on other lines or segments. This principle was a result of a double constraint imposed on SNCF, that of operating unprofitable lines and that of balancing its budget on an overall national basis, rather than per market.

Before the introduction of *Socrate*, and for many years, train fares were calculated according to the distance travelled, following the principle of geographic cross-subsidisation ("péréquation géographique"). In this pricing system passengers travelling on profitable lines - and additional government funding if necessary - contributed to the cost of running unprofitable lines. Public utilities, including major air companies [Villiers 1994], apply this principle in order to provide services in the interest of national and regional development.

SNCF started introducing price differentiation in the late 70s by modifying fares according to the time of travel [Gianfaldoni 1993]. Its aim was to optimise average revenues, by examining two variables: the filling of trains and the price offered at a certain time on a certain route. If demand is greater than capacity, fares can be increased and price-sensitive passengers can transfer their travel to under-utilised trains at a different time. Some price differentiation existed prior to *Socrate*, and had been in place since 1979, but was quite limited. It was based on a tricolour calendar (three time zones, red for very busy, blue for busy, white for quiet periods) published once a year and widely available; it corresponded to three simple differentiation bands or zones depending on the year calendar (similar to Channel crossing ferries or rented holiday cottages price calendars). It was set a year at a time according to previous results, accumulated mainly through sales figures and counting passengers and types of tickets in trains. This calendar tried to modulate demand to deal primarily with trains in heavy demand (holidays, weekends). For instance on Friday evenings and Monday mornings no reductions were available (red). At some other times such as bank holiday weekends or school holidays, only some reduced fares were allowed, e.g. youth passes, family cards (blue); and in the third band all reduced fares were accepted (white). Special discounts, only available in 'white' periods were also devised. This pricing system was clear and easy to publicise. Pricing according to the number of kilometres travelled has the advantage of being totally understandable to passengers who can work out the cost of a specific journey. They can also establish very quickly which trains their reduction entitlements apply to or not. The calendar had a colourful and simple design and was printed as a small standalone folded leaflet available everywhere, which you could carry in your wallet (I remember it!). Its aim was to offer reduced prices on less busy days so as to fill emptier trains.

This price differentiation, if simple, was also heavy. The calendar had to be set a long time ahead and it had some absurd effects. Some of the disadvantages are:

- Rules apply to whole trains so no reduced seats are available at all at busy times;
- Rules also apply to all periods everywhere in the same way;
- It deals primarily with weekly and seasonal variations starting from Paris (heaviest traffic); so in a red period there were no reductions in trains going to Paris (rather than leaving it) therefore many trains were made to be even more unprofitable through the use of the calendar;
- No control information is available per seat and per train;
- It is difficult to establish detailed patterns of use and customer behaviour;
- Daily variations (the time of the day) as opposed to weekly or monthly variations are not catered for. This is particularly important since daily variations occurring on profitable lines have the potential of bringing in higher profits through further price differentiation.

Differentiation was therefore limited and fares were relatively uniform. However, the cost of increasing price differentiation, which involves the use of sophisticated computer systems, was initially seen by SNCF as too high to warrant any change [Quinet 1990]. The aim of increasing price differentiation would be a major consideration in the choice of the *Socrate* software.

SNCF started experimenting with further price differentiation, which eventually set the scene for *Socrate*. It did so on the first TGV line Paris-Lyon that opened in 1981, and then Paris-Ouest in the early 90s. A major change was the use of compulsory and chargeable reservations, and the introduction of different types of 'supplements' for very busy trains (TGVs as well as normal intercity trains). The objective was not only to fill empty trains but also to increase profits on busy routes and compete with air, which proved successful on the Paris-Lyon route. It can be seen that in SNCF experience, TGV technology and differentiated pricing became strongly associated and successfully so.

Prices varied from a factor to 1 (for the slower normal 'classical' train to these destinations) and 1.35 on the TGV. When the TGV to Le Mans was launched in the early 90s, the increase in the second class price was between 25.4% to 53.5% (according to the period in the calendar) over 'normal' prices, i.e. calculated on the basis of kilometres [Sanchez 1993]. One implication of this system (which was superimposed on the tricolour calendar system) was that it was cheaper to travel first class in certain trains than second class in others. The principles of "péréquation" were beginning to become eroded ("dépéréquation") in the sense that price became related to the type of train and the time and day of travel rather than the distance travelled.

5.1.2 Sophisticated price differentiation through yield management

The biggest price differentiation changes that exploited yield management were applied to the new TGV Nord in April 1993. For the rest of the network, pricing differentiation was less extreme [SNCF 1992c]. However, the well-publicised simultaneous announcement of the TGV Nord and *Socrate*, together with the modifications of many commercial principles through optimisation on the whole network, soon affected relations with passengers.

Socrate, with its computerised reservation systems and yield management techniques, brought the possibility of much more sophisticated price differentiation, and therefore threatened the principles of geographic and social "péréquation" and equal access to transport to a much greater extent. Three parameters could now be used to modulate pricing [Gianfaldoni 1993]: not only the type of train and a more refined division of the time of travel (the day of the week but also the exact time of the day), but also the type of purchase, and the flexibility (or lack of) of the bought product.

This new pricing implies the use of yield management techniques to know, predict and control demand, and manage available capacity according to this knowledge, so as to maximise revenues. Like marketing, yield management seeks to redefine and segment demand and concentrates on the price/quality relationship. Yield management includes both pricing and seat inventory control. In the air industry seat inventory control enables the air company to influence yields and total revenues on a flight-by-flight basis, within a given price structure.

As well as different prices according to the type and time of train, the time of reservation now affects the price. The idea is to block a certain number of seats (a quota) for specific trains, for which the price will vary according to the date of purchase (e.g. from 2 months to 45 days - or from 44 to 15 days - before the time of departure). Some constraints may be associated such as staying a Saturday night, to prevent business people from benefiting from discounts. The price of reservation varies (the earlier one books the cheaper it is) in order to experiment with the size of quotas. This implies limiting capacity for certain groups (according to a fare) on each train in order to smooth demand peaks and fill the lows. The means to do this are quota management ("contingentement") and overbooking. If the risk of waste (unoccupied seats therefore loss of earnings) is higher than the risk of rejects (too much demand and dissatisfied customers), the priority will be the low fares group. If the risk of rejects is higher than the risk of waste, priority will be given to the high fares group. Compulsory booking enables the gathering of information to adjust the offer by modifying train planning.

The following table (**Table 5.1**) gives an example of differentiated pricing for the TGV Paris-Lille; the proportion of seats on offer in each category is derived from quota management principles.

Table 5.1 TGV-Nord Paris-Lille prices [SNCF 1993d]

Niveau	Prix normal	Prix réduit 1	Prix réduit 2	Prix réduit 3	Prix réduit 4	Joker J-8	Joker J-30
N1	207F	145F	125F	104F	53F	180F	100F
N2 N3	255F	194F	174F	152F	101F	180F	100F
N4	301F	240F	220F	198F	138F	180F	100F

There are four levels ("Niveaux") of pricing, from N1 to N4, N1 being the low period when trains are emptier, to N4 when trains are in high demand. Prices are the same in N2 and N3 for second class tickets only. Reduced ("Réduit") prices correspond to four categories of available discounts such as family cards "Familles Nombreuses", child passes "Kiwi", young persons passes "Carissimo", couples, frequent travellers "Modulopass", old age pensioners "Vermeil", army personnel "Militaires and "Pensionnés de guerre", groups, conferences "Billets Congrès", holidays "Billets de Congé Annuel"). 'Joker' fares are available when customers buy their tickets 30 days before travelling (J-30) or 8 eight days (J-8) [SNCF 1994b]. These "Joker" tickets are non-cumulative, i.e. they cannot be combined with other discounts (reductions 1, 2, 3 or 4). The 'normal' full fare ticket using the classical train "Corail" rather than the TGV is 164FF.

Other pricing and purchasing changes that took place between January and June 1993 were as follows:

- Abolition of stopovers (interrupting a trip);
- Reselling of seats booked via phone/Minitel if not picked up 30mins before departure;
- Obligation to take train specified on ticket; if someone misses a train and catches the next one without going back to the ticket office, the ticket will be considered invalid and the passenger fined;
- Impossible to have several discounts on the same trip (e.g. "Modulopass" for Paris-Le Mans and family discount for Le Mans-Rennes)
- Abolition of 'supplement' vouchers;
- Unreasonable price increases.

Passenger associations [FNAUT 1994b] claimed that: when pricing was modified on the first

TGVs in 1981, prices were 20% higher than the kilometric unit applied to the intercity 'classical' trains (reservation costs and supplements were additional to this); in 1993 this over-pricing ("sur-tarification") was 51% higher for full fares and 102% for reduced fares on Paris-Le Creusot, 57% and 130% on Paris-Le Mans, 84% and 141% on Paris-Lille. In fact, price increases above the franc/kilometre unit on Paris-Lille were also 26% for 'classical' intercity trains, and between 80 and 160% for regular passes (depending on weekly, monthly or yearly travel passes) [FNAUT 1994a].

Difficulties commonly encountered and complaints made by passengers were accumulated by the SNCF Communication Department [EC & AH Interview 3] and Marketing Department [MP Interview 7] and some of them were:

- Difficulties in exchanging tickets;
- More complicated organisation of travel because of impossibility of breaking a journey (stopovers);
- Worries of price stability and predictability, which affect work travel planning and long term attitudes;
- Air and road alternatives (including car fleets for businesses) more seriously considered;
- Difficulties in getting information for connecting trains, e.g. from regional trains to TGV;
- Lack of flexibility, too many constraints.

These difficulties and the problems associated with the new ticket described in **Section 5.1.4**, led to dissatisfaction and anger in a clientele which had been historically faithfull to rail transport because of convenience and simplicity [Moissonnier 1993:13] as well as prices. Passengers compared the new system to the previous one in which prices were clear, with only a few supplements on 'luxury' trains, and in which travellers could organise their trips easily and improvise if necessary [Sivardière 1993].

5.1.3 Towards the identification of 'marketable products': a problematic segmentation

Faced with what is perceived as a non-uniform demand and increased competition, yield management aims to know, control and predict demand, as well as manage capacity according to this knowledge. It combines differentiated pricing, profit maximisation and quota management. It balances under- and over-capacity using customers' sensitivity to prices. In an under-capacity situation it can be used to increase market share and fight off new entrants; in an over-capacity situation, lucrative segments can be protected and spare capacity can be offered with discounts. It combines price differentiation and capacity management. Overbooking enables operations to deal with 'no shows'. The need for overbooking is balanced against the temptation for customers to 'go show'. It determines the number of seats per train (quotas) which are discounted so as to maintain maximum profits from the normally priced seats. These quotas can be determined dynamically: they are revised continuously according to real time demand until

then. Analysing past statistics, comparing past and current demand so far, forecasting from current demand, try to establish the ideal point at which a customer who does not get a discounted fare either transfers to the higher fare or to another train at the same price. Statistical information and optimisation is carried out on all origin-destination pairs, which must therefore include analysing all possible legs of a journey. Higher fares may not be the best option when compared to lower fares, if the distance travelled in the latter case is longer.

Yield management and optimisation, when compared to the previously used price differentiation where several techniques were simply used in conjunction, represents a fundamental qualitative shift: detailed information is gathered about each train throughout the day, the week and the year; this goes far beyond dividing prices into crude time periods; information is gathered continuously on seats sold so far, enabling to modify the price mix on each train in real time; each train journey therefore becomes identifiable and marketable as an individual and isolated product.

With *Socrate* (and *Thalès*) it is possible to identify, segment and target groups. However, this means an end to geographic and national cross-subsidisation, which ensured a coherent regional and national development based on economic and demographic factors. New pricing tactics represent an end to equality of access and socially orientated price structures, and are seen as contributing to a "désertification" of less populated areas through an emphasis on profitable segments. The logic of the optimisation software is to maximise the number of high fares and limit the number of seats at reduced fares. Such a priority coincides with the development of the most profitable parts of the network, i.e. the TGV network, which is contrary to the principle of national solidarity and cross-subsidising. The TGV lines are more profitable when there are fewer stops ("On ne s'arrête pas partout" see note 16 **Section 4.3.6**). Beyond maximising revenues, yield management also leads to maintaining an offer at a slightly lower level than demand, so as to maximise revenue per seat. With the new pricing structure the distance is not the basis for prices anymore, but a combination of the choice of day, time of day, choice of route, type of train, origin and destination and duration.

Some problems due to segmentation can be illustrated below (see also example in **Section 3.2.3**). With the two following trains departing from Paris:

Train 1 12h TGV Paris-Valence-Avignon-Marseille
Train 2 13h30 TGV Paris-Valence

Prioritisation of segments applies on train 1: a Paris-Valence passenger is accepted only if a Valence-Marseille has been sold. The assumption is that a Paris-Valence is refused in case a Paris-Marseille is required, and that the passenger wanting to travel from Paris to Valence can catch the following train (Train 2). From the passenger's perspective, Train 1 is not on offer, whereas it is on offer all the way to Marseille, and it does stop in Valence...

Passenger associations argued that the new commercial policy did not fulfill public service requirements of transport law [Broussolle 1993] as expressed in LOTI ("Loi d'Orientation des Transports Intérieurs") and in Article 14 of the "Cahier des Charges de la SNCF"[19] [Journal Officiel 1994]. Following the controversies surrounding the overpricing ("surtarification") above the standard franc/kilometre unit introduced by *Socrate*, a compromise was reached in an amendment to Article 14 in July 1994 which limits maximum prices and the number and proportion of overpriced trains. 'Baseline' overpricing was limited to 40%, 'modulation' was allowed up to 50% for high demand trains (full fares) and 100% (reduced fares).This amendment in effect legitimated the end of "péréquation géographique" and abolished the link between price and distance. SNCF executives [e.g. CQ Interview 10] thought that it was too small a step in the right direction; and most SNCF interviewees [e.g. GV Interview 14] stated that passenger associations were not representative and always found counterexamples to prove their points, when "no system can be perfect" [CQ Interview 10].

By contrast, FNAUT [1994a] points out that these limits do not prevent prices from increasing on non-competitive segments, for example Paris-Valence or Paris-Arras (Arras is in between Paris and Lille); it argues that passengers travelling between Paris and Arras are suffering as a result of arbitrary prices on that uncompetitive segment (when compared to Paris-Lille). Additionally, regularity and frequency of 'classical' trains on Paris-Arras are suffering and have become too poor to constitute an attractive transport mode [FNAUT 1994c]. Commuters from Abbeville and Amiens (towns in Northern France like Arras) similarly suffered as a result and transferred to the A16 motorway [FR3 1997]. And daily commuters between Lille and Paris, on the other hand, complained that they had to book their TGV seat everyday making travelling to work very awkward [FR3 1997].

FNAUT also opposed the generalisation of quota management to the whole SNCF network [FNAUT 1994a]; and a member of the *Socrate* team responsible for sales [LDM Interview 8] reflected that in fact there are different priorities and tensions between different functional needs across the network, and that yield management only really applies to the first category:

- "Grandes Lignes": reservations primarily and seat availability
- Regions: ticketing: unique journeys and regular journeys – weekly, monthly, annual passes

[19] Article 14 is a piece of legislation that specifies pricing principles for SNCF. It is part of LOTI, a law first formulated on 30th December 1982 (82-1153, 83-109, 83-817) which determined SNCF status, responsibilities and constraints. Article 18 states that SNCF as a public enterprise "aims to exploit, manage and develop the national rail network according to public service principles"; it has been criticised for not clarifying these principles [Cuq and Bussereau 1994:18]. These authors in their report to the government for the National Assembly equally criticised The "Contrat de Plan" 1990-1994 for being vague and for not mentioning territory management.

- "Ile de France"[20]: ticketing with intermodal transport (metro, buses, tramways [Scotto 2000])

It would appear sensible not to have applied yield and quota management to regional transport (it never was on urban/suburban transport). However, the boundaries between long-distance, high-speed long-distance, national, regional, regular and occasional travelling are fuzzy, as illustrated in the case of Lille-Paris commuters [FR3 1997] above: the advent of the TGV Nord itself changed the situation (objects strike back!) and its use as a commuter train presented unanticipated difficulties and contributed to blurring the boundaries even further.

5.1.4 Complex new ticketing

A new computerised 'unique' ticket was introduced which merged reservation information and ticket information, and it was only valid for that trip. In the past, there were basically two tickets: one that indicated the exact, kilometric, fare for travelling and was valid for two months; and a reservation ticket which gave the reservation cost. There may also have been a supplement that, like the reservation slip, could be discarded if the passenger decided to use another train, as the first part was valid for two months; it could also be re-used on a different train, with or without another supplement. The new ticket made it very difficult for passengers to understand how the fares were calculated. Many stories circulated among the general public and were echoed in the press for several months [SNCF 1993e; Scripta 1993] contributing to the uncertainty, bewilderment and general frustration: for example old ladies coming to the sales office with an amount already written out on their cheques and turning away flustered, people giving up travelling on their usual train because the fare had doubled, passengers being fined for taking a later train, or suffering heavy penalties for exchanging their ticket. The unique ticket may have seemed simpler to handle for SNCF but its design did not differentiate between distance and reservation costs; it was challenged through a legal consumer protection requirement for clarity of price information (the Neiertz law) and it had to be modified and simplified by SNCF a year later [Bensahel 1994].

The 'unique' ticket in **Figure 5.1** below was revised from the more complex first version (March 1993) and simplified in September 1993 after customer complaints; it was made available in January 1994. It indicates, from left to right, top to bottom:

- Origin and destination stations (Paris Montparnasse, Angers) and A/R for a return ticket;
- Validity information (24 hours only after stamping – all tickets have to be stamped in automatic 'composteurs' or stamping machines, situated near the platforms in stations, before boarding any train);
- Number and type of passengers (1 adult, 2 children);

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[20] Ile de France consists of Paris city and a growing suburban area around it (Hauts de Seine, Seine St

- Departure and arrival dates, times, stations, train numbers;
- Discount applied (family fare in this case);
- Reservation information (2nd class, coach numbers, seat numbers, window/aisle, non/smoking);
- Price details: per passenger (adult 324FF, child 198FF), total price (1x324 + 2x198 = 720FF);
- *In very small print*: discount rate (30%), extra costs (reservations and supplements together, 38FF), fare 'base' from which the discount is calculated (179FF); ***this makes it very difficult to understand how the price was worked out***;
- Price 'level' of first (onwards) and second (return) trains used ('Niveau 1'); ***this becomes very clumsy when using connecting trains***;
- Place, date and time of purchase.

Another important change brought by *Socrate* is the lack of flexibility of the bought product. Tickets are now only valid for one train, like plane tickets. Previously, all tickets were valid on any train for 2 months; if a reservation was made, an additional piece of paper was provided; if this reservation was not used, the ticket was still valid. Now, unused tickets can be exchanged, but with a penalty of 30%. This 'unique' ticket, which merges reservation and ticket information, is aimed at preventing 'no shows' (people who reserve several seats but only turn up in one train), and 'go shows' (people who turn up without a reservation).

One effect at the ticket sales counters was a large increase in people requiring exchanges of tickets. Many incidents occurred, particularly in the trains where ticket inspectors had to deal with tense situations. Under public pressure, ticket collectors had to make ridiculous distinctions between 'good faith' and 'bad faith' customers in possession of invalid tickets.

Denis, Val d'Oise, Essonne, Val de Marne, Yvelines).

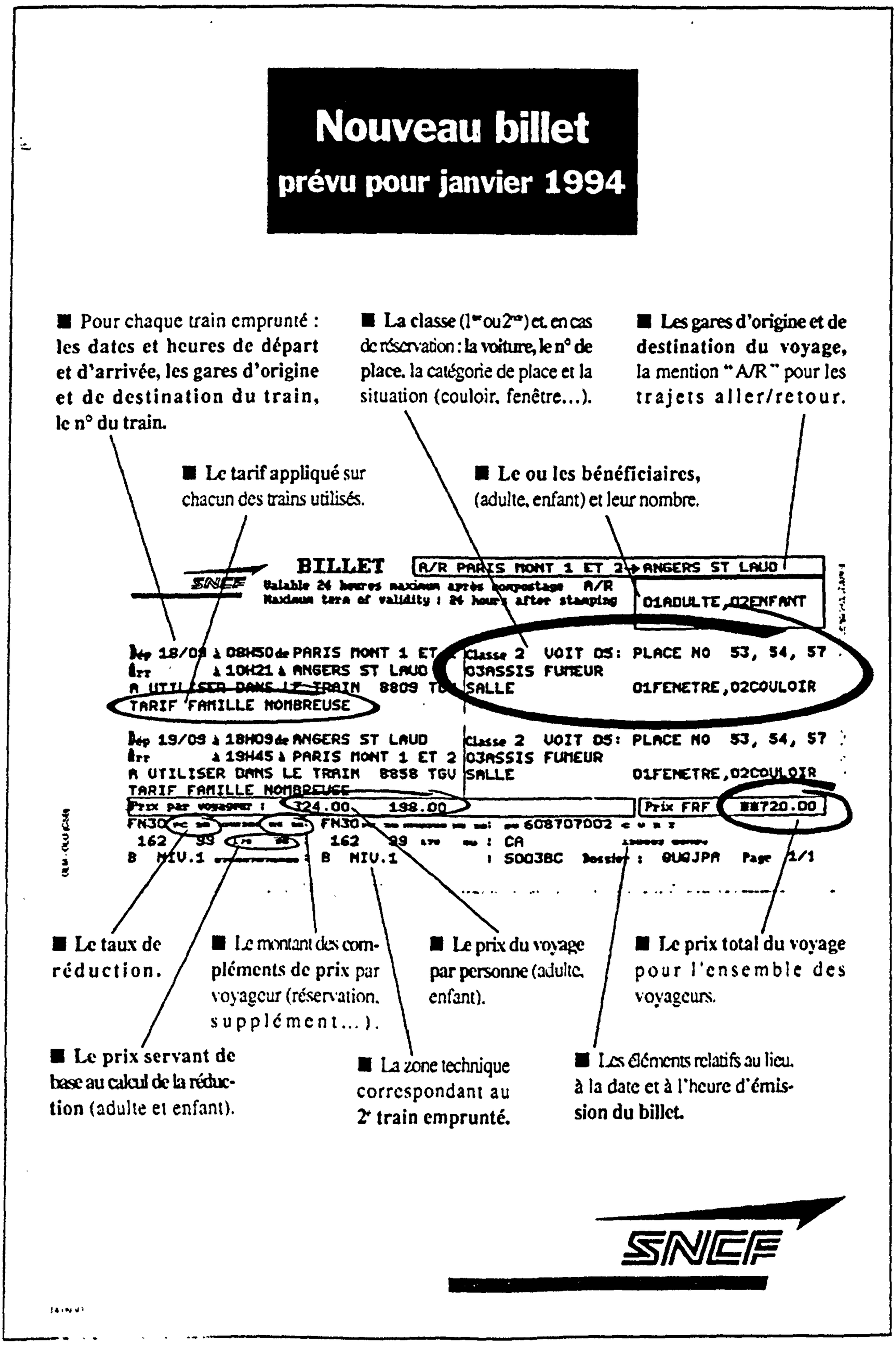

Figure 5.1 Revised unique ticket, SNCF, 14th September 1993

5.2 RATIONAL BUYING BEHAVIOUR: A NEW CULTURE OF ACCESS TO TRANSPORT

5.2.1 Consumer confusion

Yield management enables complex pricing which becomes incomprehensible to staff and customers alike and it is intended that passengers will become "conditioned to the consumer rationality" [Daudel and Vialle 1989]. The new pricing tactics are so complex that only a computer can work them out, and it is impossible for sales staff to understand and explain to the clients the price structure and concepts of pricing mix and quota management. The user-computer interface was changed so that the passenger has to first say which day and time he or she wants to travel, like in air reservation systems. With the previous SNCF system, *RESA*, sales staff could display the list of fares on a particular destination, and indicate to the passengers which days were the cheapest, which they now find very difficult to do. For instance: to travel from Lyon to Bordeaux on a certain day *Socrate* suggests to use the TGV via Paris, which is marginally faster but costs 465 FF (not including the TGV supplement and the cost of reservation) as compared to 299 FF on traditional lines another day or at a different time the same day.

The implementation of a pricing mix per train is intended to make passengers change their travelling behaviour, assuming they are rational customers and that they can, having worked out all their options, make an informed choice. We have just seen that in practice it is very complicated and time-consuming to understand all possible options. Passenger associations [SIB and GDA Interview 18] have argued that this creates inequalities of access.

When introduced in 1993, these new pricing mechanisms represented a cultural shock for SNCF passengers; anger, confusion over the new ticketing, frustration with the new incomprehensible prices, combined with the turmoil caused by the very serious technical problems exposed above, resulted in chaotic scenes and long queues of furious customers in all major SNCF stations **[Figure 5.2]**. Many incidents occurred [Maleysson 1993], in trains where ticket inspectors had to deal with tense situations and at ticket offices. People became angry when their usual ticket had trebled in price. Neither staff nor passengers could understand the new pricing logic. Trains run empty and tickets were issued for non-existent trains. Sales staff went on strike by issuing old-style tickets to delighted passengers. Compulsory reservation was also badly received. As in the Greyhound case **[Section 3.2.2]**, coach and train passengers are used to turning up in a station without reserving in advance. These passengers became very frustrated when they had to queue for hours and miss several of their usual trains. Some passengers' associations sued SNCF and won [D'Aufresnes 1993].

Figure 5.2 Gare de Lyon ticket hall, Paris, April 1993 [Adine 1993]

The technical difficulties (e.g. data missing, complex user interface, poor staff training) were also partly due to a top management decision to launch *Socrate* at the same time at the TGV North (Paris-Lille) on 1st April 1993 [Scasso 1993]. System design had to be rushed. This decision reflects SNCF's historical success and confidence in the introduction of further price differentiation at the same time as opening a new TGV line. This backfired, and as argued by passenger representatives [SIB and GDA Interview 18], passengers were not taken in by SNCF's claims that very cheap fares were now available on high-speed trains; the general perception was that "other unwelcome measures were taken to compensate for this claim". Accordingly, "quota management is used instead of increasing capacity" and it represents the "unofficial *de facto* end of social cross-subsidising" [SIB Interview 18]. As early as November 1992, consumer organisations stated that with the new system passengers would pay more without knowing why and complained about the new unique ticket and the lack of consultation [Associations Nationales de Consommateurs 1992].

Socrate increases discrimination through targeting precise and better off categories. This is seen as unfair [Ribeill 1994] as follows: people with the least constraints (in terms of availability and income) such as the professional or middle management categories, are those who can get maximum benefits from the pricing policies (since they can choose their travel times) when they could easily afford the highest prices anyway. Workers, clerks, etc. are more time constrained and have less money; they are caught in the system; or they can choose another transport. This represents a shift away from social price structures.

Unions [Interviews 16 and 17] also analysed *Socrate* as an alibi, which hides a new commercial policy as well as a new work organisation. The new policy is based on the premise that the ideal client is an executive who knows his/her departure times and who is not bothered about the expense.

Unions, consumer and passenger associations perceived these changes in similar ways, for example by pointing out the implications for clients who now have to "take responsibility" for their buying and travelling behaviour and "behave like adults" [CGT 1993a]. Passengers associations felt they had been ignored (when previous relations had been good) by the initiators of the *Socrate* project and criticised the focus on business travellers and competing with planes. They organised demonstrations in co-ordination with unions [FO 1993] and various events, leaflets [CGT 1993b], exhibitions in stations [CGT 1993c] and petitions [Fédération des Cheminots 1993] to express discontent. There was a week long strike after the implementation in 12 stations in January 1993; three other strikes in February, another one in March; and another one after the implementation of a 'super' version of the software which was supposed to be bug-free. Another union action which was well-received by passengers was to issue open tickets, without reservation, with only the distance accounted for. During three weeks this action was strong in Paris Gare de Lyon. Another action was to go on strike for an hour every Friday. Both unions [e.g. UFCM-CGT 1994; Interviews 16 and 17] and passenger associations [e.g. FNAUT 1994c; SIB Interview 18] emphasised the importance of public service and related events to issues of territory management and maintenance of the network ("maillage") put at risk through the new pricing structures.

In terms of buying behaviour, passengers found ways round the system, soon to be addressed by SNCF: it increased overbooking to counteract multiple reservations made over the Minitel or the phone (which need to be paid and picked up at a station later on) and which aren't picked up by customers. Many passengers used this tactic to delay as much as possible the choice of the cheapest time and seat. On an average Friday afternoon at Paris Montparnasse approximately 1200 travellers change their mind as to their departure time and change their reservations. As a sales staff said it: "the computer was designed for selling not for after sales!" [SLG Interview 13].

Rational consumer behaviour?

Examining the underlying assumption of a rational, "adult", consumer behaviour implied in the new pricing and ticketing techniques, a deeper analysis could be attempted. Critical writers on consumerism [e.g. Featherstone 1991] clearly argue that real people, unlike economic 'rational' men, cannot express preferences among all possible commodities; do not always prefer cheap to expensive, or good to poor (or fast to slow!); do not act with complete information; and do not, indeed, cannot, act to maximise preference, and do not have stable preferences. According to the sociologist and philosopher Bauman, consumer behaviour has been playing a growing cognitive and moral role, is expected to be an

"integrative bond of society" and is also the "focus of systematic management" [Bauman 1988:807]. Providing consumer choice, as evidenced in some of SNCF marketing vocabulary[21] could perhaps cynically be seen as a way to try to get the people that are either likely to be profitable or likely to accept the product on offer. More fundamentally, and following critical accounting academics:

> "There is a change at the level of practices, a change in power-knowledge relations, which quite specifically produces a new emphasis on calculability while engendering a new power of (and for) [accounting]" [Ezzamel and Hoskin 1991:6].

In the case of marketing train services, transport needs are now construed as an individual need for a service or commodity, individually satisfiable. The onus is on the consumer to seek the right level of satisfaction, exhibit rational decision-making amongst all products on offer, mediated via complex information technology (and large information overload). "Clients will learn to reason train by train and will take responsibility in anticipating their travels, by consulting the new SNCF information systems" [SNCF-GL 1992]. However, an understanding of price constraints (type of train, purchasing conditions, flexibility of product, belonging to a market segment entitled to discounts) does not guarantee a successful transaction; moreover, a price at a certain time for a specific train may not be available at another time [APST 1991]. Individualisation of consumption and commodification of needs separate consumers as social individuals, with the responsibility (through complex information searching) to make their own 'free' choice. Whether the concept of consumer identity and individual consumption is appropriate for collective goods such as train services remains questionable. Furthermore, reformulating power-knowledge relations in these terms occludes the politics of distributing the goods, as well as the knowledge accumulated about customers in the CRS and statistical databases.

5.2.2 Public relations

SNCF public relations and communication efforts did not smooth the introduction of *Socrate* and its associated pricing and ticketing techniques. Public relations staff [EC and AH Interview 3] talked of communication blunders and admit readily there were many marketing mistakes; for instance, and as already mentioned in **Section 4.3.6**, combining *Socrate* with new price structures and general price increases in February 1993 (usually introduced later in the summer) sent the wrong message to the public. The unfortunate use of the existing slogans "Avec la SNCF tout est possible" and "Le progrès ne vaut que s'il est partagé par tous"[22] was more than unfortunate and derided by the media and public alike. **Figure 5.3** is an example of a cartoon found in the general press.

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[21] For example: "Il existe une formule adaptée à chacun de vos besoins" or "We have a well-adapted formula to fit every single one of your needs", in otherwise very clearly designed brochures [SNCF 1994b].

[22] "Everything is possible with SNCF" and "Progress is only worth when shared by all", slogans appearing

Figure 5.3 Cartoon of ticket staff strike at SNCF [Anon. 1993][23]

These slogans seemed ironical as events were perceived to undermine the human face of the public enterprise. Other events were amalgamated with the initial *Socrate* problems such as: ticket offices opened only at peak times in smaller stations; some stations not equipped to sell all tickets anymore; the importance given to automatic vending machines [Foot 1993] and dissatisfaction with a supposedly easy interaction with these APVs ("Automate Point de Vente") - "Avoir un dialogue interactif afin de se procurer un titre de transport"[24] was the SNCF instruction, which Mariano [1993] describes as "technocratic" and insensitive to older people, for example; the sense of being lost in big stations and the difficulty of finding a staff member for help; security problems, etc. It is clear that dehumanising stations is a disincentive for the public. At the same time RATP (Paris city métro system) was re-humanising its stations by increasing staff presence (rather than security guards) and security was improving.

The most serious communication mistake centred on the message transmitted prior to the launch of *Socrate*. Publicity, press conferences and communication with the media largely emphasised the

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on all SNCF brochures, leaflets and posters at the time.

[23] The ticket clerk says: "Does someone know how to use this thing?"

[24] "An interactive dialogue to purchase your ticket".

sophistication and complexity of the new computer system and associated techniques. In fact, the *Socrate* yield management expert [CQ Interview 10 confirmed by GC Interview 6] recounted participating in a trip organised by SNCF for selected journalists: they were taken to the AADT headquarters in the US where yield management techniques were explained to them in great detail, including mathematical equations. *Socrate* experts seem to have been carried away by their enthusiasm for this new technology, which they presented as "sound economics" supporting "good management" [CQ Interview 10] and providing a mean to reduce the SNCF public deficit. This obviously had counter-effects as journalists became cynical about these claims when implementation difficulties piled up after the launch. Presenting *Socrate* as the solution to the company's problems rather than passengers' needs, also provoked the following reaction in the general public: "this system is supposed to manage things better, so they will make more money, but where is this money coming from? Us of course"... [CQ Interview 10]; or even that "the new pricing structure is there to pay for the cost of *Socrate*" according to [DC Interview 2]. In terms of communication message, it would have been better to compare the new methods to well-established differentiated telephone pricing, for instance.

The name chosen *Socrate* does not project images of simplicity or clarity. A change of name was considered and rejected. On the other hand, many people believed (and still do) that *Socrate* was disposed of after the events. Understandably, the system is never mentioned externally anymore. Finally, constantly referring to air was also counterproductive, as air transport at the time had a mixed image (bankruptcies, ruthless behaviour of companies). These communication blunders, together with the implementation difficulties, led to a serious degradation of public image. Opinion polls in June 1993 [Moissonnier 1993:8] found that:

- 4 in 10 were dissatisfied with transactions at the ticket office;
- 4 in 10 had difficulties with transactions in the previous 2 months;
- 1 in 2 felt that transactions were more difficult than before.

The overall level of satisfaction with SNCF went from 61% in 1992 to 57% in 1993; this compared to 92% satisfaction with Electricité de France, 91% with France Telecom and 81% with the French Post Office. Some argued that traffic loss due to *Socrate* estimated at FF 15 million by SNCF could be contested as being an underestimate [e.g. Moissonnier 1993:116].

Jacques Berducou, the new 'Grandes Lignes' director and Jean-Marie Metzler's successor (who was also the *Socrate* director and was moved to the Department of International Relations after the implementation debâcle), organised a huge passenger survey in October 1993 entitled "Nous avons tant de choses à nous dire"[25]. It involved 165 stations and more than 100,000 passengers. It concentrated on passengers' experiences with pricing, information, access flexibility, service quality, ticket control and

[25] "We have so many things to say to each other".

after sales [Berducou 1994a; Mariano 1993]. An effort was also made to rebuild good relations with consumer and passenger associations [SNCF 1993f; SNCF 1993g; SNCF 1993h]. The SNCF slogan was eventually changed to "A nous de vous faire préferer le train"[26] which started appearing on all leaflets and brochures in 1996 [SNCF 1996b] and represents a significant change of focus.

In an effort to rebuild its image, SNCF carried out an audit and set up consultative committees with passengers [SNCF 1993i]. It reversed its differentiation principles and reviewed pricing and ticketing in early 1994 [Berducou 1994b] (as well as simplified its unique ticket, see above **Section 5.1.4**). The Moissonnier audit [1993] in fact had recommended that commercial optimisation should only be used on the TGV and that it should be suspended from the rest of the network (in the short-term only).

SNCF improved TGV boarding conditions without reservation; reinstated better ticket reimbursement, for instance "billets de congés annuels"[27] and cancellations of group tickets; introduced an 'access ticket' in case of very long queues at ticket offices; decreased prices on reduced fares (Kiwi, Carissimo, Vermeil); reintroduced free exchanges of tickets and reservation changes without penalty; provided better information on prices breakdown (reservation, supplement); allowed some 'open' tickets; reintroduced supplement vouchers; modified quotas for reduced fares on some TGVs [CGT 1993d]. SNCF believes that these measures regained lost traffic by 1994 [Berducou 1994c]. This policy has been continued in the following years, as outlined in **Section 4.3.5**: by allowing passengers to change their choice of TGV until the last minute [SNCF 1998a]; by removing the tricolour calendar from TGVs thereby allowing reduced fares on all TGVs (with some limits on 'niveaux' 3 and 4) [SNCF 1994b]; by simplifying the calendar on other trains to two periods ('blue' and 'white') instead of three [SNCF 1996b]; by eventually removing the four TGV levels ("niveaux") and replacing them with two levels in 2nd class and one level in 1st class [SNCF 1998b; SNCF 1998c]; by reducing the number of reduced fares categories from four to two (see **Table 5.1**; SNCF 1998b); by introducing new advantageous types of tickets, e.g. "Tarif Découverte Séjour" for various age groups (senior, children, 12-25s) which gives a 25% discount, has to include a Saturday night and has to be for a minimum of 200kms [SNCF 1998d]. Pricing simplification and decreases are still currently credited for a 3.5% increase of long distance traffic in 1999, superior to the 1998 predictions, and a 4.3% increase in revenues [Anon 1999].

5.2.3 Access to transport, technology and progress

Socrate represents, and contributes to, a conflict about transport access between: (a) well-established public rail cultures and practices; and (b) what was perceived by SNCF and the government as "necessary changes" [Moissonnier 1993:21]. The necessity of these changes was founded on various argumentations. Two examples of different formulations are those of Jean-Marie Metzler and Jacques

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[26] "It is up to us to make you prefer the train".
[27] Employees with low salaries are entitled to reduced tickets for their annual vacation.

Fournier which both draw on notions of progress. The former [JMM Interview 1, *Socrate* director] bases his argumentation on the notion of modern transport: consumer needs are changing; future clients will require high speeds, comfort, car rental and hotel bookings, and sophisticated travel distributors; and passenger associations do not understand this and have an "old-fashioned" view of transport. Jacques Fournier [SNCF president]'s argument is related to the concept of social progress through the use of technology: *Socrate* allows a more sophisticated and flexible approach to pricing; indeed its very flexibility has the potential of making the TGV more accessible financially to lower social classes, through charging higher fares to wealthy customers[28] [Fournier 1993a:52; Fournier 1993b][29].

Marketing research on the concept and presentation of *Socrate* formulates a different justification by avoiding social connotations and proposing a focus on individualised customers. They suggest to avoid the following 'negative' images [SNCF 1992d; MP Interview 7; Bruno de Courrèges Consultants 1992]: "trains for the rich, trains for the poor"; pricing complexity; advance booking; cheap sales techniques ("SNCF is not in the business of selling soap" [Interview 7]); yield and profit. And they recommend to concentrate on: a new simpler ticket; the existence of discounts for all and on all trains; a shift from a collective anonymous public to a diversity of individual situations, expressed as: "Pour tous et à chacun", "A chaque client, un besoin; A chaque besoin, une question; A chaque question, une réponse"[30]; travel opportunities with positive connotations of personalised occasions ("you are going away for the weekend...") rather than access conditions and constraints; a new open interaction between SNCF and clients where customers are at the centre of the transaction with a "new active way of managing one's travel" ("I am a active subject and I negotiate my travel with SNCF") [SNCF 1992d]. These ideas relate to the concept of customer rational behaviour analysed above in **Section 5.2.1**.

Technical experts, on the other hand, draw on the neutrality of technology to distance themselves from social implications. When accused of increasing prices, yield management experts [e.g. CQ Interview 10; SNCF 1993j; 1993k] declare that: *Socrate* does not change prices; they are established and published once a year in consultation with the Ministry of Transport; they are well known to the public; *Socrate* merely changes the number of reduced fares available; that it is reasonable as clients who want to travel at busy times should organise themselves in advance, like people booking holidays or hotels; and that the technology is not to be blamed[31].

Yet another justification of *Socrate* and of more extensive pricing differentiation [Descoutures 1992:23] is market economics: pricing 'freedom' is necessary to cover real costs in order to establish a 'sane' basis for competition; *Socrate* allows 'truth' and 'transparency' of prices [p. 74]; ensures equality

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[28] This was vehemently denied by passenger associations, see **Section 5.2.1**.

[29] Jacques Fournier was SNCF president during the events, he left and was replaced by Jean Bergougnoux in May 1994.

[30] "For all and for every single one", "For each client, a need – for each need, a question – for each question, an answer".

[31] This is in contrast to the view expressed by a passenger representative that once the technology is there, it has to be used and is not neutral [SIB Interview 18, see **Section 3.5**].

of treatment and enables the mechanism of free markets which secures an efficient allocation of resources.

Far from the technical being blameless and disconnected from the social, technology and modernisation are discourses and instruments of social action. Top SNCF executives share a belief in modernisation and progress, position technology as logical and neutral, but make it carry various lines of argumentation, as illustrated above. Their style and ethos can be referred to as technocratic [AP Interview 2] and is also symbolised by the company slogan chosen in 1990 [Fournier 1993:31]: "Le progrès ne vaut que s'il est partagé par tous". For instance, and like many other SNCF technocrats, the *Socrate* key expert in yield management [CQ Interview 10, see also **Section 4.3.6**] also adheres to the view of yield management as a modern, technical and 'natural' progression (or technological, natural, 'trajectory' see **Section 2.2.1**). By contrast, transport experts [Quinet 1995:57] argue that it is necessary to replace "technocratic diktat" by a broad and open political debate.

This vision of modernisation and progress also relates to the earlier success of an important French technical innovation, the TGV. It is no coincidence that the *Socrate* project director, Jean-Marie Metzler [Interview 1] had previously successfully managed the introduction of the TGV at SNCF. He came from "Ecole Polytechnique", one of the best "grandes écoles", and he started working on the TGV project in 1977, which was successfully launched in 1981. It was a very strong episode in his career, he gained an enormous reputation within the company and was therefore highly trusted [LDM Interview 8]. The fact that *Socrate* had to be completed in time for the opening of the TGV Nord (which would then lead to the Channel Tunnel) and its advanced pricing differentiation was not a coincidence either. The centre of the whole *Socrate* apparatus is also the TGV, and the next section explores this link further.

> "Overbooking became extremely important for SNCF when it implemented mandatory, instead of optional, reservations for TGV services. Like aircraft, TGV trains have a fixed capacity. Short of running a complete extra train, it is not possible to use the [old pricing differentiation methods] - adding or subtracting coaches to match the capacity and suit demand, and by allowing passengers to stand in corridors and vestibules[32]. With the TGV's fixed capacity, SNCF had to be able to determine the demand for each route and anticipate the number of reservation requests" [Queille and Silva 1994:669].

5.3 THE TGV AS AN ANTECEDENT TO *SOCRATE*

Socrate appears to be a strategy to develop the TGV network and controlling the European long distance rail market. Seat reservations for the Channel tunnel rail link are already administered through *Socrate,* which Belgian Railways and British Rail bought from SNCF through the European Passenger Services consortium. It is based on the premise that the TGV network can compete with airlines and that it satisfies a growth in demand for fast transport [Walrave 1989]. SNCF gained competitive advantage and

[32] Passengers are not allowed to stand in corridors in TGVs (like the Eurostar) for safety reasons, as speeds are too high.

recouped its investment in the TGV technological innovation through the sale of TGVs to other countries - e.g. to Korea [Scemama, 1993] - and the expansion of a fast train network in Western Europe [Marchais, 1992]. Return on investment on the first TGV Paris-Lyon line has been good, although profitability of new lines - Bordeaux, Marseille, Rennes, Strasbourg, Lille - is less clearcut. Maximum contribution from these newer lines, through the use of yield management techniques, could be seen as the real objective of *Socrate*. However, economic factors (or technical criteria) cannot explain innovation success or failure on their own. Innovation is seen as a complex and uncertain process involving many actors and their different interests, elaborating and shaping new objects [Mitev 2000b].

5.3.1 *Socrate* and the TGV

The new computer system is closely related to the high-speed trains (e.g. through pricing) which have been declared a major success in the past. Revisiting this past success enriches the understanding of the CRS failure: by recognising the French notion of public service, which led SNCF to conceive of TGV technology as a way to prevent rail transport decline; the fact that the existence of the TGV shifted the focus on air/rail competition (as opposed to road/rail); and that the subsequent link between the successful TGV and the new computer system was in fact a handicap and had unintended effects. It shows that any technological innovation is a situated construct subject to negotiation and differential access with unpredictable elements and is constantly created and recreated through perceptions, conflicts and failures attendant to such efforts.

SNCF started introducing price differentiation in the early 80s by modifying fares according to the time of travel [Gianfaldoni, 1993] but was initially quite limited (e.g. holiday periods, weekends in and out of Paris, when passengers tended to book their tickets in advance). Further experimentation was carried out with the TGV Paris-Lyon (South East) in 1981 through compulsory and chargeable reservation and different supplements according to time and day of travel. When the TGV Atlantique [Bazin 1988] was launched in 1989 the increase in the second class price was between 25.4% to 53.5% over 'normal' prices [Sanchez 1993]. This set the scene for *Socrate* as in SNCF's experience TGV technology and differentiated pricing became strongly associated and successfully so. However, in 1993, the sophisticated pricing mechanisms enabled by *Socrate* were implemented on the whole rail network leading to passengers' frustrations.

More fundamentally, *Socrate* was perceived as the ideal solution for SNCF: it would bring higher profits, particularly from the TGV network and it still maintained cheap fares (at certain times) so as to fulfill its public service mission. It is useful to return to how SNCF dealt with conflicting pressures which led to the innovation of the TGV, how the TGV itself modified the context and led to the association between a successful TGV and another technological innovation such as CRS.

5.3.2 SNCF and the TGV innovation

Innovation is seen here as stabilising, or exposing, a multitude of transformations in this public sector enterprise and not just pertaining to the domain of technological objects or economic forces. The TGV-innovation, as much as the CRS innovation, was a complex and uncertain process, with a variety of planned and unplanned episodes, negotiations and experimentation. Innovation emerges when various entities are put together, are associated to a problem with many aspects which interests them all, even if, and particularly if, these interests are different.

The general climate for French public enterprises has been shifting for some years from state intervention to withdrawal from the state. In this context, and if we look at the enterprise as a rational economic agent, the TGV innovation was a way for SNCF to deal with new economic challenges which the state could not deal with [Suleimann and Courty 1997]. At the same time, decision-making processes are also coloured by inertia and routines, interpersonal conflicts, alliances and compromises which create and diffuse, or not, objects. Objects need to be put back in social and cognitive structures from which they never escaped. The TGV technological success legitimated the existence of railway engineers and constructors and provided SNCF, the service provider, with a social success.

The TGV was a result of SNCF looking to innovate in order to stop what was perceived as the terminal decline of rail transport [Suleimann and Courty 1997]. This decline was a political problem as SNCF had continuous budget deficits, and an economic one for constructors as market demand in rail equipment was diminishing. The perception of this decline came partly from the US, where road transport was winning over rail transport, and rail, as a result, was seen as an out-of-date transport mode. At the same time (late 60s early 70s) the Airbus was being designed in the aerospace industry, and its potential effect was thought to change air/rail/road competition. However, and unlike the air industry, the history of innovation in Frenh rail originates primarily from the rail enterprises rather than the manufacturers, e.g. Aérospatiale [Suleimann and Courty 1997].

SNCF was and is still subjected to political, financial and administrative control from the State to ensure the 'public good' and this influences its activities and objects. The notion of public service in rail transport can be summarised as "no barrier to access to each and everyone, speed and safety". But at the core of the public enterprise lays a tension. Its financial structure is designed to ensure solidarity (and this affects fare structures), whilst it clashes with profit objectives. In the post-war period, including the 70s when the TGV project was beginning to take shape, the notion of public service was strong and shared across actors even with different interests (workers, engineers, executives, civil servants). There was pride in belonging to the enterprise with a belief in the spirit of innovation for the public good, even if it served various groups unequally (e.g. professional value for engineers). "French State engineers had a strong loyalty to the national railway as a whole" [Powell 1997:54].

The search for speed came to represent this (with connotations of faith in progress and modern,

young images of transport). Aeronautic engineering influenced this search, and there were various projects in the late 60s such as turbotrains and 'aerotrains' that drew on jet engines. There was also international competition with fast trains projects in the US (Boston-Washington) and Japan (Osaka-Tokyo). In the late 60s, France, Italy, Germany and UK all started high speed train research programmes [Descoutures 1992]. These programmes found their justification in the technical and commercial success of the Japanese *Shinkansen*. The choices made however varied from country to country. Powell [1997] compares the economic, social and cultural differences between the TGV success and the failure of the Advanced Passenger Train (APT) in the UK. Germany chose to build new mixed lines for freight and passenger high speed trains (HST) with many connections with the existing rail network, and HST themselves (240 km/h) came second. The UK and Italy both sought HST solutions to run on existing lines. France, having tested a HST of 200 km/h in 1956, chose an integrated high-speed solution for passengers, with new rolling stock and track at the same time, with large capacities, and the lower cost of building dedicated new lines [Descoutures 1992:141].

Organisationally and culturally, engineers easily imposed their faith in the success of speed, and stopped being perceived as an unjustified expense to the enterprise. This happened to coincide with executives' aims of 'catching up' with the US and Japan and being seen as a dominant and profitable company. The representation of the project thus evolved and arguments which convinced and enrolled politicians were issues of regional development, a 'new' rail system (not just faster trains), new lines, a new rail policy, decentralisation and equality symbolised in the chosen slogan "la vitesse pour tous"[33]. TGV technology became a mean to achieve business objectives and bring competitiveness as well as address political aims. The French TGV represented a fairly simple adaptation of the rail transport mode 'which 'saved' rail from decline, "like motorways for road transport" [Troin 1995:11]. The first TGV investments were funded through a mix of SNCF self-financing, State contribution, borrowing guaranteed by the State; these were a sign of faith in the technology to achieve commercial success and be capable of ensuring continuing growth of passenger traffic [Descoutures 1992:86]. Plassard even analyses the fascination with high rail speed in the French collective imagination as associated with the conquest of a new space, Europe: "in the same way as Christopher Columbus and his ships redrew the world map, the TGV produces Europe" [Plassard 1994:47, my translation].

5.3.3 The TGV success

The TGV technical innovation became a social success through unpredicted elements, planned and unplanned implications of actions and forces driving actors, which coincided. With strong R&D and engineers researching technical solutions to policy problems, speed became the major technological issue and a politically seductive promise to resolve 'all' rail problems. An important element identified by

[33] "Speed for everyone". One can see a strong link with the later slogan "Progress is only worth if shared

Powell [1997:46] is the "remarkably integrated technico-administrative elite" and "professional interface between the French State and the railways consisting of civil servants and senior railway officers who have a shared educational background". This elite education is both technical and economic and provided the TGV project with both a strong engineering base and commercial justification.

The TGV project also effected a major shift (which was the real and more fundamental innovation): instead of running faster trains on existing lines (like the British tilting train), the idea came to build new lines, separate from normal intercity trains, but kept compatible when using the urban network to reach central city stations. The problem was put on its head, and by changing the nature of the network, it became possible to address the speed issue technically speaking (high-speed trains could now go fast more easily on dedicated lines). Perceiving speed as the most rational and modern way to deliver a transport mode (as well as the 60s fascination with rockets and jet engines) was coupled to a democratic purpose: "la démocracie par la vitesse"[34] [Lamming 1987].

Other fortuitous elements which happened to have a welcome influence on the project were: the choice of line for the first TGV (Paris-Lyon-Marseille which has deep symbolic and cultural connotations in France and is called the "ligne impériale" or "voie royale"[35]); and the fact that, after the 1973 oil crisis, electricity became the dominant energy, the main rail network was largely electrified, and the aero-dynamic TGV was thus represented as saving energy and as more cost-effective than road and air.

Considerable improvements of speed, the straightening of lines, the modernisation of signalling and the suppression of intermediate stops contributed to a significant reduction of travelling times [**Figure 5.4** which indicates the 1988/89 travelling time and the planned travelling time, e.g. Paris-Bordeaux 4h08 in 88/89 and a planned 2h05]. The proportion of TGV investment grew to 45% of total infrastructure investments in the 1990-94 "Contrat de Plan" whereby investments in domestic rail transport in Europe has decreased dramatically since 1975 [Troin 1995].

5.3.4 From the TGV success to *Socrate* failure

Once in place, the TGV spurred a transformation in usage (different categories of travellers were attracted to rail), increases in traffic (Paris-Lyon, then Paris-Bordeaux) and profitability, and more competition with planes. It became an important new transport mode which expanded into Europe (Channel tunnel, but also towards Germany and eventually Eastern Europe [FR3 1997]) and TGV technology was sold to Korea, the US and Spain. But it was not sufficient to stop the crisis at SNCF. There was still loss of traffic, more recently there has been strong opposition to new TGV routes (whereby previously local politicians were desperate to have a TGV station in their region), and

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by all".
[34] "Democracy through speed".
[35] "Imperial line" or "Royal way".

Projet de Schéma directeur national des liaisons ferroviaires à grande vitesse
Évolution des temps de parcours au départ de Paris

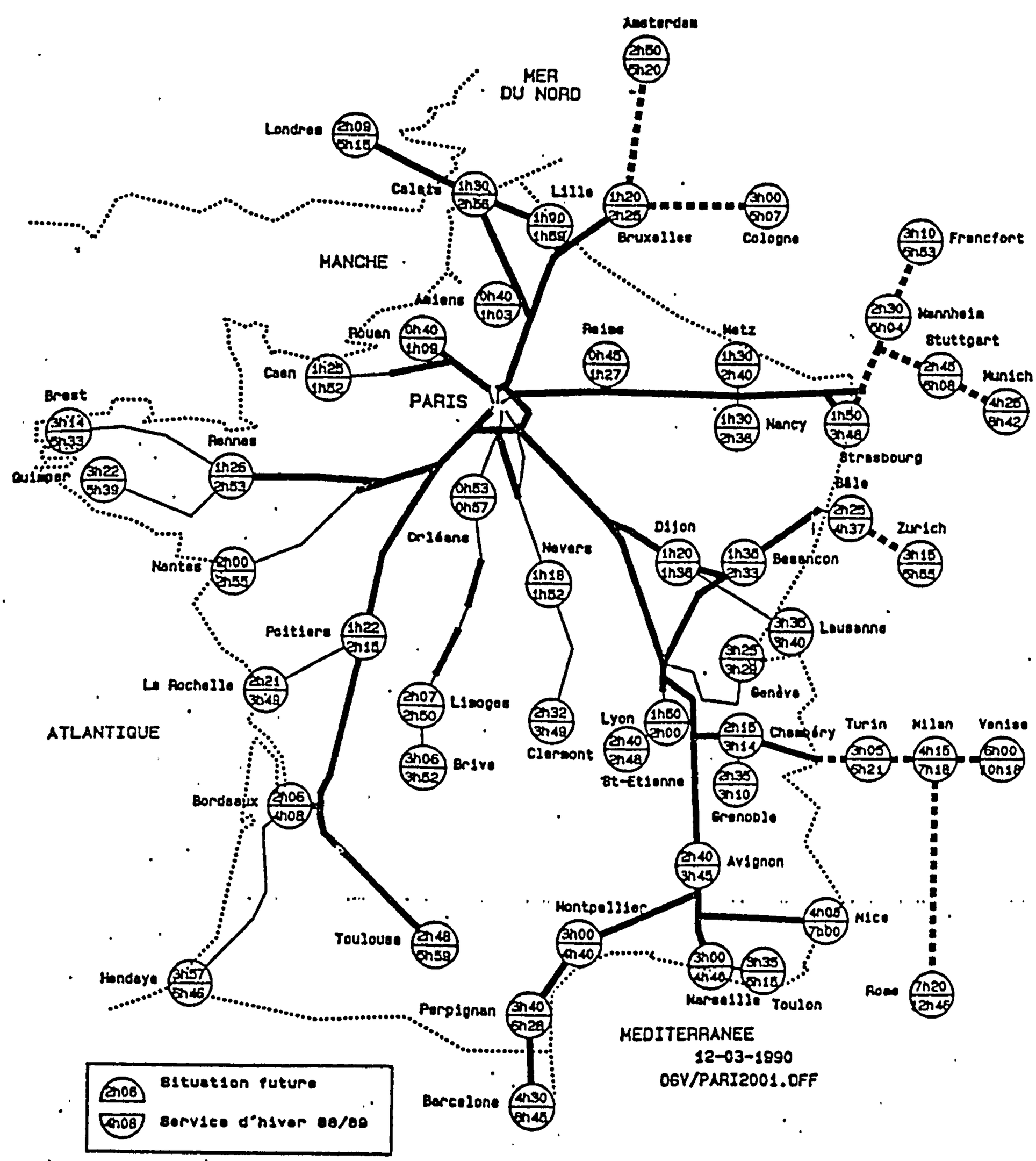

Figure 5.4 High speed rail national plan: future evolution of travelling times by rail from Paris [Bourdillon 1991:103]

passengers complain about reservations and pricing. Objects are used in unanticipated ways by users too, and their experiences with TGV reservations and pricing in the past influenced their reactions to *Socrate*.

The tensions between public service and profit making were still present in the mid-80s, and some of the aims and rhetoric surrounding the *Socrate* project were very similar to the ones surrounding the TGV project. For instance: addressing business objectives and public mission at the same time, as illustrated above through the use of yield management to simultaneously bring higher profits and (appear to?) maintain a public service mission; using technology to solve political and economic problems; trust in technical progress represented in the 80s by computers (as opposed to planes in the 60s and early 70s); in fact, a link between high-speed trains and computers (and Europe) was already made in 1989 by the "Conférence Européenne des Ministres des Transports" [CEMT 1989; see also Hepworth and Ducatel 1992]; and a faith in modernisation[36] and progress. Both innovation processes were situated in similar contexts, leading to similar negotiations, perceptions and conflicts. The first innovation was seen as successful so an effort was made to repeat it, with unanticipated consequences. The TGV innovation formed minds to seeking solutions in similar ways[37], but at the same time it became a handicap as it had itself changed the scene.

One consequence of TGV technology was to increase competition with air, and in some ways, TGVs are a hybrid between planes and trains or "semi-avions" [FNAUT 1994c]. A clear example of this blurring of boundaries is the opening in 1994 of the Paris-Charles de Gaulle air-rail hub [Sparaco 1994][38]; This set the course for SNCF to seeing itself as a hybrid transporter, and to seek plane-related solutions. *Sabre* must have appeared as the ideal solution as it represented the ultimate combination of planes and computers and responded perfectly to business objectives. However, the model represented by *Sabre* contributed to transport deregulation and to intramodal (TGVs competing with classical intercity trains) as well as intermodal competition and opposition to this was unforeseen or underestimated. The deregulated model has implications for transport planning through the separate accountability of identifiable and marketable transport segments enabled by CRS and yield management, in the context of a fierce public debate on European transport liberalisation and deregulation [see Cartelier *et al*, 1996; Fournier, 1993; Julienne, 1996; Ross, 1998]. It is particularly related to the opposition between the traditional notion of public service in European countries, and that of universal service in Anglo-American societies [Barrère, 1998].

Another way in which the TGV technology has had an important effect on transport planning and pricing is the technical object ('non-human' actor) itself, and is another example of how objects 'strike

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[36] In a press release announcing the nomination of Jacques Fournier as Honorary President of SNCF, Jean Bergougnoux, the new president, congratulates him for having pursued the modernisation of the company in a particularly difficult context [Bergougnoux 1994].

[37] A report on SNCF to the National Assembly accuses SNCF of still being "obsessed with the TGV" in 1994 [Cuq and Bussereau 1994:127].

[38] The SNCF Charles de Gaulle hub leaflet [SNCF 1994c] offers train tickets and reservations for France and abroad, Eurostar, restaurant, train + hotel, car on train, and car rental services.

back' or how 'antecedents' have effects (see **Section 5.1.3**). TGVs are 'half planes half trains' since they have fixed capacity. With the second generation TGV, a set of carriages (a "rame de train") which makes up a train has 485 seats (116 first class, 369 second class); there are also 37 folding seats for passengers who have boarded the train without a reservation despite the fact that this not allowed[39]; consists of ten articulated coaches and two engines; it can only doubled to nearly 1000 seats [Bazin 1988:98-99]. It is very difficult to add just one or two coaches to deal with extra demand, and adding a whole train is very expensive. Dedicated lines allow speed, which requires fixed capacity, which leads to capacity management issues, which brings to yield management. Indeed, the price of speed is a loss of flexibility.

The French transport situation is changing and the *Socrate* technology has had an effect too. The current climate is to stop the construction of new TGV lines now considered too expensive and the TGV is seen as having counter-effects of 'désertification' for remote areas, as opposed to providing equal access to all French citizens. There is a shift towards investing in the classical intercity lines, concentrating on the complementarity of intercity and fast trains (using TGVs more like normal trains, therefore regaining flexibility), stopping the building of new motorways, and emphasising the notion of mass public transport. Pricing differentiation has been simplified as a result, limiting the use of yield management. So despite a discourse of crisis, debt, deregulation and privatisation and some influence of American models [Djelic, 1999] - in this case the adoption of new tools such as CRS and yield management, new vocabulary such as 'customers', and new management practices - this is not a direct adoption but an adaptation and translation of liberal models to fit in with the SNCF aim of working towards the common and public good.

Public utilities are particularly interesting as they are crossroads of the economic, the social and the political in which innovations are caught. The innovation processes followed at SNCF in the cases of the TGV and of the CRS were caught in similar contexts, and their outcomes were equally unpredictable.

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[39] The ticket controllers usually deal with these passengers by making them pay a reservation supplement on the spot; these folding seats are in practice used too in the case of cancellations, delays or unusual circumstances. I was in this situation once: I could not catch the TGV I had booked on (Chambéry-Paris) as my previous connecting TER train (Bourg St Maurice-Chambéry) was delayed so I boarded the following TGV and on that occasion ticket controllers were very understanding. Nevertheless, passengers are not allowed to stand up for safety reasons and the number of folding seats is small.

CHAPTER 6

SNCF AND *SOCRATE:* ORGANISATIONAL TRANSLATION FROM PUBLIC SERVICE TO SELLING (...MICRO...)

Through *Socrate* the organisation was trying to achieve three objectives:

- Quantitative objective: to process the forecast volume of reservations generated by TGVs (50% with TGV Nord Europe see **Section 3.1.1**);
- Qualitative objective: to acquire airlines functionality (availability, price differentiation, customer profiling, optimisation of price/capacity, other services, car rental, hotels) and distribution capacity (see **Sections 3.2, 3.3.1, 4.4**);
- Organisational objective: to transform the organisation through automation and integration to increase the reliability and productivity of sales and distribution.

The last two objectives could not have been reached with the previous system *RESA* [Moissonnier 1993:4]. To explore this organisational transformation, this chapter first looks at how the organisational structure and culture have evolved in order to understand the organisational climate in which change management and consultation exercises took place, prior to and surrounding the *Socrate* project. The internal frictions provoked by *Socrate* are then detailed. The second section examines the implications for sales staff in terms of testing and pilot sites, user-computer interface, dialogue with clients, training and sales team organisation. Finally, the shift towards organisational restructuring and its relationship to information technologies is analysed.

6.1 ORGANISATIONAL TRANSFORMATION

6.1.1 Organisational structure and management control: tabula rasa?

The traditional sectors at SNCF used to be freight, parcel services, passengers and infrastructures and were supported by many specialised occupations. A large geographic spread led to a dual organisational hierarchical structure, geographic and functional. Labour costs were high and in 1992 salaries accounted for 58% of expenses, despite staff reductions of approximately 2% a year to less than 200,000 in 1992 from 252,000 in 1980 and 500,00 in 1939. By 1992 non- sedentary jobs represented 14% of the total, many of the manual and physically intensive jobs had disappeared and 90% of staff was in technical or commercial functions [Descoutures 1992:178].

An organisational reform was initiated in 1991 and its aims were: to increase transparence and internal accountability; give a bigger managerial autonomy to different product lines; make the organisation more commercially proactive; and introduce internal charging and purchaser/providers relationships between technical services and operations. The objective was to separate management of

infrastructure and operations, and regroup products and services into families of products and corresponding organisational divisions [Descoutures 1992:177; Cuq and Bussereau 1994:79]. Professional occupations also had to be reviewed. The traditional professional basis of the organisational structure was seen, for instance by Jean-François Bénard, Directeur Général in 1994, as horrific: "each cheminot identifies himself with his profession. It engenders irresponsible behaviour towards customers, as the latter are located at the junction of several activities which are totally compartmentalised and isolated from each other" [quoted in Cuq and Bussereau 1994:88]. This compartmentalisation also necessitates strong centralised control in order to co-ordinate activities, and this was seen as an organisational "impasse" [Cuq and Bussereau 1994:88].

Other public sector administrations and enterprises adopted similar measures at that time [Ribeill 1993] as a way of responding to and stimulating different market segments, through transparent internal accounting, decentralised responsibility and cost/profit centres. Each unit is supposed to manage its own production, personnel, accounting, materials, etc. Centralised common services can be cut down, and coherence is ensured through the company strategic vision and direction [Cuq and Bussereau 1994:91]. Nevertheless, its implementation in a rail company is complex. Indeed, its diverse commercial activities largely draw on common resources, e.g. rail tracks for freight and passenger travel, the use of locomotives and traction engines and of drivers, maintenance teams. They are linked and integrated, and the accounting of these activities is intricate. The Direction Générale worked on these measures for several years, was planning to implement them on 1st January 1994, but this did not happen and it was postponed until 1995. Difficulties in setting this reform in motion were due to serious implementation difficulties [Descoutures 1992]:

- The move from a budget based, low risk, neatly compartmentalised style of management to a transparent, responsibilised, contractualised, cross-functional management mode upset power divisions and responsibilities;
- Performance indicators and production criteria for each service used to be measured in technical units specific to each service, e.g. trains/kilometres for transport, points/jobs scores for equipment, or labour hours for materials output. The new measures had to create a common language across functions, e.g. contracts, service levels, etc. which were to be negotiated and evaluated in financial units only.

Executives in the regions and the main functional establishments received this new thinking about organisational structure with enormous critical apprehension [Ribeill 1994:44]. This was compounded by a context of confused and fuzzy public service missions and objectives for the whole company. Executives could adhere to a decentralisation that reinforces their roles, but could see that contractual relations (purchasers/providers) would expose them to further economic evaluation. Incomprehension and reticence, if not defiance or resistance, led executives to stop adopting or only partially adopt their expected managerial roles and lines of command to implement the new top policies. This radical 'tabula rasa' change meant a total break with the past and the new management mode implied

a restructuring at all managerial level, for central and regional directions and local units of production (the "établissements").

Concentrating certain units (equipment, traction depots, maintenance), their experimental merging, sometimes into multifunctional units, were initiated and became sources of classical local conflicts. In 1992, the transfer of some central Paris headquarter functions were being examined, as a contribution to the governmental policy of decentralisation (see **Section 4.3.6 Note 15**) and involved relocation of Parisian jobs to the provinces. In the spring of 1993, SNCF announced a wide-ranging structural reform. After merging two regions (Paris-Sud Ouest and Paris-Montparnasse) in October 1989 into a single region (Paris- Rive Gauche), and that of Metz and Nancy in 1990, SNCF wanted to concentrate the 23 remaining regions into 12 "inter-régions" (renamed 'operational zones'); some would have control over 'old' thinned out regions (e.g. Caen, Poitiers, Besançon) which would become simply SNCF 'ambassadors' with the regional councils - their political dialogue partners regarding the funding of regional trains (TERs). Evidently, this project of restructuring and thinning out of regions was strongly opposed since it implied staff cuts and moves in regional headquarters. SNCF exposed itself to resistance from agents threatened by relocation, as well as from regional elected representatives, worried that employment opportunities would decrease in their region. Following the vociferous Air-France conflict in 1993, and fearing that such a reform would provoke massive social and political protests, the government slowed the reform down in November 1993, and stopped it altogether in January 1994 [Ribeill 1994:43]. Only three pilot experiments were carried out (merging of Paris-Nord and Amiens where new headquarters were set up; decentralised reorganisation of the Lille region; restructuring of the Bordeaux region with an SNCF representative in Poitiers for the Poitou-Charentes region).

In terms of workforce, changes of qualifications, promotion and job grades have followed changes in SNCF recruitment, as average educational qualifications have been increasing. The importance allocated to promotion based on years of service has been reduced. Besides professional and cultural resistance to the new contractual mode of management, there was opposition to increasing geographic mobility due to a recent "sédentarisation" of "cheminot"[40] families. Earlier this century, "cheminots" used to move as they got promoted, and only at the end of their career could they buy some property, usually in their initial birthplace. The man was the only earner in 75% of railworkers' families in 1962, compared to 38% in 1992. In three decades, the old pattern of mobile non-sedentary "cheminot" families became eroded, with families earning two salaries, having higher educational expectations and becoming house-owners [Ribeill 1993]. This evolution parallels the growing importance of more technical and commercial jobs.

These internal changes have to be viewed in the light of external political and economic pressures in particular increased competition (in freight initially). They put in question SNCF's accountability and imposed staff reductions through budgetary control, in a situation of growing deficits. European transport liberalisation measures undermined monopolistic behaviour and LOTI also changed the status of SNCF into a semi-commercial enterprise in 1982, as indicated in **Chapter 4**.

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[40] The term 'cheminot' which initially meant someone working on railway tracks ('*chemins* de fer') came to mean any railway employee; even an executive can be referred to as a 'cheminot' in SNCF culture.

A new "Direction Commerciale"

Significant structural changes took place in the organisation of commercial functions [Interviews 7 & 8]. The old "Direction Commerciale Voyageurs" (DCV) became the "Direction Grandes Lignes" (DGL) with new separate regional directions ("Services Régionaux Voyageurs" or SRV). In the previous structure, the commercial division (DCV) was divided into functions such as distribution, sales force, etc. In January 1992 it was restructured into three main activities (according to product types): a "Grandes Lignes" unit, 22 Regions, and a "Ile de France" unit. They share a unique distribution system, controlled by the Grandes Lignes unit, which in effect controls distribution for all types of transport. This has disadvantages when negotiating systems specifications: GL predominates to the detriment of the 22 regional managers and the IdF manager, which creates tensions. Support of functional needs expressed by regions and IdF such as simple and rapid transactions (6 seconds average for urban transport) was not provided in *Socrate*. GL tends to focus more heavily on product design, marketing, communication, quality and distribution; whereas other more routine functions are taken out of GL and put into a new department called "Services Communs", making it awkward for regions and IdF [LDM Interview 8]. All units have been turned into cost centres with the view of making them in the future profit centres or 'strategic business units' – an expression many of the interviewees [Interviews 6, 7, 8] used in English.

The reasoning behind these changes is that control of the distribution function is strategic and needs to be centralised and closely controlled [MP Interview 7]. New professional activities had to be delineated as relating to profit margins; distribution costs were organised per business unit; purchaser/provider contractual relationships with distributors were set up; distribution costs had to be related to revenues. But these changes are culturally problematic and "this kind of chopping has associated costs" [LDM Interview 8]. They were badly received by staff with associated fears of loss of status etc. [LDM Interview 8]. Structural changes were accompanied by attempts to change the organisational culture and this is explored in the next section.

6.1.2 Cultural change: a new managerial ethos

According to Georges Ribeill [1994], a social historian of French rail transport, SNCF experienced a social 'malaise' during the 80s and early 90s due to a fracture between (a) its traditional 'corporatism' and social conservatism and (b) modernising tendencies (technical and commercial). Historically, and until the late 80s, SNCF was organised on a strong centralised (from Paris headquarters) and hierarchical basis, with clear lines of command and control, with little participation in decision-making, and with promotion linked to years of service. In 1986-87, SNCF employees went on one of the longest strikes in the history of the enterprise; one major issue was the criticism[41] of top management practices and its command and control structure based on hierarchy and length of service [Ribeill 1987]. It challenged the corporatist military-hierarchical culture, as well as asked for new salary, job and promotion structures. A set of reforms was initiated by the SNCF personnel department as a result [HG Interview 11], with the support of some of the managerial elite, which sensed a cultural change was needed. A form of "social

[41] Including by some top executives themselves.

management" [Ribeill, 1994] was advocated. The traditional regime of embedded sovereignties, spread within all functional directions, from the top feudal chiefs to the bottom vassals, was to be directly confronted and questioned. After an external audit of the management of the enterprise, the Direction Générale chose a global reform of the functioning of the company to respond to political and economic pressures and adapt strategically. Jacques Fournier [1993] initiated a programme of social transformation in 1990, which aimed to maintain managerial control as well as seek approval of unions and corporatist commitment [JMP Interview 12]. Some of the social and managerial reforms of the early 90s are outlined below.

- The first and most important reform in 1991 was the modification of salary scales, more flexible remuneration and promotions which balanced: on the one hand, the old notion of career advancement on the basis of years of service; and on the other hand, the introduction of promotion on merit and new hierarchical levels which recognise staff responsibilities and performance. It satisfied both 'careerist' and 'traditionalist' groups;
- Decentralisation of personnel and middle management functions to the regions; in 1988 recruitment of operatives and executives (middle managers) was delegated to regions, and in 1992, management control of executives was also partially delegated to regional headquarters;
- Of a more symbolic importance, in 1990 agreements were signed on: training (only CGT refused to sign these and protested against the closure of many SNCF training centres); equal opportunities for the disabled; and the development of specialised training programmes for uneducated low-level staff (SNCF traditionally recruited young people with very low educational background).

These reforms were perceived by the large majority of staff and unions as socially progressive, positive and corresponding to the traditional role of SNCF as an enterprise of social promotion, and were readily accepted. On the other hand, other reforms affected the routine, organic and customary ways of doing things and play of power and responsibilities at all levels of the enterprise. They destabilised the traditional managerial modes, forced a cultural conversion of executive control: from a compartmentalised, low risk budgetary control to a culture of transparent, cross-functional, contractual relations. They were received with scepticism if not outright rejection by a large proportion of staff at all levels [Ribeill 1994:47].

The following reforms were met with scepticism and resistance: participatory management, which was intended to bring a new 'empowering' (my retrospective translation here) relational mode of power for hierarchical roles and command structures, more open to initiatives from workers' groups. They were initiated by a small minority of executives with management profiles and were resisted by a large majority of technical and administrative executives, trained to the old methods of relaying authority from above, and who associated their legitimate authority and status to their technical expertise or budgetary responsibility.

If this new type of discourse could be heard in the enterprise, breaking off with the old militaristic-hierarchical SNCF universe, it is because it was supported by a minority of executives, "who saw

themselves as managers" [Ribeill, 1994: 41]. This reform, indeed, could only be blocked by the large majority of middle rank technical (engineering) and administrative executives. The old model/mould in which they were shaped made them simple relays of an authority traditionally legitimated by their mere technical competence or their budgetary autonomy. Opposition between these two groups was therefore strong within SNCF [JMP Interview 12]; in fact, it grew in 1992-93 according to a study commissioned by the SNCF "Comité Central d'Entreprise" and carried out by the "Laboratoire d'Economie et de Sociologie du Travail, Université d'Aix-en-Provence" [see Faïta 1993a- and Ribeill 1994:41]. The company is still split between two groups with different professional ethos: a first older and still large group believing in SNCF traditional values of high technical quality (e.g. the TGV technical excellence) and centralised control, and a smaller younger group of entrepreneurs anxious to promote a different organisation and new management methods [Cuq and Bussereau 1994:93]. This is illustrated by lunching habits: according to one interviewee [EC Interview 3] working at the Paris headquarters, these groups have their lunch breaks in different places. Top executives eat in the company restaurant, older traditional middle managers meet in the staff canteen and younger entrepreneurial managers go to the local cafés...

The 1990-1994 "Contrat de Plan" pursued this cultural revolution and intended to promote staff development through further decentralisation, social dialogue, participation and better decision-making through planning and forecasting based on information systems. Jacques Fournier [1993:173-174] expresses this fundamental cultural shift as follows:

> "The challenge of this reform is considerable. It is about no less than moving SNCF from an administrative, bureaucratic, centralised and normalised mode of functioning in which each unit must conform to pre-established rules and procedures, to an entrepreneurial, decentralised, contractual mode of functioning, in which clearly identified [and financially] independent centres exchange purchasers/providers contracts. The cultural leap required from the enterprise is very significant".

Most interestingly, he adds that: "Its realisation is only possible if methods have been specified, minds have been prepared, and tools have been made available to sustain this new managerial mode and manage this cultural shift, especially information systems" [Fournier 1993:174]. Yield management is such a system and its intended impact on the organisation was represented in **Figure 3.11b (Section 3.4)**. The new managerial discourse, together with commercial and marketing skills[42], and information technology expertise are in conflict with the traditional engineering and administrative orientation of the organisational culture. The former represents the new, modern, 'managerialist' rhetoric and practices analysed by many critical management academics [Willmott and Grugulis 1999; Alvesson and Willmott 1992; Fournier and Grey 2000] and tend to provoke professional as well as social resistance.

6.1.3 Degradation of consultation with staff and unions

[42] Several interviewees [EC Interview 3; LDM Interview 8] referred to a book which obviously had impressed them and insisted on giving me an interview of the author published in one of the internal company newsletters; in it the author, a professor at HEC (Ecole des Hautes Etudes Commerciales, a top business school) explains the importance of the brand names SNCF, TGV, *Socrate* and compares them to EuroDisney and deodorants [Kapferer 1993].

Until 1983, when the enterprise changed its public enterprise status and became semi-commercial, consultation was organised through a series of specific committees dealing with economic and social affairs, delegations representing staff requirements, and staff delegates participating in personnel decisions on salaries, job specifications, training and promotions. This system ensured consultation throughout all hierarchical levels [HG Interview 11]. In 1983 was added a "Comité Central d'Entreprise" with various personnel representatives on health and safety and working conditions committees amongst others [JMP Interview 12]. There were soon problems with the new consultation apparatus. Some claim that it did not allow equal representation of all "cheminots"; and that it only served as a justification for the new managerial principles rather than ensure a true expression of workers' needs [Cuq and Bussereau 1994:98]. The partial co-existence of the old and new systems and a proliferation of committees diluted staff relations.

The three main unions represented at board level (CGT, CFDT, FMC) voted against annual budgets from 1987. Personnel negotiations were hectic and salaries were in effect steadily decreased for ten years. CGT and CFDT, the two biggest unions, refused to sign salary agreements from 1987. The other staff associations (FO, CFTC, FMC, FGAAC and CGC) have signed since 1989, but FO refused to do so in 1990 and 1992. In 1993, there were no salary negotiations as there was no plan for any salary increases. Since 1984, the average gross annual salary and spending power have been eroded systematically, apart from two "luxury" years, 1989 (+1.79%) and 1992 (+1.79%).The endless job cuts made the vast majority of staff feel abandoned by a Direction Générale which overall did not appear to notice them [HG Interview 11] The 1988 and 1990 internal staff surveys carried out by SNCF, showed that 66% of personnel thought they were well-informed, by 1992 it had become 36% [Cuq and Bussereau 1994:98]. It can be said that all the above led to a progressive breakdown in communications. Bernard Bosson, Ministre de l'Equipement, des Transports et du Tourisme, estimated that by the end of 1993 it was impossible to contemplate any meeting between the different social partners. Striking had become the only way for staff to compensate for the poor functioning of consultative mechanisms [Cuq and Bussereau 1994:100] which partly explains why staff and unions promptly resorted to action during the *Socrate* débâcle.

The various managerial reforms delineated above also affected executives ("cadres"). Their numbers had grown from 4.2% of the workforce in 1938, to 22.9% in 1978, and 39.2% in 1992, whilst there was fewer and fewer staff to supervise. For the first time, they were also affected by a poor organisational climate and felt that their future was uncertain. Jacques Mallet, président of the "Fédération des syndicats d'ingénieurs, cadres et agents de maîtrise des chemins de fer" complained that: a new direction ["Direction des Cadres" established in January 1994] "only concerns top executives and divisional directors, and was set up, as too often, without any consultation, and only to emulate what is being done in other enterprises" [quoted in Cuq and Bussereau 1994:93].

<u>GARP and social dialogue: a sham?</u>

To improve the situation, top management decided to associate staff to the development of the "Contrat de Plan" for 1995-99. GARP (Groupe d'Animation et de Réflexion Préalable) was a consultation

initiative designed to involve staff, as consultation for the 1990-1994 "Contrat de Plan" had been criticised for being merely symbolic. GARP involved 20,000 staff, started at the beginning of 1992 and lasted till June 1993, and was run by the "Direction des Relations Humaines et Sociales" [JMP Interview 12]. A Steering Group consisted of 30 internal and external personalities known for their "social competence". Central and regional voluntary groups run by managers worked on a series of suggested themes such as:

- the goals and objectives of the enterprise;
- the analysis of social conflict;
- quality of production;
- staff commitment;
- the notion of the flexible enterprise;
- organisational culture, values and identities;
- how to improve cross and multi-functionality.

A proportion of 8.6% of total staff participated in a group and 10.4% responded to surveys and questionnaires. One top executive in two was consulted, one middle manager ("cadre") in three, and one supervisor in eight. Unions did not seek to participate at national and central level and criticised its representativeness. As a result of these workshops, a new phase called "Construisons nos choix"[43] was started in September 1993 during which ten groups worked in more depth on a series of strategic themes. This covered a deeper reflection involving 1,500 local and national representatives, and the results were disseminated to the whole staff.

GARP led to twelve recommendations, half of them about human resource management and the functioning of the company. Management argued that GARP showed dialogue was still possible and welcome by staff. However, FO (Fédération Syndicale Force Ouvrière des Cheminots) representatives called this initiative "des grands-messes" (or religious rituals) which did not correspond to claims and were not constructive [HG Interview 11]. CGT boycotted them as some of the problems they identified were not addressed, and it was "anything but consultation" [Bernard Thibault, secrétaire de la Fédération Nationale des Travailleurs, Cadres et Techniciens des Chemins de Fer CGT, quoted in Cuq and Bussereau 1994:99]. This consultation exercise did not lift the general scepticism. Experiences were that there was a large gap between the medium-term objectives of each "Contrat de Plan" and the short-term negative measures taken to balance annual budgets as a response to yearly financial imperatives imposed by SNCF contracts with the government. Contradictory short-term measures fed disillusions about participation and its good intentions. Staff felt GARP did not consider organisational realities. The chosen themes (see above) were criticised and can be seen to relate to new managerialist thinking; more practical subjects, for example the evolution of railway stations and the role of staff, might have been more useful. This participative consultation, it could be argued, even endangered the day-to-day adaptation to worsening

conditions. And in its approach to "talk to everybody" GARP has been analysed as a way to bypass unions [Cuq and Bussereau 1994:.99].

Unions: ripe for *Socrate*

Seven union organisations represent SNCF employees. There are five federated unions (CGT, CFDT, FO, CFTC, CGC) which are affiliated to national unions, some with political leanings e.g. CGT and CFDT to the left, and two unaffiliated or autonomous organisations, FMC (Fédération des agents de Maîtrise et Cadres) and FGAAC (Fédération Générale Autonome des Agents de Conduite). Some are orientated towards specific professional groups i.e. train drivers (FGAAC) or middle managers (CGC and FMC). Unionisation amongst cheminots is high and was estimated at 33% in 1990, which is far superior to the public sector at large (26%) and the private sector (8%). Union strength used to be affected by divisions and in-fighting; on 76 national (as opposed to regional, local or for a particular profession) registered calls for striking from 1990 to 1992, 67% were initiated by only one organisation, and only 9% by at least four of the seven organisations [Ribeill 1994:50].

In 1993 there was a marked increase in unity of action [HG Interview 11]. Of 18 national strike calls, only 10 came from only one union and four from at least four unions. This reflects an increasing consensus in criticising the policies of the enterprise (from short-term austerity measures to threats to the political regime of rail transport). Localised strikes (regional, local or professional) decreased in comparison to national strikes, particularly in 1993, which had more national and unified action. This can be interpreted as a sort of "collectivisation" of conflicts, which have become more political and corporatist than local or profession-related [Ribeill 1994:51].

Ribeill [1994:39-40] analyses the social dynamics at SNCF as a historical tripartite balance between three groups of social partners, political actors (government), management and the unions, which usually creates the following two alternative alliances: a corporatist alliance between management and unions; or a political alliance between the government and management. It depends on: whether unions and staff are in tune with each other; whether their representativeness in the organisation is secured; whether unions are able to present a united front; and how management positions itself, running the risk of isolation and exposure to both political order and union action. Union actions have been based on the following motives [Ribeill 1994:51-52].

- Internal/social opposition to short-term austerity measures (salaries, staff numbers) or to their announcement (vote of the SNCF budget at board level, or budget modifications during the year);
- Internal/political hostility to the global direction of the enterprise and its medium term future, as stated in the "Contrats de Plan";
- Corporatist/social resistance to threats (real or potential) to the social corporate regime (status, salary scales and promotion, pensions, the right to strike), or to the company practices (repression and antistrike sanctions, legal sanctions against prosecuted staff in the case of accidents);

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[43] "Let's build our choices".

- Political/corporatist rejections of anything which affects the foundations, including cultural ones, of corporate values (public rail transport, integrity of the public enterprise);
- External/social and/or political actions reacting to governmental measures or projects which can affect all sectors socially (e.g. non income-related taxation) or politically (employment policies, public services etc.) or the public sector at large (salary freeze, staff cuts, social security etc.). The 1995 massive national strikes against the Juppé government and its ultra-liberal measures [Cassen 1996] are an example of this and had a long term effect (Président Chirac called another election and socialist Lionel Jospin became Prime Minister instead of republican Alain Juppé). These strikes involved many central union federations at national level.

Socially orientated and internal strikes (e.g. against the 1993 budget on 25th November 1992) usually reach around 20% staff participation [Ribeill 1994:52]. Political union actions, for instance the 31st January 1990 strike against the "Contrat de Plan" which was organised by all union organisations except CGC, can reach 41% staff participation [Ribeill 1994:53]. Between 1992 and 1994, the period surrounding the *Socrate* project, actions became more political and unified; for instance the 27th October 1992 European strike against the 91/440 European directive and for defending public rail enterprises involved 28 European rail unions [Ribeill 1994:54; see also more recent European petition against privatisation in rail, CGT-CFDT-CFTC-CGC-FMC 1994]. The year 1993 saw more focussed and radical activities against strategic directions (employment, public service mission and integrity of the company) which Ribeill [1994:59] interprets as a reaction to: new internal corporate and managerial priorities which diverge from cultural and organisational reference points; a destabilising external political context that renders the political future of rail uncertain. Ross [1998] also argues that:

> "Organisational conflicts over policy priorities play a crucial role in transport issues and by linking newer, post-industrial (e.g. environmental) policy concerns with traditional, class-based issues" (...) "the idea of a common cause [emerges] due to combined economic and socially re-distributive functions of transport systems" [Ross 1998:29].

Interestingly, management and unions often articulate the same concerns and political arguments regarding the survival of rail [Ribeill 1994:61]: harmonisation of competition conditions across transport modes, political co-ordination of infrastructures financing, equal negotiation of contributions towards public service missions [e.g. FO 1994; LDM Interview 8; MG, MN, Interview 17]. This is best expressed by Bernard Thibault's (CGT Secrétaire Général) comment that "today a cheminot in four works to pay the debt back" [quoted in Cuq and Bussereau 1994:97; see also FR3 1997]. Yet Jacques Fournier, who was an almost militant SNCF president in his defence of the notion of public service [Fournier 1993; Cartelier *et al* 1996], failed to complete this alliance: his controversial corporate managerial initiatives brought him down [Ribeill 1994:61] – mainly because of a clash between the rhetoric of 'bottom up' empowerement and decentralised responsibility, and the reality of constant 'top down' cost cutting measures, fear and uncertainty. This was best expressed by an interviewee [GC Interview 6]: "at the coal face this is perceived as the right hand not knowing what the left hand is doing". On the other hand, some think that these managerial initiatives at least enabled Fournier to break down what they perceived as "the

old barons" [SNCF 1994e] or "the old feudal system" [AP Interview 2]. Cuq and Bussereau [1994:97] reflect that if these initiatives had been better carried out, it would have mobilised energies and human capital as cheminots, despite their shortcomings, share a sense of belonging and pride in the enterprise and a strong tradition of competence and professional identity [Cuq and Bussereau 1994:100].

The *Socrate* events made unions turn towards the public, passenger associations and rail users as their allies; abandon the inconvenient and ill-received 'all out' strikes; and devise innovative actions such as issuing open tickets [see **Section 5.2.1**], organising debates and exhibitions in stations [CGT 1993b; also available in **Appendix 6**], circulating petitions and leaflets [Fédération des Cheminots 1993; CGT 1993c].

6.1.4 Internal tensions over the introduction of *Socrate*

Clearly the climate was generally tense in the whole organisation. There seems to have been a constant pressure and extreme statements about the state of the crisis of the enterprise, for example "la situation de l'entreprise est grave, très grave"[44] by Jean Bergougnoux [FO 1994], which must have contributed to a climate of fear and uncertainty. This can hinder support for organisational changes, for instance in the "Direction Commerciale Voyageurs" (DCV), the part most directly affected by *Socrate*. The unions had opposed the structural changes at the DCV already mentioned above (**Section 6.1.1**). They were against splitting the DCV into three 'product' units (GL, IdF, regions) as they felt this would lead to disunity, dilute responsibility for public transport and was in fact a preparation for privatisation [Fédération des Cheminots 1992]. Activities "with potential margins" would be isolated to the detriment of others [Interview 17]. The new divided commercial structure would lead to the imposition of cross-functional and geographic mobility, intensification, less specialisation and standardisation of jobs within each of the subdivisions [CGT 1993e].

When the *Socrate* project was first announced in 1990, the DCV produced a report on the introduction of new technologies and planned changes in sales and distribution. The Fédération Nationale des Cheminots responded [1990] by raising concerns about the organisational implications of the introduction of new technologies, their effects on professional qualifications and on the nature of the tools. Stations were to be divided into three categories: (1) those with less than 3MF annual revenues, (2) those with more than 3MF and (3) those with more than 30MF. The cost/revenue ratio per "point de vente" (selling point or PV) was to be no more than the average per type of station. Unions [Fédération Nationale des Cheminots 1990] claimed that the implications would be to reduce costs through staff cuts, leading to the closing of PV in small stations leaving them unmanned. 407 unmanned (or stopping only) stations had been closed down in 1989. In other stations part-time staff on short-term contracts would be employed at peak times only. Similarly, services such as cleaning, car park management, assistance for the handicapped, stations maintenance, providing trolleys or pillows and blankets for night trains, were being outsourced. The DCV planned for sales to shift from 73% to 53% in stations, 3% to 15% through automatic vending machines, and 21% to 27% in travel agencies between 1989 to 1995. Other plans were to provide sales facilities in post offices or newsagents shops. Additionally, the number of

[44] "The situation of the enterprise is serious, very serious".

telephone reservation centres ("Centres de Renseignements Téléphoniques Voyageurs" or CRTV) was to decrease from 103 in 1989 to 26 in 1995, employing more staff on short-term contracts.

Increasing distribution profitability was seen as enforcing competition between the various sales points and distribution methods (particularly from the cheaper call centres), and as constituting threats to permanent staff, job security and prospects. Computing staff similarly opposed IT outsourcing, felt under pressure when comparing practices with AMR staff (working long hours, weekend availability, recruitment of cheaper staff, degradation of salaries) [UFCM-CGT 1993a and 1993b].

Another area of conflict worsened by the new emphasis on different product lines was the one between regional and intercity services ("Grandes Lignes") and their divergent interests. GL was perceived as arrogant but prestigious organisationally, with more substantial budgets and revenues, more educated and technical staff and strategic clout. In the new structure GL was in charge of the overall distribution network and of the *Socrate* project, which was badly received by other divisions (see **Section 6.1.1**).To fears of dismantling of activities, loss of territory and changing alliances was added the fact that the "GL issue was a problem going back a long way" [LDM Interview 8]. Consequently, when the *Socrate* problems happened, "there was little support left internally (...) a 'balcony'[45] blame culture, which was not the usual SNCF culture (traditionally solidarity, passion and pride in the company) prevailed. This has left a scar, a trace in the company" [LDM Interview 8].

A research study by the Université d'Aix en Provence [APST 1991][46] into the possible impact of *Socrate* on the workforce observed that: "technical choices are presented as inevitable" (p.5); the discourse of transforming activities and 'liberating' sales staff does not correspond to working realities; there is the danger of destabilising existing and collective know-how, e.g. the information desk ("Bureau Information Réservation" or BIR) has "accumulated collective knowledge which has not been taken into account" (p.6); *Socrate* could interfere with existing practices as it takes away the often invisible but complex collective nature of work; training is said to make staff more responsible in the whole enterprise (and is related to the new organisational culture changes see **Section 6.1.2**), but at the same time changes in jobs are presented as a consequence of new technologies (p.15) leading to contradictions.

Commercial staff had also experienced increasing difficulties and work pressures in their day-to-day activities [Interview 13]: lack of controllers on trains, staff cuts at ticket offices, closing down of services (information desk, after sales office, luggage services), reduction of opening hours and of tickets on offer. An instance of only one mechanic left on duty at St Lazare, a major Paris station, was cited as a revealing example [Interview 17]. The union for middle managers [CFTC 1993] also drew attention to problems before the *Socrate* launch such as lack of training, poor data quality, ill-conceived internal and external communication; and also to what they considered as strategic mistakes: closure of stations and ticket offices, staff cuts (including on trains, leading to more fraud and profit losses), poor quality of services, expensive audits from consultancy firms which were perceived as not politically neutral [CFTC 1993]. This context made many employees wary rather than resistant to the new system, seen as "imposed from the top" and disconnected from working realities [Interview 17]. CFTC [1993] for instance agreed

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[45] This alludes to the headquarters buildings in Paris, a set of late 19th century houses with many windows and balconies and interconnecting courtyards. GL staff felt physically exposed at the balcony stared at by the other divisions with glee.

[46] It was commissioned by the "Comité Central d'Entreprise" [JMP Interview 12].

that SNCF had to respond to EU and economic pressures in order to "develop services on offer and protect our sales"; but that although necessary, *Socrate* should have been accompanied by suitable organisational reforms.

Personalities involved played a role too and contributed to tensions at top level. Jean-Marie Metzler, Director of the *Socrate* project (and Director of the DCV), and Jacques Fournier, the president, had very different styles, personalities and preferences, including politically (the former to the right, the latter to the left, whilst the government was socialist).

Nevertheless, despite occasional confrontations and differences, they both assumed their responsibility when the *Socrate* events occurred. The president faced the press and the public and gave many radio interviews and press conferences [SNCF 1993e]. He did however leave many unsolved problems to his successor Jean Bourgougnoux in May 1994. Jean-Marie Metzler was even more closely associated with the events in the public eye and obtained the nickname "Monsieur Socrate". He gained respect from many of his colleagues in taking the blame internally and externally [Interviews 3, 4, 7, 9]; although a FNAUT representative [GDA Interview 18] joked that he had been put in a 'golden cupboard' when he was sidelined to International Relations and put in charge of international distribution systems on 1st September 1993. This was also symbolised by moving his office from a top floor to a lower floor at the Paris headquarters, but still located at the front (a sort of tower) of the building where all "top notch people are" according to a waiter in the café opposite.

Perhaps more fundamentally, Metzler can be seen as representing a technocratic, top down, strategic vision of the *Socrate* project; whereas Fournier was more focussed on the organisational changes required to transform SNCF into a commercial enterprise, but also caught in the power relations and contradictions between the government's political indecision, financial pressures and social needs. The choice of *Socrate* as a 'quick fix' organisational solution was not well accepted as it clashed with existing conditions, cultures and skills and it did not build upon them. This gap between the strategic and organisational vision and the climate of crisis led to a tendency to present the changes as purely technical.

6.2 *SOCRATE* AND SALES STAFF

Sales staff was confronted not only with a new computer tool but also a new commercial philosophy [Moissonnier 1993:6]. Yield management and new commercial objectives disrupted the staff culture. There were many existing tensions within the organisation so when problems started occurring, it was much harder to contain them. A rushed pilot phase, complex new interface and inadequate training did not help.

6.2.1 Controversial pilots

A Steering Group was set up between the "Direction Commerciale Voyageurs" and staff representatives in 1991. It was intended that unions would be kept informed about the evolution of the project and that they would visit pilot sites. This started happening, but communication became flawed. Bernard Bondu (CFDT Secrétaire Général) claimed that user feedback on the pilot sites was hardly taken

into consideration when the software was modified and eventually finalised at the end of 1992 [PLR Interview 16].

In an effort to get user feedback, SNCF commissioned the "Agence Nationale pour l'Amélioration des Conditions de Travail" (ANACT) to monitor the pilot sites through interviews and observations [SNCF 1992f]. The choice of pilot sites was voluntary and the first phase involved installing the software in a representative selection of stations (small, medium, large); in the second phase this was expanded to one site per region; and in the final phase, due to take place in January 1993, the system was to be used by 15,000 sales staff ("agents commerciaux" or AC) and 11,000 "agents commerciaux trains" (ACT or ticket controllers in trains).

The "Direction Grandes Lignes" claimed that Phase 2 (November 1992) went well. The CGT union [1992b] denied this and complained about lack of training, a simplistic computer simulation, serious technical malfunctions (breakdowns, longer queues), too many temporary rather than permanent staff, and warned that problems would reoccur in the final phase.. In December 1992 (Phase 2/3) 92% of sales staff encountered technical difficulties, an increase from 80% in November 1992. They are broken down into [SNCF 1992e]:

- 25% incidents at central level
- 17% unhelpful messages
- 41% wrong system response
- 49% complex sale transaction
- 16% data anomalies
- 17% system too slow
- 24% complex procedures
- 25% local incidents
- 8% payment problems

There were many breakdowns of the communication interface with the X25 network, which could only be remedied through reloading the software; this seriously interrupted work processes as it took at least 15 minutes which is far too long and increases waiting times considerably especially at peak time (when the average time for staff to process a transaction is 1min30). This was remedied through the implementation of Ethernet local area networks but only in important stations.

Pilot staff was still unhappy in January 1993 and asked to delay the launch and for two more training days. Unions [UFCM-CGT 1993c] stated that the system was not reliable, the training was inadequate, increases of transaction times were unacceptable (two or three times longer), and that the new ticket was unreadable. And that this was likely to lead to poor service and worsening working conditions. ANACT also argued that the planned phases were too tight and measures were taken to space out Phase 3 [SNCF 1993l) and to improve data quality, provide more support and documentation on procedures for exchanging tickets. Phase 3 had been planned on 3 weeks, starting on 18th January with the "Terminaux

Points de Vente" (TPV), the 25th for travel agencies and the 28th for the "Automates Points de Vente" (APV). This was changed to 3 months with the TPV on 12th January and finishing with the APV on 11th April. There were still serious problems in early April e.g. central loading of tapes and manipulation errors, which blocked workstations for two hours on 6th April [SNCF 1993n].

The system went live despite the fact that the majority of sales staff still wanted the software to be simplified [Baverel 1993]. Union representatives expressed regret that training on the pilot sites, which proved unsatisfactory, was not improved. New concepts related to the air industry, such as the difference between ticketing and booking, were only added to training material later on.

In his government report, Moissonnier [1993:14] states that there was a significant difference between the important funds provided for the computer centre in Lille (see **Section 3.1.1**) - in terms of reliability, security, backup, autonomous power, etc. – when compared to more limited amounts for sales staff TPV in stations. He reflects that this contrast led to serious malfunctions "like having a fantastic computer centre but very poor data" [Moissonnier 1993:14]. Unions [CGT 1992a] had also questioned the amount invested in each *Socrate* workstation (8,000FF) as early as June 1992. It would seem that investments on workstations was important to SNCF employees but less so for SNCF management who were more concerned with the technical and commercial changes introduced, although the latter did have a direct effect on working conditions.

Deliberate lack of user involvement?

Unions and staff representatives asked for consultation on *Socrate* itself and the pilot sites, and also on sales team organisation, call centres (CRTV), the new pricing policies, and changes in large stations due to the new system. As soon as the end of 1992 unions asked for extra time to think about modifications to solve problems which occurred in the pilots. Pilot tests were run in such stations as Paris Austerlitz, St Brieuc and Lyon, and showed that the system was running correctly technically, but comments made by staff were not integrated in the design. And new mistakes appeared in the next implementation phases when more sites were connected. Technical improvements were eventually carried out (to the communication interface and fixing bugs); but rather than accepting there may be more serious user interface issues, the underlying belief appeared to be that sales staff were not mastering the new "selling logic".

Eventually, some form of user involvement was put in place and user panels were constituted in May 1993 for consultation on technical progress [SNCF 1993m]. Adams and Cahen [1997:19] go further in arguing that: non involvement of users was a "deliberate, fundamental, and arguably necessary choice to ensure the success of *Socrate* to enforce the company's business strategy"; and that SNCF by not including the users in the development "may have avoided a quasi certain failure" [Adam and Cahen 1997:20]. On the other hand, they also comment that "it is surprising that *Socrate* survived at all" [Adam and Cahen 1997:17]. Lack of user involvement was certainly a cause of staff hostility but only in so far as it was just another area of friction following from a long history of broader organisational problems and tensions.

6.2.2 Interface design and dialogue between sales staff and passengers

Socrate was installed on all workstations on 1st April 1993 despite the fact that sales staff still wanted the software to be simplified. There were bugs and mistakes because of rushed testing and implementation: wrong prices, seats reserved for several people simultaneously, seats reserved without any tag displayed on the seats themselves in the train, and seats reserved for non-existent trains. Waiting times were unacceptable. Issuing tickets was too complex even for relatively simple trips. If the system went down manual procedures were difficult to carry out. Passengers were given 'temporary' yearly passes on paper that would get torn in a few months etc. Beyond the initial teething problems, this section examines the new user interface more specifically and its effects on the nature of the task and on the dialogue between sales staff and passengers.

The sales and distribution system was installed on sales terminals (TPV for "Terminal Point de Vente") and on the computerised ticketing machines (APV for "Automate Point de Vente") at SNCF premises. It was also connected to the Minitel network and to travel agents and other companies with computerised reservation systems. Modifications were necessary since the *Sabre* user interface was inappropriate and a new interface named MULTIVISION was added. Four different versions were designed corresponding to the four following contexts: TPVs in stations, APVs ticketing machines, Minitel and travel agencies.

<u>Terminal Point de Vente</u>

MULTIVISION is in use on TPVs in stations and is a screen management system adapted from air to rail [JPD Interview 9]. It divides the screen into four zones as shown in **Figure 6.1**:

- bottom right hand corner: a menu-driven zone consisting of 16 areas, related to the current transaction and accessible via a pad of 16 keys for further menu options (no mouse access). For instance, pressing the area "Dossier client" will bring up customer details as shown in **Figure 6.2**; or pressing "Fichier RP1" will bring up "Relations Privilégiées" or stored preferential O-D relations, as shown in **Figure 6.3**.

- top areas: seat availability ("disponibilités") on one or two zones if necessary. In the example the top left area displays one way (Paris-Rouen), the right left area shows availability coming back (Rouen-Paris). The following details are displayed: types of trains (TGV, Express Régional), departure and arrival times, correspondence (via EVR, the code for Evreux), types of fares ("classes"), services (buffet, restaurant), and pricing level (N1, N2, N3).

- bottom left hand corner: in this zone, the various options chosen are displayed showing a history of the transaction, which builds the client profile and then produces a ticket. In the example, seat availability from Paris Gare de Lyon (PLY) to Rouen has also been examined for various dates.

There is a keypad with 16 keys corresponding to the 16 options in the bottom right hand corner of the screen. Mirroring the 16 screen areas with the use of this keypad was generally praised as very convenient. There is also a normal keyboard for typing station names for instance. On the screen there is a

system status area ("système central") for error messages and a free input line for the sales clerk to note extra information ("bloc note"). Various pop up menus appear on top of this 4 square screen, as shown in **Figures 6.2** and **6.3** or for data input. All the information is available on this unique screen; this is an advantage over the previous system where sales clerks had to remember information from one screen to the next. Having a history of the transactions carried out for this customer so far (bottom left hand corner) also helps remembering the various options already examined. This screen design seems comprehensive and clear, although sales staff claimed that there was too much information on the screen, making it unreadable, and they also asked for the capacity to zoom in and out [SLG Interview 13].

The issue of interaction control is not so clear cut. The logic of the sales transaction is imposed by the system in that it is driven by seat availability. This presumes a particular type of transaction and logic of communication between the buyer and seller. Seat availability is provided according to "classes" of fares, which are complex and were new to staff. For a specific train at a given time, the computer system will nearly always have offers and the premise is that a transaction will always lead to a successful sale in whichever class is left. Emphasis is also put on the "Dossier client" or customer profile, which keeps a history of all transactions for regular customers. This is perceived by sales staff as 'objectifying' customers and as trying to sell them more, possibly in classes of fares equal or superior to what they have purchased in the past [SLG and NR Interview 13].

Disponibilités ALLER 27/11/93
PST PARIS ST LAZARE à ROU ROUEN

train	heure	via	classes	services sup
1 TGV R	11:16		1A3 1AJ1 1AC7	B R N3
08721	15:18		2A7 2AJ7 2AC2	
2 TGV R	12:56		1A7 1AK3	B R F N2
08625	15:06	EVR	2A3 2AJ2	
EXP RP	15:19	EVR	1A7	
03689	17:45		2A5	
3 TGV R	14:16		1A4 1AJ7 1C2	B F N1
08737	18:18		2A7 2AJ3	

Disponibilités RETOUR 27/11/93
ROU ROUEN à PST PARIS ST LAZARE

train	heure	via	classes	services sup
1 TGV R	16:23		1A3 1AJ1 1AC7	B R N3
08972	20:25		2A7 2AJ7 2AC2	
2 TGV R	17:23		1A4 1AJ7 1C2	B F N2
08973	21:25		2A7 2AJ32	
3 TGV R	17:57		1A7 1AK3	B R F N1
08972	19:54	EVR	2A3 2AJ2	
EXP RP	20:03	EVR	1A7	
03689	21:54		2A5	

Affichage du dossier voyage No 1414
Affichage du dossier client No 456
Dispo de PLY à ROU le 23/11/93
Dispo de ROU à PLY le 23/11/93
Dispo de ROU à PLY le 25/11/93
Dispo de PST à ROU le 27/11/93
Dispo de ROU à PST le 27/11/93

Système central: OK
(message d'erreur ou de confirmation)

(Bloc note : 1 ligne)

RP	Origine	Destination	Date 27/11/93
Fichier RP1	Via	Classe Serv	Heure
Retour	Dossier Voyage	Dossier Client	Direct/ 3 segments
Suite disponibilité	Réservation	Prix	Tarif

Figure 6.1 Screen example of availability for return tickets [Faïta 1993b:155]

Dossier client No 456

Nom: Martin Prénom: Pierre
Adr: 116 rue de Saussure
75017 PARIS
Tél: 99 99 99 99

Parcours: PLY DIJ Paris Lyon/Dijon
Classe: AS2 Assise 2ème
Placement: NFI Non Fumeur Impératif

Figure 6.2 Customer profiling [Faïta 1993b:156]

RELATIONS PRIVILEGIEES – Fichier 1

1 PST ROU : PARIS ST LAZARE – ROUEN
2 PST CAE : PARIS ST LAZARE – CAEN
3 PST LEH : PARIS ST LAZARE – LE HAVRE
4 PLY MSC : PARIS LYON – MARSEILLE ST CHARLES
5 PLY LPD : PARIS LYON – LYON PART DIEU
6 PLY DIJ : PARIS LYON – DIJON
7 PLY AVI : PARIS LYON – AVIGNON
8 PLY VAL : PARIS LYON – VALENCE
9 PLY MTP : PARIS LYON – MONTPELLIER
10 PLY TOU : PARIS LYON – TOULOUSE
11 PLY NAR : PARIS LYON – NARBONNE
12 PLY JOI : PARIS LYON – JOIGNY
13 PLY AUX : PARIS LYON – AUXERRE
14 PNO LIL: PARIS NORD – LILLE
15 PNO AMI : PARIS NORD – AMIENS
16 PES MET : PARIS EST – METZ
17 PES THI : PARIS EST – THIONVILLE

VOTRE CHOIX? ☐☐☐

Figure 6.3 Privileged relations [Faïta 1993b:162]

Sales clerks also found that because of the amount and complexity of information on the screen, it was more difficult to build routines and automatic gestures [Interview 13]. This leads to visual fatigue and further mistakes. To minimise reading and transaction times sales staff go directly to availability and ignore timetables. The emphasis on preferential and most frequently asked O-D relations [**Figure 6.3**] can be seen in the same light. This is similar to travel agents booking 90% of airline tickets from the first screen display [Taib 1990]. Only offering times that sell can lead to sales agents not offering some trains which appear last on the screen and jeopardising their future existence. Another implication of the user interface design mentioned by consultants [Faïta 1993b:157] is that: when several passengers want to travel together but benefit from different types of discounts, three transactions have to be carried out and three tickets produced, increasing the workload.

Travel agencies

In travel agencies, the previous system seemed very easy to use compared to the new interface [KM and HB Interview 15], which is less polished than the one for TPVs. Town codes are not normalised between SNCF and air reservation systems (unlike between air reservation systems). Before requesting a ticket, the agent must consult a list of stations in a leaflet or on the screen and write down the town code (there is no cut/paste facilities forcing users to write down codes from screen to screen) then enter the query with separators such as !, $, etc. If another request is necessary the agent must start all over again in order to compare with a different route or another type of fare. *Socrate* cannot: give a price unless a reservation is initiated; output a ticket for a whole group using discounts; or incorporate on a single ticket part of a route which is not a pre-recorded O-D relation. The interface rationale was that travel agents would already be familiar with CRS types of dialogues. However, since codes are different, agents must now cope with different systems for *Socrate*, *Amadeus*, Club Méditerranée, etc. This may be partly alleviated by the agreement between SNCF and *Amadeus* [Anon 1995] that enabled *Amadeus* subscribers to book SNCF and Eurostar rail tickets from their existing terminals from 1996. The large chain of travel agents investigated only had one employee specialised in the use of *Socrate* to whom requests from all branches were directed. According to their training manager it is not worth training all staff on this system [KM Interview 15]. In fact, the largest tourism chains which offer their own package tours as well as tickets from many airlines, tend to build (or partly buy or lease) their own information systems [Faujas 2000] which are often integrated with one major GDS (or parts of, depending on cost). This is to avoid having to manipulate too many CRS and GDS [KM Interview 15].

Automate Point de Vente

There are two sorts of computerised ticketing machines or APV. Some are a complement to traditional means (ticket sales counters) and are placed in large stations to ensure a higher number of transactions. Others are placed in small and medium-size stations and are used instead of sales counters leading to staff cuts. This has other effects: often the station employee was multi-skilled and performed a commercial role as well as operational and safety tasks. This policy has had de-motivating effects on employees. Commercial posts are often part-time short-term contracts. In terms of transactions with passengers, the *Socrate* APV suffers from problems similar to many other automatic ticketing machines; but the complexity of pricing, of the variety and validity of discounts and the large number of destinations all add to the difficulties in 'reducing' human interactions to machine transactions [Foot 1993]. APVs require as many transactions as there are types of discounts; group tickets are not catered for; paying mechanisms go wrong leading to queues and delays at peak times; human agents are needed to explain how to use the machines or to carry out the manipulation themselves [NR Interview 13]. Foot shows how difficult it is to anticipate such practical problems and take account of human agency; he also argues that the design of automatic ticketing machines ignores the symbolic nature of commercial transactions [Foot 1993:17].

Minitel

The Minitel *Socrate* interface is not very sophisticated and users cannot benefit from simultaneous access to a range of timetables, fares, and availability for a specific destination. It supports a

reservation dialogue for a certain day and time rather than consultation; it then provides users with a reservation reference number, which they use at a real ticket office to pay and get their tickets. More recently, Internet access has proved popular and it is claimed it is leading to increased sales [Anon 1999] although pricing structures are simpler than originally planned with the first version of *Socrate*. A Web-based interface can also be more sophisticated and powerful than using Minitel technology.

A changed task and dialogue with clients

Changes in transaction times have been an area of complaint. Adam and Cahen [1997:16] state that *Socrate* transaction times were underestimated at the requirement specification stage as the time for a user transaction had to be shorter than what airlines can afford. The new screen interface gains 7 to 14% per transaction but unions argue that it increases visual and mental fatigue [CFDT 1994]. Now that the job is more computer-related staff is asking for pauses; however there is no SNCF policy on this and some regional directions have stated that when staff interacts with customers they don't look at the screen therefore this does not constitute a fully computerised task. This assumes the nature of the task has not changed and that the new computer system supports the same job as before.

Paradoxically, the computer system does not contribute to a simplification of the job; as availability and prices are constantly changing, transparency has now disappeared. The new commercial logic is determined by the system [GC Interview 6]: the sequence of the commercial transaction is built in the interface, as the first element which appears is the availability for a specific date. The price is only available after six screens. This is reflected in the training slogan "Un train, un jour, une heure" (A train, a day, a time) [GC Interview 6]. The interface displays available trains for a specific time rather than all trains for different time periods. The latter information is available for phone information staff in CRTVs but not station sales staff.

The nature of the work is disrupted. Sales staff used to be selected and promoted on their knowledge of price structures, products and discounts available, and of the rail network. They built their dialogue using this knowledge. Interactions between sales staff and clients generally consist of obvious and less obvious activities [Niero 1993]: listening to explicit and implicit questions; eliciting and clarifying poorly formulated needs; explaining answers; anticipating further questions; managing the interaction with the client and with the tools at hand, for instance by not asking the client to wait too many times whilst searching computer files; verifying, correcting and validating transaction details; managing this particular transaction in its context: queuing pressures, equipment breakdowns, refilling paper etc., dealing with colleagues' demands and being aware of other individual and collective events in the ticket office, time breaks and changes of work shifts, etc. [see **Figure 6.4**].

To support these working practices, computers could be used for repetitive tasks so that staff can spend more time to interact with clients. It is not clear the new system assists in this manner. Dialogue with the client is now more difficult since staff must keep looking at the screen; the dialogue is now curtailed to: "for such a time it is that much, full stop" [Interview 13]. This dialogue does not support the complexity of making a buying decision and it is up to the customer to find a compromise between prices, times and his/her own priorities. The dialogue framed in the machine appears to support faster and more

sales transactions at higher fares. Some interviewees referred to this situation as "organised racketeering" [Interview 17] and "publicité mensongère"[47] [Interview 16].

Through the new system staff felt forced to implement a new commercial policy which rewards quick sales at the least possible cost for SNCF. They felt caught between commercial imperatives and client needs. They were also aware that ticket revenues are necessary to pay their wages and believed that as a result of corporate decisions they were at the 'coal face' of potentially conflictual relationships with clients. SNCF had been warned of serious consumer behaviour problems in adjusting to new pricing and ticketing [APST 1991]. Working conditions for sales staff and train ticket collectors involve relations with the public adding a mental and emotional workload. Ticket controllers on the Paris-Lyon TGV had experienced this for many years. They report a difference between the TGVs and the classical trains [DP Interview 13]: in the former the atmosphere is more individualised, mechanical and conflictual, compared to the latter where communication flows more easily between passengers (through "téléphone arabe") usually with an appeasing effect.

Gare de Lyon. *Sur les 1 000 anomalies déjà relevées par les informaticiens de la SNCF, 200 sont liées au système Socrate.*

Figure 6.4 Gare de Lyon ticket office, Paris, March 1993
[Benhasel and Villeneuve 1993]

The new managerial discourse claimed to put customers at the centre of the enterprise [GC Interview 6]. This calls for providing information and client support during the sales transaction, not just performing quicker sales. It also leads to better job satisfaction but takes longer. Understanding the new pricing

[47] Or "unethical advertising" with respect to the advertised but unfounded availability of cheap tickets on trains in high demand (as manipulated by quota management).

structures in order to support clients in their transactions is only really possible with high quality staff, better qualifications and training [CGT 1992a].

6.2.3 Staff training and skills

Five training days were organised, principally about new pricing structures and the new commercial policies [GC Interview 6]. Those were highly criticised by staff and unions for not providing enough information about the interface and technical aspects [Interviews 13, 16, 17]. Unlike its predecessor, this new system requires a good understanding of what happens behind the screen. A computer-based simulation was used, but its examples were too simplistic and unrealistic. It was abandoned. Some of these problems were blamed on delays in software design and a rushed implementation. Technical staff could not produce material in time to train the trainers who had no real examples to show during the 5 days training sessions [GC Interview 6]. Another four months should have been available to bridge the gap between commercial and operational requirements and to prepare staff to these changes [GC Interview 6]. Seeking involvement from regional staff for instance was not organised by headquarters in time [GC Interview 6].

Training consultants on the *Socrate* project contended that staff had to "own change by implicating themselves with issues such as 'who are your competitors in your rail station?'" [Capdevielle 1992]. This met with resistance. For instance, CGT [1992b] argued that such contents were ideologically unacceptable. Training material was interpreted as asking staff to sell tickets as expensively as possible – just a bit cheaper than plane tickets[48] – and not to mention discounts as "it is up to clients to do it first" [Interview 17]. This also fitted in with corporate catch phrases [CFDT 1994]: "On ne vend pas tout partout"[49] and "Trains à moitié vides plutot que pleins et à bas prix"[50] [Interview 17]. Training sessions were criticised for centering on an aggressive commercial discourse. It is in contradiction with the need to have non-conflictual interactions with users. Words such as passengers, rail users, public service have strong emotional connotations. Replacing them by clients, customers, price differentiation, commercial transactions, alters the working relationship. A gap or "double language" [PLR Interview 16] between the commercial discourse about quality and the reality became obvious. "When ticket controllers working in trains with broken windows for lack of repair staff sit in these training sessions, it contributes to their mental images" [DP Interview 13]. Ticket collectors felt that they were asked to become "income tax collectors" [DP Interview 13].

<u>Skills and qualifications</u>

SNCF had a tradition of training and preparing staff for new jobs and new technical requirements. Internal promotion, in-house and external education and training were important, and a large majority of middle managers have come through internal promotion. The *Socrate* training sessions

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[48] PLR [Interview 16] pointed out that a sales clerk cannot tell clients to buy a plane ticket instead if they are not happy; that placing air/rail competition as predominant is counterproductive as other transport modes (car, coach, bus) are alternatives for most passengers.

[49] "We don't sell everything everywhere" accredited to Jean-Marie Metzler on the grounds that 50% of stations bring in 98.5% of revenues. It is reminiscent of the phrase "We do not stop everywhere" (see Note 16 in **Section 4.3.6**).

[50] "Half empty trains rather than full trains with low fares".

seemed designed to change sellers' approaches to their work. Promotion exams had been based on knowledge of fare structures, discounts, routes, etc. Sales staff was now to deal with sales only and not general information; job status was related to volume of sales rather than experience; work variety was diminished; the sales process was standardised implying deskilling; sales teams with performance objectives were set up; permanent staff was to work with more temporary staff trained in a few days. The message seemed to be that if the machine does everything, unqualified staff is sufficient. Another contradiction was that sales staff was to be "more commercial" (after 3-5 days training) but it was not matched with better salaries such as those in the air industry [Interviews 16 and 17]. SNCF agreed to pay bonuses (from 120 to 500FF a month) and union action ensured another day of training and some changes in job qualifications. Training was entirely rethought and redesigned after the *Socrate* events, with new user manuals, pricing documentation, specialised guidelines (international, urban and regional sales manuals), videos, paper-boards and interactive training aids [SNCF 1994f]. Sales teams' managers, who had been judged ill prepared for the changes, were more strongly associated with training and performance monitoring [GC Interview 6].

New work organisation: sales teams

Under the previous more traditional work organisation, sales clerks (AC or "Agent Commercial" now) had a supervisor ("chef de bureau"). Most supervisors had previously been sales clerks themselves and had been selected internally on their knowledge of pricing rules and regulations. They could easily perform selling and ticketing tasks, provide help if necessary and even replace staff in case of problems. Their technical competence was recognised by clerks and gave them legitimacy. Supervisors were in charge of a sales area regardless of individual staff. Sales areas are split into rapid sales, advance or 'comfortable' sales and reservations ("Bureau Information Réservations" or BIR). A "chef de bureau principal" was responsible for sales in a whole station and had deputy assistants. With the old system, there were more sales staff, supervisors and deputy assistants, up to three times more than current numbers in a station like Paris-Montparnasse [PLR Interview 16].

This was replaced, initially in 1990 with the opening of the TGV Atlantique, by a system of sales teams and managers. Team managers ("Technicien Commercial" or TC) are selected externally and their competence is managerial only. They are responsible for sales teams (individual staff) rather than sales 'zones'. This can present co-ordination problems: a particular team manager may have managed her team well and has adapted the team organisation to changes in demand, but if another team manager has not organised her team properly, this can create chaos [PLR Interview 16]. TCs are accountable to a commercial deputy or delegate ("délégué commercial"). A station director ("chef d'établissement") has several deputies or delegates; the first and second deputies are usually technically or engineering oriented; the third deputy is the commercial one and the fourth deputy is administrative. The commercial deputy is responsible for evaluating commercial results and participates in the formulation of future commercial objectives. Station directors are accountable to a regional director who usually comes straight from one of the "grandes écoles" before pursuing her career at headquarters.

These new managerial/commercial roles are not well understood by sales clerks [SLG and NR Interview 13]. Team managers have rather ill defined competencies and they do not know how to perform

sales transactions or use sales terminals, undermining their legitimacy. They come in at 9am to check that everything is running smoothly then disappear again at 9.30am to various meetings with the station director or elsewhere and their role is to understand the corporate strategy and communicate it to their team. Team managers are assisted by an "agent commercial moniteur" (ACM) whose role is to liaise between the team manager and sales clerks. She is much closer to sales clerks. She has the same working hours and starts at 6.00am, checks that all staff is present, holds the keys to offices and equipment, allocates sales clerks to particular ticket offices, organises breaks, deals with technical incidents, reloads software, changes printers and intervenes with clients in case of difficulties.

Team managers work in a separate office where they evaluate cost/revenue ratios, reallocate clerks, monitor sales per clerk and control resources. Team managers for train ticket inspectors ("Agent Commercial Train" or ACT) have the same role and have even less legitimacy than team managers for sales teams, as they hardly ever set foot in trains[51]. Sales managers set sales targets and objectives. This is seen as dissociated from real work: "it is easy to sit there and say 'we will sell more 1st class tickets, margins will increase by such a percentage'" [PLR Interview 16]. Targets are hardly ever met, which does not necessarily mean sales are decreasing or sales teams have performed badly. An increase of 9% is set and the results may be –5%, but this all seems quite arbitrary: sales clerks have done no worse no better than before, they have coped reasonably well without being able to achieve additional margins. PLR [Interview 16] quoted an example where the target was 0% (Paris-Austerlitz which is seen as declining because of TGVs at Paris-Montparnasse) and sales staff achieved an increase of 1.3%. The sales management and control system could not really cope with this. Reward, appraisal and promotion mechanisms do not seem to work very well in this context leading to demotivation, and appraisal was boycotted [Interview 17].

Sales staff was generally criticised for not understanding the new commercial principles, not knowing how to sell with the new system and not delivering the expected results [EC Interview 3]. The new *Socrate* selling techniques were to be supported through team management, team managers and individualised planning and control in order for staff to commit themselves to the new objectives [Capdevielle 1992]. Competitions and games organised between sales teams to encourage this commitment were received with scepticism and produced few results. The introduction of teamwork to replace line work has been shown by critical management theorists [Ezzamel and Willmott 1998] to extend rather than supplant traditional hierarchical systems of management control. "Self-managing demands of teamwork contravened workers' established sense of identity (...) and had the unintended effect of fermenting hostility toward the managerial goal of making the teams fully self-managing" [Ezzamel and Willmott 1998:358]. Realising that this 'conceptual' approach had been too brusque and that change needs to be "accompanied socially", SNCF executives have since been developing more progressive training and management methods [GC Interview 6].

6.2.4 Not against *Socrate*: another way of using it

[51] Train inspectors do not like being followed around by their supervisor whilst doing their jobs and would resist their presence quite strongly. They may even use it in incidents with passengers and say "Oh well, my boss is just here as it happens..." to put them on the spot [DP Interview 13].

Unions and staff representatives have been very keen not to blame the technology or computer staff or even Jean-Marie Metzler "who in fact was doing his job very well! " [PLR Interview 16]. They clearly blame policies rather than the technology [Interview 17]. As early as December 1991 union organisations condemned the new commercial objectives on the grounds of collective social costs and environmental consequences (energy consumption, pollution, safety, accidents, road traffic saturation). 'Pure' competition leads to poor utilisation of rail infrastructures, some are under-utilised when roads are choking with traffic. Instead of competition across sectors, they argue that there is room for complementarity and combined transport in the interest of the public; and that *Socrate* could be used for integrating different modes of transport and consider social aspects [Prades 1993].

They suggest other ways of using the technology. CGT [1992a:15] advocates to use the computer to support a dynamic, responsive commercial attitude towards passengers; to have more sales points with well qualified staff; to maintain all services, reservations, information, timetables, etc. and types of tickets; better promotion and training prospects; more breaks in call centres particularly (a minimum of 30 seconds least between calls, and 20 minutes pauses every 2 hours); and to use technology to enrich work in the stations as well as services offered to clients [CGT 1993e:5].

Examples of improving services have been transit suites for business travellers with fax machines, telephones and Minitel connections in Dijon station. Unions criticise SNCF management for limiting such developments to small highly lucrative niches to maximise revenues. Other customer groups could also benefit from these, such as young people. The potential of *Socrate* is put forward and it is envisaged as a mean to rebuild public trust and reaffirm the public service mission, thereby reclaiming modernisation and regaining control of the technology.

6.3 FLEXIBLE INFRASTRUCTURES AND RESOURCES: THE LOGIC OF IT-INDUCED MARKET STRUCTURES

6.3.1 SNCF restructuring: strategic/organisational fit

The use of yield management techniques is a management tool for maximising profitability through controlling organisational costs. Yield management can potentially transform transport planning through a more flexible allocation of trains to match commercial needs. Distribution of resources, decisions about new equipment, infrastructures and investments, cost reductions and passengers' financial contribution can be directly related to the results of yield management and resources can be moved across the rail network. Relationships between commercial, maintenance and operational services are affected. Decisions and power relations are transformed in an organisation where traditionally engineers and technicians dominated. The nature of the SNCF public network and the existing organisational culture and power base are altered.

Other affected areas are the relations between purchasers and suppliers and the centralisation of decision-making. The electronic network enforces a concentration of financial, technical and commercial means on 'core' activities, and the outsourcing of peripheral tasks such as property management, maintenance, etc. There is a process of rationalisation and specialisation of the distribution network,

with points of sale in stations curtailed to match demand and the growth of hubs. In terms of human resource allocation, there is loss of sales jobs and the setting up of automatic ticketing machines. Inspection staff may be replaced by more intelligent check-in systems. Job flexibility is enforced through standardisation (all sales staff to do the same job everywhere and anywhere), intensification (through automatic monitoring of sales transactions) and casualisation of labour (e.g. part-time workers for peak periods) [Lemaître 1995].

Socrate enables SNCF to go beyond the objective of just maximising revenues. Through yield management, the offer can be kept at a slightly lower level than matching demand so as to maximise revenue per seat. Material utilisation is optimised and maintenance organisation is modified. This has effects on working conditions: repair and equipment workshops are reorganised from normal working hours to rosters of three times 8 hours [PLR Interview 16]. This is not to say that there is a direct causal relationship between yield management and new maintenance regimes, but they are both aspects of the same managerial principles and they reinforce each other. As already argued in **Section 4.4.1**, the technology is simultaneously a condition and a consequence of – or it both allows and arises from - organisational changes.

The management of rail companies is made to follow principles usually applying to commercial enterprises, which imply a separation, in accounting terms to begin with, of exploitation activities from infrastructure management. In their 'post *Socrate*' government report, Cuq and Bussereau [1994] advocated accounting for the direct costs of increased use of infrastructures, externalities (congestion, pollution, safety) and passenger contributions towards infrastructure costs. Accordingly, "if all this information is taken into account properly, yield management can lead to better customer choices for the system and optimal allocation of resources" [Cuq and Bussereau 1994:62]. They stated that SNCF did not go far enough with *Socrate* and that there is a need to know infrastructure costs line per line, through O-D relations accounting [Cuq and Bussereau 1994:66]. They recommended that financial modalities for infrastructures should be readjusted through stronger involvement from public authorities; and that public investments and market modalities for infrastructure charging should be decided through political intervention (p. 68) and individualisation of infrastructures (p.84). An institutional split logically follows.

6.3.2 Split between infrastructures and operations: information gathering and market segmentation

As outlined in **Section 4.3.3**, SNCF did eventually split in January 1997 into two companies, "Réseau Ferré de France" which looks after infrastructures, and SNCF now dedicated to operations. Several interviewees in 1994 had predicted that this would happen and indeed called for it [GC Interview 6; GV Interview 14; PLR Interview 16]. In a sense, the problems surrounding the implementation of *Socrate* raised a public debate about economic issues and infrastructures funding particularly. *Socrate* was seen as a way to recoup TGV infrastructure investments assumed by SNCF, when they should have been paid for by the State. Many felt that the organisation was put in an unfair position, having to constantly increase productivity and cut costs to repay for these investments. Some argued [GC Interview 6] that further divisions into strategic units were also necessary and would ultimately occur: "Grandes

Lignes" for long distance trains, "Ile de France" for urban/suburban transport and "Services Régionaux Voyageurs" for regional transport [GC Interview 6]. Customers would pay for GL; IdF and SRV would be partially funded by local and regional authorities in the public interest. There would be competition in sales and distribution, not only with travel agencies but also between ticket offices in stations, from these new commercial entities and others, like airline companies in airports [see **Figure 6.5**]. The importance of distribution systems is clear and *Socrate* was envisaged as multi-hosting air, rail, car and hotel products from any company. This implies open access to national rail infrastructures to international operators, groups of traditional national public rail operators or even new private transport operators, such as Virgin [GC Interview 6].

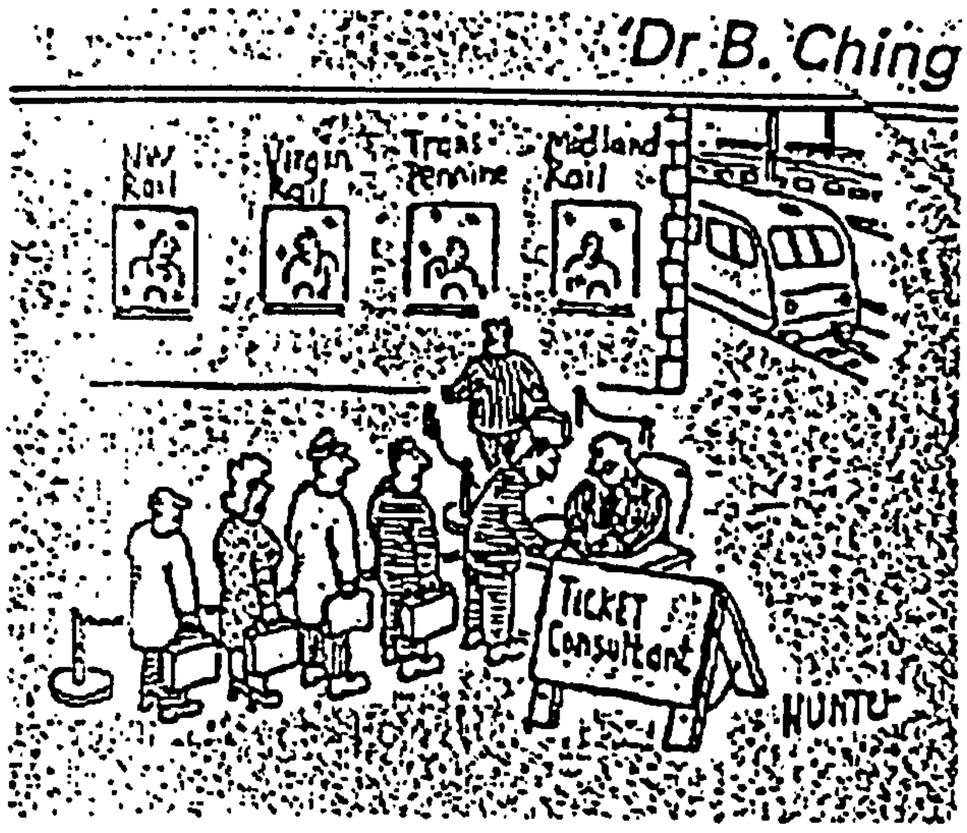

Figure 6.5 Ticket consultant, Dr B. Ching, *Private Eye*, No 993, 14th January 2000

The restructuring of the US air industry into hubs and spokes resulted in a split of the market between firms, with fewer and bigger 'trunk' companies occupying the 'inter-hub' market, and local companies left with the smaller and less profitable routes between the hub and the spokes. A similar restructuring of the network, in the French geographical and transport network context, follows from this logic. Combined transport and complementarity, for instance with the coach companies competing for profitable hub to spokes segments to the detriment of less busy routes, and rail for hub-to-hub, is already happening in many parts of the network. However, intermodal competition between road, air and rail on hub-to-hub would require an arbitrage in terms of profitability, accountability and fair competition. It is symptomatic of the emergence of a new market: an information market, which can readily identify profitable market segments, to be shared with firms potentially competing in other markets, possibly resulting in alliances and cartels.

If rail transport is to be seen as a contestable market, deregulation must entail the suppression of 'artificial' entry and exit barriers. Infrastructure costs (sunk costs) have to be detached from operational costs, so that individual market segments can be accounted for separately and therefore made exchangeable. The integrated computer systems *Socrate*, *Thalès* and *Aristote* (see **Section 3.2.3**) facilitate this and provide information for competitive leverage. Whereas deregulation in the US affected air

transport, which led to frantic price competition, in Europe, deregulation is affecting different areas of transport simultaneously. Cross-sectorial co-operation and competition may take the following forms [Bjorn-Andersen and Nygaard-Andersen 1995]: vertical integration of the distribution channels; and horizontal integration through alliances with competitors. Inter-organisational links aim to establish entry barriers as well as economies of scope. Technological networks play an important role in creating interdependencies in these new electronic markets [Eistert and Krcmar 1995].

6.3.3 Global electronic tourism systems

The tourism sector is currently being transformed into an intensely competitive, global arena, highly dependent on international distribution channels, and subject to electronic dis-intermediation and re-intermediation [McCubbrey 1999]. In recent years, other areas of the tourism industry have joined airlines in the use of yield management technology, for instance hotel chains, cruise lines and car rental companies (see **Section 3.5**). Some argue that artificial price constraints limit tourism businesses' ability to deal with the seasonality of demand and to optimise profits [Arthur Andersen 1997]. However, national public transport enterprises may feel differentiated demand-oriented pricing supported by yield management, is inconsistent with their public transport mission and politically untenable. Additionally, international travel depends on national infrastructures.

Yield management in distribution channels can be seen as an essential mechanism which can make businesses compete 'freely' through electronic markets. However, it raises many questions and can misfire when used in rail transport. Among European tourism and transport companies, British Airways, Lufthansa, SNCF and the Club Méditerranée are the only ones generally acknowledged to have top-level expertise in CRS and yield management [Arthur Andersen 1997]. SNCF is the only rail company but its currently unsuccessful transformation into an international rail distribution provider and organiser of travel and tourism (as opposed to transport)[52] can be attributed to the tensions between demand-oriented pricing and equal access to transport.

Redefining rail transport as a service industry amenable to marketing and segmentation principles presents problems. Market segmentation and price differentiation are technically difficult to implement in railways. The travelling public is large and complex and these techniques can lead to a mixing of segments and a failure to distribute demand more evenly. Some claim that a transport revolution is in process [Messerlin 1997]. The responsibilities for local, national and global transport infrastructures, and the boundaries between commuting, leisure, business travel and tourism will probably be incrementally [Graham *et al* 1996] redefined and renegotiated before global electronic markets in transport can operate.

6.3.4 Information systems, managerialism and the segmentation of transport

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[52] Note the presence of the words "Affaires" (business travel) and "Tourisme" in the *Socrate* acronym ("Système Offrant à la Clientèle des Réservations d'Affaires et de Tourisme en Europe") as well as the word "Europe".

The nature of SNCF and rail transport is being fundamentally affected by IT-supported large-scale information gathering. The re-conceptualisation of transport as a business has involved a change in organisational culture and a clash of discourses. The legitimation of managerial as opposed to engineering decision-making has been achieved through the introduction of a new language of economic rationality and performance or a 'market speak', typified by the replacement of public sector specialists with 'generic' generalist managers. "This redefinition is being accomplished with the introduction of new information technologies which are designed to make visible the new accountability" [Doolin 1997]. The solution is being presented in terms of 'better management' and 'more information'. And "the introduction of a managed market represents a translation of the problem into one of competition in which the market is delegated the task of ensuring economic value" [Bloomfield 1995]. However, information is not the product of some neutral recording activity. Such a recording of 'reality' makes it susceptible to evaluation, calculation and intervention. Appeals to 'common' market interests and attempts to make the information systems an obligatory passage point are equivalent to the solutions transforming the nature of the problem.

CHAPTER 7

TOWARDS A SOCIAL CONSTRUCTIVIST ACCOUNT OF INFORMATION SYSTEMS FAILURE

This thesis has attempted to build a social constructivist account of an IS failure case study in order to find more complex and richer ways of describing and understanding the controversial use of IS in organisations. This has entailed the inclusion of broader social, economic, political, cultural and historical perspectives, as announced in the first research objective (**Section 1.3.1**). As such it is not directed towards finding solutions to the problems associated with IS failures, but instead attempts to provide a better understanding of what IS innovation represents and how it is constructed. This phenomenon is both a product of, and an influence upon, our society. We have shown that understanding the reasons for the implementation problems faced by a complex system such as *Socrate* is only possible through an interpretive, emergent and process perspective and a mixing of levels of analysis (**Section 1.4.1**). The analysis explores the interplay between technology, individuals, organisations and social structures and the following contextual factors were investigated (see **Table 4.2**): market, economics, politics and culture. As indicated below in bold italics, relationships can be established between technology, the micro level (individuals and groups), the organisational or meso level and the macro level (markets, economics, politics, culture). These three levels were outlined in **Section 1.5.2** as specific research questions to investigate about technology and change at SNCF.

- The technical problems were found to relate to the more complex nature of rail market operations when compared to air transport markets - ***relationship between technology and markets***;

- The economics of US and European air and rail transport differ in terms of intermodal and intramodal, as well as national and pan-European competition, and liberalisation measures vary amongst European states - ***relationship between organisation and economics***;

- Politics was an important element in the opposition to pricing policies interpreted as forcing passengers onto the more expensive TGVs to the detriment of the 'classical' national regional lines, and leading to the desertification of peripheral zones. Other related political issues are pollution, fair competition, infrastructure and social costs and equality of access to transport - ***relationship between organisation, politics and individuals***;

- Cultural aspects were apparent in the view that the national rail network would be weakened if split, and that deregulation ignores the cultural and public service differences between countries. Cultural issues also became evident when comparing the *Socrate* project with its

antecedent, the TGV. They relate to notions of national identity, modernism and progress - ***relationship between culture and technology***;

- Organisational changes such as a shift in power relations and in the relative importance of certain professional groups (from engineers to marketing and computer staff), deskilling and work intensification, were seen to be related to the introduction of *Socrate* - ***relationship between technology and organisation***;

All these points illustrate the fact that implementing systems goes beyond simply dealing with technical issues. Contextual factors are interrelated, evolve rapidly and unpredictably, and it is difficult to state whether one is more influential than the others and to assess their relative importance. One major finding is that in transferring a technical solution from one context to another, SNCF was drastically underestimating the difficulties. Expecting technology to reproduce strategic solutions is simplistic. Technical solutions are not neutral, they carry with them assumptions about the context, and they interact with contexts. One important contextual difference in this case was that deregulation affects more complex and multiple transport sectors simultaneously in Europe, unlike the US air deregulation which had an impact on national intramodal competition only.

The second research objective **(Section 1.3.2)** was to explore how the social and the technical are combined and constructed using the controversial aspects of the case study. An effort was made to avoid deterministic accounts and perform a non-essentialist sociological analysis to describe the translations and negotiations leading to the *Socrate* new socio-technical actor network (major research question, **Section 1.5.1**). Analytical insights are summarised below using actor-network theory and the concept of translation **(Figure 1.2)**.

7.1 A SERIES OF TRANSLATIONS: PARTIAL SUCCESSES AND FAILURES

7.1.1 Strategic translation

In borrowing US airline computerised reservation system techniques, SNCF had commercial and strategic objectives that were to increase yields per seat and control distribution channels. The rhetoric of IT-led competitive advantage, due in particular to the role of computerised reservation systems during US air deregulation in the 80s and the almost mythical legend of *Sabre*'s strategic success at American Airlines, were very influential on the thinking of the company **(Section 3.1.2)**. Acquiring a global distribution system in the early 90s was intended to provide SNCF with the first-mover advantage in the European rail electronic market. However, it is debatable whether the strategic coup that American Airlines accomplished with its computerised reservation system could be replicated. Whether American Airlines' experience over many years can be transplanted and duplicated in a different context is a question at the core of the local/global debate.

The rhetoric of *Sabre* as a competitive weapon was translated by SNCF as a potential to gain market share against road and air transport through controlling European distribution channels.

Market demands were presented as the driving force by the *Socrate* founding father, Jean-Marie Metzler. Various technical and economic justifications were put forward too, e.g. the technical limitations of the previous system in dealing with reservation forecasts, which turned out to have been very optimistic (**Section 3.1.1**). As Knights and Murray [1997] point out, tensions surrounding IT management are related to complex sets of power, managerial and market relations; and involve the mobilisation of particular views of the market and technology in order to legitimate choices (**Section 2.3.2**). The emphasis on using information technology as a strategic weapon also illustrates how the technical and the social blend: IT simultaneously addresses and contributes to 'information intensive' market issues, for instance by constantly changing fare structures.

Transferring a technical solution across two cultures (from the US to France) and across two different market sectors (from air to rail) assumes that technology is neutral and universal and that its identity and use can be managed and controlled. However, unexpected translations inevitably occur, due to different cultural and industrial contexts; as a result, and because the social and the technical interact, the solution is perceived differently, alters and has unintended effects. In this case SNCF's belief that the *Sabre* technology could be transported to such a different cultural and industrial context seems simplistic with hindsight; as was their expectation that using this technology could reproduce the strategic advantage gained at American Airlines. It exposes the assumption that technology can solve social issues.

7.1.2 The socio-technical role of yield management

A significant SNCF qualitative objective was to acquire airlines commercial functionality. Computerised yield management and statistical techniques used in global distribution systems are critical in supporting commercial optimisation and complex differentiated pricing strategies (**Section 3.3**). They also correspond to a deregulated transport model and lead to accounting for the profitability of each route thereby transforming routes into individual and competitive products (rather than a national network), and to the maximisation of capacity/revenue for profitable lines. For instance, yield management techniques were associated with the promotion of profitable high-speed trains that compete with planes over wealthy business customers.

Demand-based discounting, differentiated pricing and restricted discounts through the choice of route, time of travel, type of train and purchasing method are related to a belief in the elimination of regulations hindering freely competing businesses. Through this discourse and through yield management, transport is being redefined as a service industry amenable to marketing and business principles, in contrast to 'old-fashioned' unnatural and artificial restrictions and regulations. However, this obscures a conflict between sellers who want flexibility of pricing and buyers who want stability and predictability of prices. The technical (yield management) is therefore intertwined with the social (pricing) and the power relations are obvious. As a passenger representative pointed out, the technology is not neutral: "once it is there you have to use it, it does things that could not be done before" (**Section 3.5**).

The choice of *Socrate* as a strategy for SNCF is a translation of a particular reading of the social and political environment and corresponds to the development of a new technico-commercial actor network. Yet the subsequent translation of social practices through new pricing principles became problematic (see below and **Chapter 5**).

It is also clear that adopting an American airline optimisation and pricing techniques was not just a matter of duplicating strategic success, but implied transferring the US air deregulation model to the French rail situation, which is not problem-free. It has important implications for transport planning and cannot be isolated from current debates on European transport at large.

7.1.3 Transport deregulation, economic relations and political translation

Chapter 4 shows that the cross-cultural transfer of the deregulation model from the US air industry to the European transport industry is complex and politically controversial. Perhaps the most important characteristic of the European scene is that deregulation affects different transport sectors at the same time, as well as European countries differently, whereby US air deregulation had an impact on national intramodal competition only. The European context involves issues of infrastructures, concerning particularly trans-European high-speed trains, complementarity rather than competition, national and regional development and identities, traffic congestion, equal access to transport, and the conflicting and political notions of public transport and liberalised transport.

> "After deregulation US airfares became purely market-driven and as sensitive to supply and demand as a Middle Eastern bazaar. Airline prices no longer bore the slightest relation to the cost of providing the service, which was why a 300-mile trip beginning and ending at a hub airport might cost three times that of a 1000 mile trip *through* a hub airport. Instead airline pricing depended almost entirely on what the market in any place and at any moment could bear" [Petzinger 1995:420].

Yet market prices cannot cover rail production factors and investments (equipment, stock, infrastructures); it is difficult to evaluate external costs; how these costs are perceived and accounted for is a major area of conflict [Descoutures 1992:74]. External social costs are often borne by those who do not benefit from the activity [Perrow 1984:341]. Harmonisation of the conditions of competition across road, rail and air modes is intricate and politically sensitive.

Consequently, gaining strategic advantage in a context of increased intermodal, intramodal and cross-European competition is not as straightforward as it seems, is difficult to manage and control and is politically controversial since it has unintended social, cultural and economic effects and associated costs. These complex political translations explain some of the difficulties experienced when SNCF first implemented *Socrate.* Yield management as a technical object was endowed with the capacity to address economic and political objectives ('natural' competition with air) but ignored another less vocal activity, intramodal competition across trains. The former 'hides' the latter, resulting in an 'unintended effect'.

A current unexpected outcome of the *Socrate* events (an unintended translation) is the redefinition and reorientation of SNCF as a low price mass public rail transport company, with recent

positive results (**Section 4.3.4**). Divall [2000:137] also found that when the British rail industry applied America's experience of diesel locomotives, "institutional, political, financial and economic factors of a domestic nature were far more significant", raising questions about technology transfer and global vs local solutions. He also found that the polemical reference to American experience by British rail managers and engineers contributed to the social construction of the debate.

7.1.4 Pricing, customer ethos and consumer rationality

Sophisticated pricing differentiation through yield management was interpreted by passengers as: increasing prices on trains in high demand; giving priority to high-speed trains; making connections with traditional intercity and regional trains difficult; producing confusing and obscure tickets and difficult ticket exchange conditions; making purchasing decisions complex and time-consuming; reducing the possibility of getting discounted tickets on some trains; enforcing compulsory reservations; and abandoning purchasing convenience, price stability and predictability. Marketing slogans such as "Progress is only worth when shared by all" and "An interactive dialogue to purchase your ticket" (**Section 5.2.2**) created poor public relations and contributed to a degradation of SNCF public image.

This new marketing of train services construes transport needs as an individual consumer need and the onus is on the consumer to seek the right level of satisfaction and exhibit rational decision-making mediated via complex information technology. Whether the notion of individual consumption and commodification of needs is appropriate for collective goods such as train services remains questionable. Train services can be envisaged as a collective means of delivering individual services; but they also correspond to the more general notion of transport, in which the overall organisation of services, their cost, frequency, quality, safety etc., whatever the mode, is considered in the context of collective or societal goals. And reformulating power-knowledge relations in terms of individual consumer choice obscures the politics of distributing these goods. In their relationships with customers, organisations reflect and reproduce social inequalities [Knights *et al* 1997, **Section 2.3.2**]

Two examples of discourses about the changes initiated by *Socrate* are those of Jean-Marie Metzler, *Socrate* director, and of Jacques Fournier, SNCF president, which both draw on technocratic notions of progress. The former argues that customers demand high speed sophisticated transport; the latter relates technology to social progress (**Section 5.2.3**). This vision of modernisation and progress as a 'natural trajectory' [after MacKenzie, see **Section 2.2.1**) also relates to the earlier TGV innovation, successfully introduced by Jean-Marie Metzler in 1981.

7.1.5 The TGV as an antecedent innovation: similar modern cultural connotations

Revisiting the TGV technological innovation highlights common characteristics between the two projects: they both attempted to address a perceived decline in rail transport; became ideal

political solutions for SNCF survival; drew on cultural notions of modernity and progress[53]; reconciled public service missions and profit objectives; and relied on an integrated technico-administrative professional interface with the French State. Yet innovation is a complex and uncertain process and a situated construct subject to unpredictable results. Both innovation processes were situated in similar contexts, leading to similar negotiations, perceptions and conflicts. The TGV innovation became a social success through planned and unplanned elements and coinciding forces and actors. An effort was made to repeat this success. Yet similar processes led to a different result for *Socrate*.

The TGV had formed minds to seeking similar solutions but at the same time it became a handicap as it had itself changed the scene. The TGV was an 'antecedent' to *Socrate*: it is a non-human actor which 'struck back' [Latour 2000]. The TGV increased competition with air, and is a form of hybrid, a 'half train half plane', leading SNCF to seek plane-related solutions. It has unintended effects, for instance passengers use the new TGV Nord line to commute to work from Lille to Paris. This augments the blurring of boundaries between long distance, national, regional, regular and occasional travel (**Section 5.1.3**). TGVs have fixed capacity, one cannot add or withdraw a coach at the last minute, and the price of speed is a loss of flexibility (**Section 5.3.4**). SNCF was accused of having become obsessed with the TGV, with managing capacity through price differentiation and with market segmentation.

Socrate as a non-human actor is also striking back. It raised important public debates about pricing, infrastructure costs and "aménagement du territoire", a French concept concerned with planning and development of the national territory and its regions. *Socrate* and the TGV were perceived as contributing to isolation and impoverishment of rural areas (Massif Central, Brittany) and environmental opposition to new TGV lines grew. Since the 1993 events, the obsession with TGVs is being replaced by investments in normal intercity and regional trains, complementarity rather than competition between intercity and high-speed trains, and a new emphasis on mass public transport (**Section 4.3.4**). Pricing differentiation has been simplified as a result, making yield management partly redundant. Changes were made to simplify and clarify the ticketing and pricing tactics [Bobasch 1997], public relations were improved and SNCF now consults consistently with passengers' associations and the general public [Jakubyszyn 1996e]. The translation to a new customer ethos has not been achieved, for the time being.

7.1.6 Organisational culture, systems and actors and managerial transformation

An organisational objective of the *Socrate* project was to transform the company through the automation and integration of all functions to ensure a flexible management of resources, and to increase the reliability and productivity of sales and distribution. This entailed an organisational translation to a managerial and commercial perspective for organisational actors. Various management programmes were initiated to change a traditionally functional, 'corporatist' and hierarchical organisation to a decentralised, accountable and entrepreneurial company. Outsourcing,

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[53] "Democracy through speed" and "Speed for everyone" for the TGV (see **Note 33 Section 5.3.2**).

performance indicators, cross-functional management, product oriented organisational restructuring, purchaser/provider relationships, changing working conditions, flexible remuneration and promotion were some of the managerial techniques employed (**Section 6.1.1**). In parallel, social and organisational culture reforms were instigated: participatory management, empowerment, social dialogue and decision-making supported by information systems.

These organisational changes were received with scepticism for various reasons. Some conservatism was still present in the company and clashes appeared between the older traditional middle managers and the younger careerist entrepreneurial executives. Authority had been based on administrative or technical legitimacy and the new competencies (commercial, marketing and computing) representing 'managerialist' rhetoric and practices tend to provoke professional and social resistance (**Section 6.1.2**). Traditionally good staff and union relations and consultative mechanisms worsened leading to a progressive breakdown in communications. Union actions became more political and united (**Section 6.1.3**).

Contradictions between short-term cost cutting measures, unrealistic targets and the participatory corporate rhetoric fed disillusions, pessimism and anxiety. All the following contributed to internal tensions over the introduction of *Socrate*: increasing rivalries between segmented intercity and regional divisions (**Section 6.1.4**); poorly run pilot tests and lack of user involvement (**Section 6.2.1**); inappropriate training and user-computer interface; new sales teams management methods (**Sections 6.2.2** and **6.2.3**); a changed and difficult dialogue between sales staff and clients in conditions of job cuts and ticket office closures. The traditional tripartite balance between the government, management and the unions was challenged and an alliance between unions and passengers became logical. Unions were also adamant that technology was not to be blamed and suggested more socially responsible and customer orientated ways of using *Socrate* (**Section 6.2.4**).

The essentially contestable nature of organisational relations is clearly shown here: SNCF and its president Jacques Fournier were caught in the power relations and contradictions between the government's political indecision, financial pressures and social needs. Strategy and change are a contested terrain of discourse rather than a description of a rational process or a prescription for rational action, as Drummond [1996] found in the *Taurus* failure case (**Section 2.1.4**). The choice of *Socrate* as an organisational solution conflicted with existing conditions, cultures and skills and it did not build upon them. Similarly, in her exploration of the *Challenger* disaster, Vaughan [1996] found that a business ideology had emerged and clashed with the complex and unruly characteristics of NASA technical culture (**Section 2.1.5**).

Jean-Marie Metzler's vision was more technocratic, top-down and strategic than Fournier's emphasis on organisational reforms. Yet both would agree that it was right for SNCF to equip itself with powerful and 'modern' management tools represented by *Socrate* and these were presented as neutral and inevitable. The Moissonnier [1993:7] government report on the *Socrate* events claimed that all "surrounding" tensions and problems were "crystallised" on *Socrate*, thereby exonerating the technology by making it an "unfortunate scapegoat"; and that the justification and rejection of the new commercial philosophy were "another problem" [Moissonnier 1993:6], a clear example here of separating neutral managerial technologies from the socio-political domain. The attempt to replace

the old public service organisational culture by a technocratic and commercial one[54] via managerial technologies floundered. As Truex *et al* [1999:118] assert, organisations, structure and systems are emergent, socially constructed and reproduced; "but nothing is ever reproduced in quite the same way".

7.1.7 Potential IT-induced market restructuring and electronic markets

The market transformations instigated by *Socrate* represent an erosion of the French traditional notions of equality of access and public transport. They are derived from - as well as reinforce - the deregulation movement currently sweeping from the US across Europe. With *Socrate*, its yield management techniques and its *Aristote* and *Thalès* components, SNCF can use optimisation software to increase flexibility and marketability of route segments in order to adapt to, as well as bring about, increased competition.

Socrate and yield management software are still in use - even if not fully applied yet - and SNCF is developing expertise in yield management software logic and programs and accumulating travel and customer data. The problem may be seen by some as one of marketing and public relations ("rebuilding trust and public image" as expressed in the Moissonnier report [1993]): once passengers are enticed into new buying and travelling patterns, *Socrate* will enable SNCF to significantly increase its market share and become the leading rail transport company in Europe, as firstly intended. This view identifies only one aspect – customers' cultural habits - as the obstacle. It neglects many other contextual factors. It overlooks what other European air and rail companies may do; how European, national and regional development policies will evolve; what emphasis various governments will put on road programmes; what influence environmental groups may have; how national differences may affect travelling; and how distribution in the travel and tourism industry will evolve. It is difficult to bypass complex contextual factors, to anticipate reactions to systems, and to predict how market structures will change. And it remains to be seen whether *Socrate* can be used to successfully implement an ambitious pan-European business strategy in the transport sector.

On the other hand, one event following on from *Socrate* was the SNCF split between infrastructures and operations (**Section 4.3.4**). These new organisational forms and their integrated information systems are more flexible and correspond to a more refined O-D relations accounting of use of infrastructures and passenger contributions towards costs (**Section 6.3.1**). This could facilitate open access to national infrastructures to international operators (**Section 6.3.2**). Despite a reformulation of transport as a mass public system, a simplification of pricing and a partial abandonment of yield management after the *Socrate* events, liberalisation of freight transport has started through the creation of rail 'freeway corridors' open to competitors in France and Europe. These make use of computerised reservation systems (**Section 4.3.5**). With the separation of infrastructures and operations, the issue of passenger pricing is being transposed to differentiated charging of operators (higher fees for using busy and modernised tracks) and its ensuing complex and

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[54] As Laederich [1993] put it: "les dieux Service Public et Usagers remplacés par les dieux Rentabilité et Technocratie" (the gods Public Service and Users replaced by the gods Profitability and

contested (see **Section 4.3.1**) relationship to infrastructure costing [Bonnafous *et al* 1996]. It is not clear yet whether this mechanism will act as a market regulator, how it will affect passenger pricing and the existing organisational forms [Bonnafous and Seligmann 1996]. What is certain is that IT networks will play an important role in the reconfiguration of the transport industry; one of the aims is that online systems will support 'free' competition on the same tracks (**Section 4.4.2**). And large-scale data gathering for accounting and marketing purposes can enable individual market segments to be accounted for separately and therefore made exchangeable (**Section 6.3.2**).

It will also depend on the evolution of the travel and tourism industry at large, which is being transformed into an intensely competitive, global arena, highly dependent on international distribution channels (**Section 6.3.3**). The long-term threat facing travel agents is the possibility of direct sales from tour operators, hotels and transport companies to the consumer [Arthur Andersen 1997:45]. The advance of on-line information systems makes this threat particularly relevant. Together with yield management and the ongoing efforts to control operations and distribution costs, boundaries between transport, travel and tourism [Page 1998] will need to be redefined before global electronic markets in transport can be fully operational. In a political context of conflicting market and non-market principles, the future effect of global electronic travel markets on European transport industries and the role of national policy-makers remain unknown. Will national transport policy-making be replaced with technology-supported free global markets? (**Section 4.4.2**).

Technology does make certain social relations stable; "technology is congealed social relations" [Willcocks and Grint 1997; see discussion in **Section 1.4.3**]. Information technologies and electronic markets are intervening in the management of commercial and non-commercial multimodal transport activities. Information is being used as a surrogate for free, contestable and global electronic markets. Technology is, if not a causal explanation, at least a condition of possibility for global market restructuring. Instead of seeking cause and effect relationships, one can state that the technology is a condition and a consequence of market changes, or in other words, it both allows and arises from market changes (**Section 4.4.1**). However, no market is a homogeneous entity; the notion of market is a way to manage interests and resolve conflicts. As Bloomfield [1995] expresses it: "The introduction of a managed market represents a translation of the problem into one of competition in which the market is delegated the task of ensuring economic value". Appeals to 'common' market interests and attempts to make the information systems an obligatory passage point are equivalent to the solutions transforming the nature of the problem (**Section 6.3.4**). When you have a hammer everything looks like a nail...

7.2 FAILURE AND TRANSLATION

Exploring the problematic introduction of *Socrate* by examining the various translation attempts across actors helped remove beliefs and assumptions of obviousness usually associated with technology implementation. The analysis used the notion of translation to follow how the project was carried across, re-interpreted, translated and enrolled actors (or not) from one position to another, between micro-, organisational and macro- levels: increasing rail reservation capacity; borrowing

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Technocracy).

airline pricing; attempting to change passengers' buying and travelling behaviour; transforming the organisation and the professional ethos of sales staff; associating *Socrate* to the high-speed train TGV; accumulating customer data; identifying profitable market segments; restructuring the French Railways organisation and the rail network; and exploiting electronic reservation markets. It was also found that introducing yield management techniques in a complex social, political, economic and organisational situation such as SNCF and French society at large is not problem-free. It is not clear which shape this techno-economic network will take and how it will stabilise, since some of the actors' re-interpretations led to unexpected results, a significant one being the redefinition and reorientation of SNCF as a low price mass public rail transport company.

Actor-network theory and the sociology of translation helped describe how the attempts at translation and alignment of interests around the development of computerised reservation systems at SNCF were a relative failure. Failures can be seen to occur when "the necessary translation of the system (...) is problematic and a stable network of aligned interests is not yet developing" [Aarts *et al* 2000:518]. Social contexts are "complex imbroglios of human and non-human components (...) [which] represent the intricacies of the different stakeholders". [Pouloudi and Whitley 2000]. In ANT a given work situation is considered as a network of interrelated people, machines, paperwork and architectures which together produce practices. "The assumption is not that a machine is a true actor in a humanist sense; rather the assumption is that only by taking the active roles of all these entities into account can we hope to understand the functioning of the work practice and the interrelations between its constituents" [Berg 2000:489]. Constituents in this case study were an imbroglio of human actors: individuals (managers, engineers, sales staff) and groups (government, staff unions, passengers) and their associated identities and meanings; and non-human actors: trains, stations, tracks, tickets, computers, software, user interfaces, fare structures. ANT is a strategy for unpacking the complexity of our everyday life. Abbreviations, short-circuits and simplifications are always produced. They are the result of a successful mobilisation process with black-boxing effects.

> "The ordering these simplifications produce is neither neutral nor 'obvious'. They are made obvious or natural in order to achieve an effect – namely to curb opposition or alternatives. For example, the utterly 'obvious' requirement for global information infrastructures to tidy up the existing mess, fragmentation, and local variety is not obvious at all; it is constructed as obvious" [Monteiro 2000:82].

The boundaries between social and technical actors are constructed as a result of this simplification process. Translations succeed when simplifications are accepted as obvious. Yield management, as well as being a non-human socio-technical actor, is an example of a simplification that failed to become obvious or natural. There were disputes about the nature of the problems it addressed and on the reality it inscribed: profitability, deregulation, competition, accountability, segmentation, organisational flexibility, pricing, selling, buying and travelling. And as a solution, yield management (and TGVs before it) also transformed the nature of the problem.

ANT has been criticised for only providing amoral and apolitical descriptive accounts of contingencies (**Section 2.2.5**) and one objective of this thesis was to complement this approach by including power and interest issues. The manner in which problems are defined, negotiated and

maybe shared as 'common' (**Section 2.2.3**) is political and "many historians of technology seek to explore how this politics shaped the very standards by which historical actors judged the success or otherwise of technical change" [Divall 1999:100]. The next section uses Clegg's [1989] theoretical framework (**Section 2.3.4**) to analyse the case study according to the episodic, social and system circuits of power.

7.3 FAILURE AND POWER

Elements of Clegg's power framework help identify empowered and disempowered agencies [Silva [1997:93]. The three 'circuits of power' were introduced in **Section 2.3.4**. The episodic circuit deals with causal power and helps answer the following questions: Who are the agencies engaged in power struggles? What are their standing conditions? What are their projected outcomes? The social integration circuit deals with dispositional power and concentrates on: What is the general attitude towards innovation? What are the institutional mechanisms that legitimate the adoption of innovations? And the system integration circuit (facilitating power) deals with questions such as: What are the techniques and technologies adopted to ensure compliance? Who controls the innovation? Who are the disempowered and empowered agents as the result of adopting innovations?

Silva [1997] combined Clegg's circuits of power and the sociology of translation to analyse several case studies including the London Ambulance Services *Computer Aided Dispatching System*; he found that IS adoption in organisations responds greatly to environmental uncertainties (or exogenous contingencies) rather than to a rationality based on calculations [Silva 1997:96]. Exogenous contingencies affect the social and system integration circuits and the ones relevant to the *Socrate* case study are summarised in **Table 7.1**. The subsequent tables apply each circuit of power to the case study.

Table 7.1 Exogenous contingencies

Exogenous contingencies	Changes in System Integration	Changes in Social Integration
Transport crisis SNCF deficit European deregulation High speed rail networks	Cost cutting Increasing sales productivity	Staff cuts Poor staff relations From public service to selling ethos
Managerial discourses available: - CRS and strategic advantage - New management techniques	Yield management for price differentiation Accounting and marketing data	New relationships to passengers Redefinition of sales jobs Flexible use of resources Uncertain climate Changing authority and legitimacy

The episodic power table (**Table 7.2**) shows that the strong position held by SNCF management, given their resources and their authority for decision making, was not sufficient to produce a successful information system. They failed because the circuits of system and social integration were not fixed in a successful obligatory passage point.

Table 7.2 Episodic power

Social Relations	Agencies	Means and Resources	Targeted agencies
Government SNCF top management	*Socrate* management team	Authority, discretion on policies and plans, financial resources	Passengers Sales staff
Direction Commerciale Voyageurs	IT staff Sales staff	Execution of operations, discretion on operations, membership of trade union	*Socrate* management (system design and use, consultation, training) SNCF management (salaries, promotions)
Sales staff SNCF marketing and communications	Passengers Passenger associations	Some discretion on buying and travelling behaviour	Resisting new purchasing habits SNCF public image

Figure 7.1 shows the power struggle in the episodic circuit [Silva 1997:98]. Particular agencies attempt to interest and enrol other agencies in their programmes. Power factors contribute either to stabilise or unsettle the obligatory passage point (OPP), the *Socrate* system.

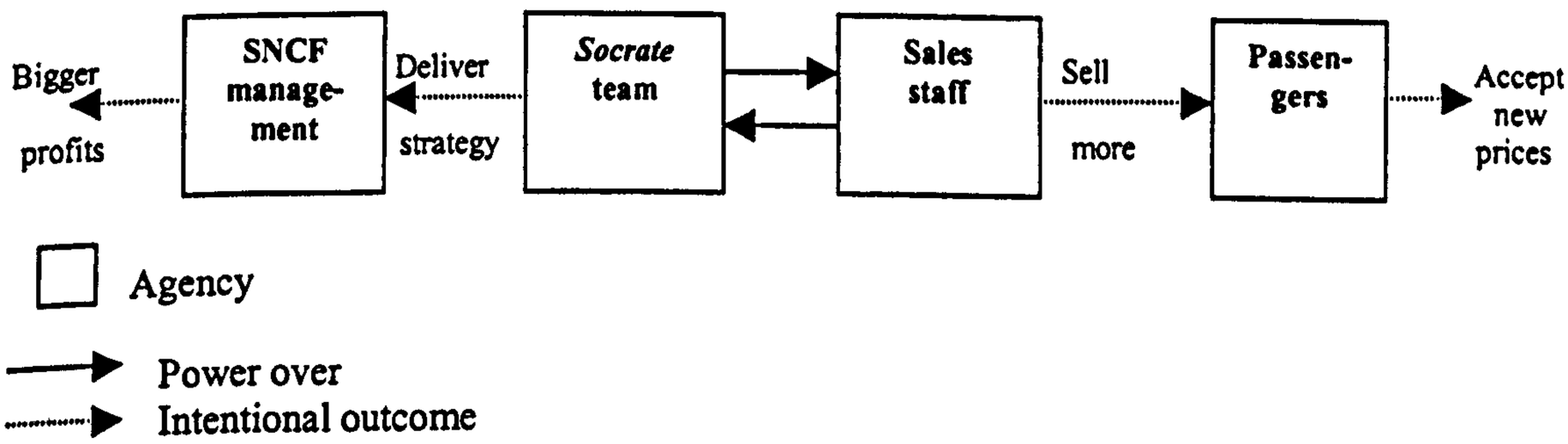

Figure 7.1 Power struggle in episodic circuit[55]

The new information system did not support social integration (**Table 7.3**). The new rules stemming from the new tasks were not translated successfully and the introduction of the system created a gap between management on the one hand, and sales staff and passengers on the other hand. *Socrate* influenced the way employees interpreted management style and objectives. Staff interpreted the system as a threat to their identity, their understanding of their work and of the organisation; managers interpreted staff attitudes and actions as a lack of collaboration and resistance. These

[55] Arguably, there is no 'power over' relationship between SNCF management and the *Socrate* team; SNCF management did have power over the project team whilst negotiating its approval. However, according to most interviewees, the *Socrate* team then seems to have become an almost independent and powerful unit of its own (partly due to Metzler's charismatic influence and his convincing argumentation but also for strategic reasons). Support from SNCF management seems to have been almost unconditional for most of the project life, until the implementation difficulties. Indeed, those difficulties have been blamed in some quarters on the isolation and technocratism of the *Socrate* team, which became driven and insensitive to operational problems.

contradictory interpretations hindered social integration, making it difficult for management to adjust their dispositional power.

Table 7.3 Social integration

Discourse affecting rules of meaning and membership	Interpretation: SNCF management	Interpretation: Sales staff
"SNCF has to become a competitive company"[56]	*Socrate* for strategic advantage	Lack of training Opposition to new commercial policy encapsulated in user interface No improvement of qualifications and work conditions
"SNCF has to become a flexible entrepreneurial organisation"	New sales teams management New organisational culture Organisational restructuring	Object to new sales team management Contradictions between staff cuts and empowerment Managerial legitimacy questioned
Socrate to introduce yield management and new prices	*Socrate* will increase control over operations and distribution costs Old fashioned uncooperative unions Organisational resistance	Resist new pricing structures and selling practices Unions oppose changes to public service mission
Expected results not achieved Passengers' resistance Rebuild public trust but keep system Split infrastructures and operations	"Sales staff do not know how to sell using *Socrate*"	Sales targets unrealistic Staff cuts and closure of ticket offices Worsened dialogue with clients Formed alliance with passengers

The system integration circuit (**Table 7.4**) concentrates on techniques of control, discipline and production. The major effect on control and discipline was that the selling transaction was taken from sales staff and programmed into the new information system; new tasks and new rules were introduced. Organisational measures that accompanied the system increased the disruption brought by the system. The system undermined control and expertise, leading to new empowered and disempowered agencies.

Table 7.4 System integration

Innovations in techniques of production and control	Empowered agencies	Disempowered agencies
New reservation, pricing and ticketing system	Yield management experts decide availability and fares Commercial managers establish sales targets	Sales staff lost control over dialogue with client Targets perceived as unrealistic
New accounting and marketing information gathering	Accounting staff check costs IT staff integrate information across functions	Operations managers become accountable

[56] The sentences in quotes were heard repeatedly in informal conversations and during interviews and seem to summarise the organisational discourse drawn upon.

Restructuring and tighter management control	'Generic' managers allocate resources	Technical specialists and engineers lost legitimacy and expertise

An obligatory passage point (OPP) involves at least two agencies: one proposes it to another. An OPP consists of strategies, discourses and artefacts that the other agencies must accept if they want to solve their particular problems and fulfil their interests. OPPs represent the translated interests, identities and roles of agents. *Socrate* was an OPP linking and translating different actors, management, sales staff, passengers, IT and yield management experts, and their interests or goals, strategic advantage, profit maximisation, sales staff working conditions and skills, passengers' ease of purchase and fair prices, data accumulation (**Figure 7.2**). If the problematisation of the project is successful and accepted by the agencies the OPP becomes indispensable. Intéressement when successful, besides consolidating the identities of the agencies as proposed in the problematisation, interposes devices to isolate the agencies from potential competitors (different OPPs). Failure occurs when problematisation does not yield intéressement [Silva 1997:212]. The plain lines in **Figure 7.2** denote a successful problematisation and the dotted ones an unsuccessful problematisation.

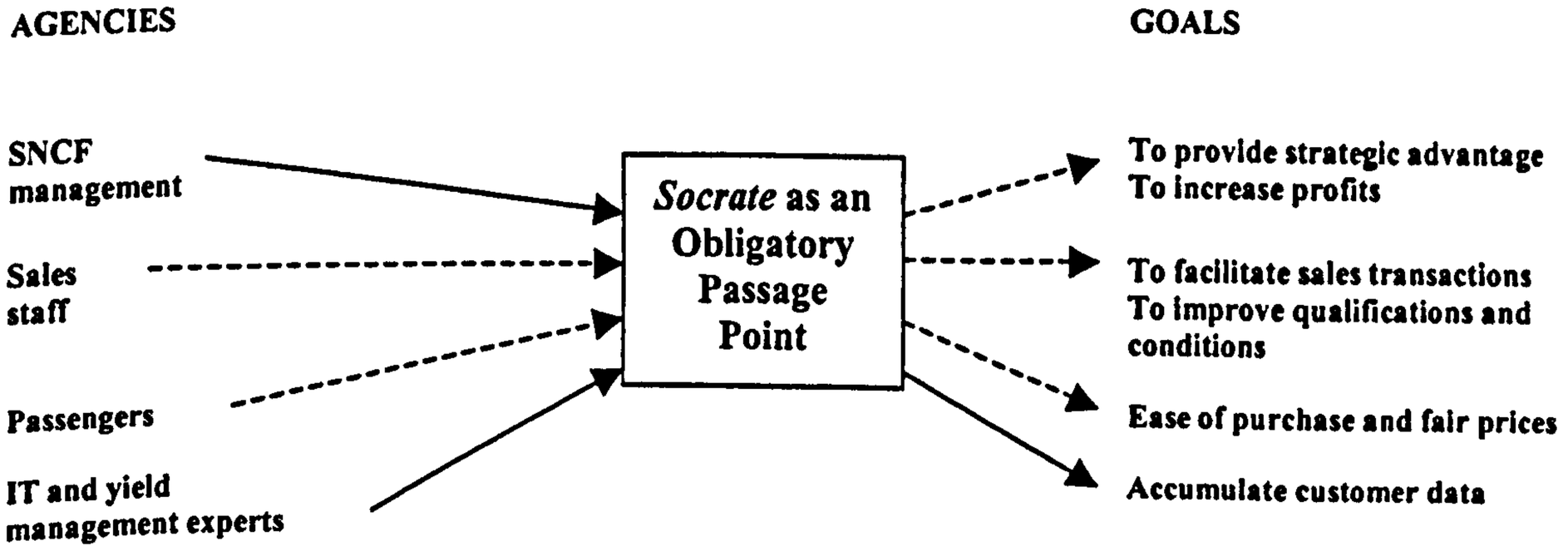

Figure 7.2 Obligatory passage point

SNCF management translated transport deregulation and governmental pressures into using technology to gain strategic advantage. The *Socrate* team translated this into techniques and strategies enacted by a system to increase profitability through yield management. Commercial expertise was inscribed in the form of new pricing rules and a new user-computer interface. Passengers were also translated into the system as rational customers. Sales staff and passengers did not go through the OPP the way they were expected to. If they were to be enrolled, it had to be the result of negotiations, unless enforced enrolment and intéressement are exerted (for instance through using authority or to keep one's job). To analyse the mobilisation of agencies is to analyse the processes by which these agencies end up being represented by spokespersons or actors, including non-human. The stability of the network of agencies and passage point will depend on the stability of the relationship between spokesperson and agency. If this relationship is not achieved, agencies will opt for dissidence rather than mobilisation [Silva 1997:217-218]. For example, sales staff did not

carry out the intentions of the *Socrate* team of selling more and differently, and formed an alliance with the customers.

The circuits of power combined with the sociology of translation can help identify whether and how the information system became an obligatory passage point, and discuss the power factors that contributed to stabilise or unsettle the OPP. Silva [1997:222] found that various scenarios can fail or succeed. Low system and social integration may hinder the adoption of an information system as an OPP [Silva 1997:223]. Conversely, even if there is strong integration of facilitative (system) and dispositional (social) power, it does not guarantee that the innovation will become an OPP. It will also depend on the political ability of the proposing agency to deploy resources (causal power) to either convince or force other agencies to enrol in the proposal. Neither facilitative nor dispositional powers were integrated with the causal power held by SNCF management.

The *Socrate* team successfully problematised *Socrate* for SNCF management. Intéressement of some agencies (Direction Commerciale, marketing and accounting staff, new entrepreneurial executives) was also achieved. However, enrolment and mobilisation (by persuasion or force) of sales staff and passengers did not succeed: resources were perceived to be unequal, objectives as unfair, persuasion failed, and force was not used in an antagonistic climate. Being in a position of authority and having access to resources is not enough. Staff and unions (and customers) had dispositional power too. In fact, there was a reversal of power and backtracking in the use of the system.

7.4 COMPARING WITH TRADITIONAL ACCOUNTS OF IS FAILURE: POTENTIAL THEORETICAL CONTRIBUTION

Together, the sociology of translation and the power circuits framework provide explanatory power about IS failure, or IS institutionalisation as argued by Silva [1997]. The social, system and episodic power circuits highlight how power factors influence success and failure, as illustrated above, and IS adoption in general. These theoretical approaches help focus on understanding the nature of work and the context in which IS are implemented. The social and system integration circuits in particular clearly establish links between IS and managerial disciplinary production techniques, which corresponds to an interest in a more critical approach (**Sections 1.4.2** and **2.3.2** review some of the critical management studies literature). Social integration encompasses formal and informal authority – e.g. sales staff not believing SNCF sales targets, or sales managers not having technical legitimacy with sales staff (**Section 6.2.3**) – and helps see why agents were not enrolled. Identifying organisational groupings and links between representatives and groups represented, or considering resistance as legitimate, help emphasise power as a complex and hidden phenomenon. This emphasis on power and politics compensates for the limitations of ANT outlined in **Section 2.2.5** (considered as amoral and apolitical) since it examines power relations between agencies and how they become dis/empowered.

7.4.1 The questionable notion of failure

More generally, the analysis of failure presented in this thesis is very different from the ones usually found in the IS literature reviewed in **Section 2.1**. A more mainstream IS analysis would for instance maintain that a socio-technical approach to the development and implementation of the

system would have avoided the failure [Beynon-Davies 1995]. In fact, Adams and Cahen [1997; see **Section 6.2.1**] argue that user involvement would have led to the failure of *Socrate*. And we found that user involvement was only a minor concern compared to (**Section 6.2.1**) other numerous organisational problems at SNCF. Another possible interpretation could be that project management was inadequate; this partially explains the initial data input problems and software bugs (**Section 3.2.1**) and rushed pilots (**Section 3.2.1**). Yet there were much more fundamental reasons for disregarding the input of less common O-D relations, for instance, which were of a strategic and commercial nature (**Section 3.1.2**). These traditional interpretations only stress system integration.

Other managerialist interpretations would for instance claim that the IS and business strategies were not aligned, that the configurational fit was not achieved, that there was no leadership, or that the company did not know how to manage change (**Sections 1.3.1, 2.1.3** and **2.1.4**). These explanations may seem commonsensical but remain superficial. What particular change? Why was it problematic? Where did this change come from? This ignores for instance how commercial and market principles influenced and were represented in the information system. These managerialist interpretations only stress social integration.

For the last decade or so, many IS researchers have recognised 'contextual factors' (**Section 2.1.3**) as the main reason for failure: "The major risks and reasons for failure tend to be through organizational, social and political rather than technical factors" [Willcocks and Griffiths 1994:208]. These authors identify such factors as: lack of strategic framework, lack of organisational adaptation, poor management of change, too much faith in the 'technical fix', lack of skills. Some of these apply to the *Socrate* project, which it could be argued, also suffered from problems associated with large-scale projects: large number of divisions, large size, high complexity, newness of technologies, environmental turbulence [Willcocks and Griffiths 1994:213].

These authors suggest a 'risk' framework to establish learning points on the management of major projects which consists of five key areas: a) governance, b) project management, c) market need/economic survival, d) learning and e) risk prediction and management [Willcocks and Griffiths 1994:221-223].

a) The *Socrate* project certainly could have benefited from better governance whereby "major stakeholders organise themselves to establish objectives, allocate resources and make decisions" [Willcocks and Griffiths 1994:221]. But this understanding ignores power issues. Stakeholders are not all equals as demonstrated in the previous section and illustrated in **Section 6.1**; some are disempowered so they are not in a position to contribute to decisions. Drummond [1996] found that constant involvement of all stakeholders led *Taurus* to continue with the project when it should have been abandoned (**Section 2.1.4**) which contradicts this recommendation.

b) Better "balancing of top-down and bottom-up project management" [Willcocks and Griffiths 1994:222] would have been nice in theory, but again this assumes equal participation of actors and reconcilable interests at different hierarchical levels and in different organisational divisions.

c) Market need and economic survival was an area of enormous controversy, as presented in

Chapter 4.

d) SNCF had learned lessons from the past TGV success and tried to build upon it and adopted incremental innovation; in this respect this case study is more similar to the *Challenger* experience where NASA banked on past technical achievements to its detriment (**Section 2.1.5**). So this last recommendation is not particularly relevant to the *Socrate* project and in fact is ill-founded as contexts change, including as a result of the previous innovation. In fact Willcocks and Griffiths [1994:223] refer here to IT learning, skills, etc. rather than organisational or innovation learning in general. In this respect SNCF managed the software project appropriately and its alliance with AMR was successful in transferring yield management expertise for instance (**Section 3.2.1**).

e) Finally, Willocks and Griffiths [1994:223-224] propose a method for predicting and managing risk, which they claim moves away from "ahistorical, acontextual and aprocessual forms of risk analysis". It consists in assessing the following areas that contribute to the 'riskiness' of computerisation:

- the history of IS success and failure in the organisation;
- the external context (government support, use of suppliers and consultancies, maturity of technology, market demand);
- the internal context (organisational structure, strategy, human resources, management, stakeholders analysis, employee relations, IT infrastructures);
- the content of the project (size, complexity, uncertainty);
- the process (governance, project management, user training, time span, IT skills);
- the risk outcomes (cost, time, technical performance, benefits and impact, market acceptance).

These certainly broaden the understanding of failure and include many aspects of relevance to the *Socrate* project i.e. government support, internal context, complexity, market acceptance. Retrospectively, these explain some of the difficulties faced. It is very debatable whether they could have been better managed and avoided at the time. The assumption that lessons can be learned from failures once all these factors are taken into consideration betrays a belief that "human and cultural factors [can be] managed" [Willcocks and Griffiths 1994:212] and that future failures can therefore be prevented by predicting and managing risk. Efforts to combat ahistorical, acontextual and aprocessual outlooks are welcome. However, these are limited as they only concern the history of IS in the organisation and the immediate external context surrounding the organisation. In the *Socrate* project, a major finding was the importance of a previous non-IS technological innovation, the TGV; history of innovation at large is therefore relevant. External actors of extreme importance were European actors and French society, particularly passengers. In terms of process, the process of managerial transformation associated with the introduction of the system was also crucial. One could conclude that these 'factors' should be added to Willcocks and Griffiths's list to ensure they are managed next time round, so the list gets longer and longer...

The problem here is the basic premise of the *possibility* of managing failure and risk, which

is treated as obvious. In fact it is apolitical and managerialist: any management effort consists of power actions that can always have unintended and uncontrollable effects. This apolitical premise corresponds to 'modernist' and instrumental assumptions in management theories, as argued by critical management theorists (**Section 2.3**). In fact, the notion of failure itself is questionable[57]. Having gained a deep understanding of this particular case study and having tried to relate it to IS failure research, I believe that there are no generic solutions to failures, and that the search for these is problematic and managerialist in itself. What I find more valuable and feel more committed to is 'de-naturalisation': the idea that these notions (e.g. failure and also risk [Scott 1998]) which take on a natural appearance are in fact complex and contingent historical constructions. Their power comes from their status as 'natural'. Management (and failure, which could be seen as a subset of management) is such a construction. The point is not that these notions are 'good' or 'bad'[58] but that they articulate, and are enmeshed in, particular worldviews which foreclose alternative forms of social organisation. What is more interesting is unravelling how, why and with what effects. Social constructivism helps in doing this, particularly in seeing the differentiation between what is technical and what is social as a matter of power [Silva 1997:225]. Management and IS implementation are social constructions filled with history and political motives, as illustrated on many occasions in this thesis.

7.4.2 IS research: richness vs rigour

These issues relate to current debates on the nature of IS research. Hirschheim and Klein, two of the IS "great wise men" [Hirschheim and Klein 2000:244, their expression which can be taken as ironical,], recently complained that:

> "It now appears as if IS research has come full circle by returning to new forms of story telling (the politically correct term is, of course, 'narratives'). Whereas the new story telling movement can point to much better and more explicit philosophical grounding than 'the great wise men' had for their stories, this does not necessarily make them more general".

They thus place the debate in terms of richness versus rigour: rich accounts or 'stories' do not provide rigorous general findings[59]. Related debates in the IS field have occurred in the last few years over qualitative versus quantitative research methods. Assuming that results from a rich case study such as the *Socrate* story should be generalisable and transposable to other contexts betrays beliefs similar to the ones outlined above; and of course, nothing is every reproduced in quite the same way. It also leads to what I think is a false debate. IS researchers, like all other contemporary

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[57] This is connected to the idea that in fact there are only partial or relative successes and failures. It depends on interpretations. *Socrate* was seen as a success by some executives and yield management experts: they thought that the system put SNCF in a much stronger position, and they were certain that the system would provide competitive advantage and useful data in the future; on the other hand, passengers, some staff and unions would say it was a failure as extreme pricing differentiation was withdrawn, ticketing was simplified, and yield management not fully exploited.

[58] It is difficult for management to avoid a technologically deterministic way of acting and thinking since the demand for profits almost always pushes management towards 'quick fixes' of the kind that technology appears to promise [Knights and McCabe 2000:169].

[59] It is also strange to establish such a dichotomy, which implies that rigour cannot be rich or richness rigorous...

social science researchers, should consider the constructed nature of people and reality; the negotiated and problematic status of discourse; the power/knowledge connection; and the fluid boundaries between knowledge, technology and action in the contemporary world [Alvesson and Deetz 2000]. Methods to research IS in organisations are not only to do with rational, neat and orderly accumulation of cleaned, streamlined, rationalised and non-contradictory accounts. More than particular techniques and procedures, method is a mode or framework for engaging with empirical material; how one attends to social reality; what vocabularies are used in clarifying and reinterpreting what emerges in the voices of the members of the research site; how to cope with ambiguities and contradictions.

> "Methods is thus not primarily a matter of 'data management' or the mechanics and logistics of data production, but is a reflexive activity where empirical material calls for careful interpretation, a process in which the theoretical, political and ethical issues are central" [Alvesson and Deetz 2000:5].

Contradictions and conflicts cannot be elicited through surveys or questionnaires or 'quick and dirty' case studies with a few isolated variables. In-depth case study 'data' is essential to study power. An interpretive approach is also necessary to elicit organisational members' interpretations of the different structures of power and authority [Silva 1997: 234]. Research access and rapport need to be carefully and constantly cared for in order to grasp the politics of the organisation. I also found that adopting a neutral position was counterproductive and some interviewees in fact responded better to their views being probed (whilst not in a confrontational manner). Secondary sources proved particularly useful to understand the organisation and its broader environment and in putting interview material in context. Internal documents (memos, consultants' reports, meetings minutes as well as union documentation and technical reports) help grasp the nature of project, its chronology, decisions by committees, who were the prime movers, what were the major phases, how it progressed, etc. External sources such as government and press reports, transport and academic literature were crucial to appreciate the specific nature of the industry. Building an impression of the organisational climate was probably the most difficult part and it is almost impossible to describe how that takes place. Small ethnographic details like where interviewees go for lunch, how they dress, where and how they meet you, what vocabulary they use, what analogies they make, the types of offices they work in and what objects they keep, all help build a picture. Interviewing organisational members at all levels and from different functions (not just IS but also marketing, human relations, public relations, commercial, strategy, sales) as well as external actors (passengers' associations, travel and transport experts) is essential to capture as many voices as possible. Asking about their previous positions, achievements and personal relationships to the organisation helps profile organisational characteristics too (see **Appendix 2**). These techniques can facilitate interviewees sharing their views on power relations and politics. Ideally, I would also have liked to use participant observation, for instance sit on technical, commercial and union meetings and spend time in ticket offices or training sessions. This was not possible due to time constraints. Variety of data and sources can mitigate limitations associated with researcher's bias. Another difficult area is to be self-reflective about one's own bias. I share an attachment and interest in SNCF like most French

people that relates to my French identity and my conception of the French national territory. I felt it made me empathise with organisational members and their difficulties but it is harder to pinpoint where this was a disadvantage and how it coloured data collection and reinterpretation.

7.4.3 The problem with exogenous contingencies: macro, meso, micro

> "Implementation of technical and organisational change is an active process of innofusion, reinvention and mutual adaptation, an emergent process of bounded rationality, unpredictable consequences and normal accidents, and a political process of mobilisation, choice and negotiation. An improved understanding of this implementation process needs to capture its complex, paradoxical (...) character, rather than reduce it to simple rules of formulae. New conceptual frameworks and explanatory models are required to guide future research and action" [Badham *et al* 2000:160].

Social constructivism did provide a conceptual framework to analyse technical change and innovation at SNCF in the form of the sociology of translation and Clegg's power circuits, which complemented each other:

- ANT with its non-essentialist emphasis on the fluid boundaries between the social and the technical and on the importance of non-human actors;
- and power circuits which combined well with the notions of translation, problematisation, intéressement and enrolment; and which highlight how actors are not equal and can be dis/empowered in unexpected ways (for instance the rejection of the new optimised pricing structures by the French public).

Nevertheless there were some difficulties in applying both the sociology of translation and the power framework. They centre on treatments of the social and the technical and their links with social orders and political intentionality [Wilson 2000], and the question of micro, meso and macro actants.

The sociology of translation is useful as a descriptive language and for detailing relations of power between actors in networks but may not be so effective in providing explanations [Collins and Yearley, 1992] – although Latour [1991] states that it is the only way to get at explanations (Section 2.2.5). Callon and Latour's notion of translation helped to describe *Socrate* as the stabilisation of an actor network: how it borrowed from airline pricing to gain strategic advantage and respond to market pressures, attempted to change passengers' buying and travelling behaviour, transform the organisation and identify profitable market segments through the new system.

However, it is hard to avoid social explanations, in this case by pointing to divergent social orders as embodied in the notions of deregulation, public service and universal service, the role of the State and the nature of national identity. This may, simplistically, lead to consider for instance deregulation as a causal (deterministic) explanation, or perhaps less bluntly, as a condition of possibility, for organisational transformation and global market restructuring – although Latour [1991:129] claims that there is no need to look for additional causes.

Similarly, the power circuits framework is not such as a good instrument to analyse the interaction between social orders, the external context and the organisation itself. The only finding is

that exogenous contingencies influence the adoption or the refusal of the use of an innovation as an OPP. Silva [1997:105] for example found that the exogenous contingencies of cost-benefit and internal market discourses were power factors and influenced and were represented in the London Ambulance Services information system. And in his other major case study, he found that agencies' withdrawal from the technical innovation stemmed from the external contingency of the end of the cold war [Silva 1997:226].

Throughout the thesis, it was necessary to draw on the macro, meso (organisational) and micro levels to analyse the case material, and these categories became part of the interpretation, description and accounting for the phenomena under study. Examining the macro-environment, the macro-micro connection and linking socio-economic conditions to organisational analysis and individual and group action was carried out as follows:

- Micro level: how changes were perceived, experienced and appropriated by individuals and groups: the passengers, now clients who were expected to become rational customers; pressure groups, consumer associations and public opinion at large; SNCF sales staff; the regional actors, government officials and political representatives; employee groups and their changing professional identities and the growing importance of marketing, computer and commercial skills.

- Meso organisational level: how a traditionally engineering-orientated company attempted to transform itself into an entrepreneurial business oriented organisation, gave predominance to accountants and marketing experts, and introduced new managerial techniques.

- Macro level: how information systems support the marketability of route segments, and how different organisational forms emerge within French Railways and in the European rail transport industry.

It seemed unavoidable to use these categories as initial reference points: they emerge and became more refined as the data collection and analysis progressed, and the three levels became very closely intertwined in understanding and reporting empirical detail. As one interviewee said: "European liberalisation considerations might initially seem quite remote from the *Socrate* project but they are in fact related to it" [LDM Interview 8; see **Section 4.3**]. It is not clear whether the reporting would have been possible without thinking of these three levels beforehand, or whether their pre-existence was what made their intertwining possible (see also **Section 2.4.2**). MacKenzie [1988; see **Section 2.3.5**] asserts that, although the micro/macro distinction is a false dichotomy, traditional macro-sociology is more relevant politically than micro-sociology. Latour [1991] argues that macro (political?) explanations can be drawn because they rely on other stabilised networks which are already in place (**Section 2.2.5**).

A major question is where does one stop using ANT and micro-social analysis. Macro political 'factors' or social orders such as transport liberalisation are irreversible, existing, powerful networks; but identifying all of the heterogeneous associations within an actor-network is difficult enough, let

alone those of overlapping networks [Walsham 1997:476]. It becomes only possible to 'zoom in and out' in choosing actors and networks to study, to use shortcuts and to derive interpretations from existing social orders. To avoid social determinism, doing this critically to 'de-naturalise' assumed orders is necessary but much more challenging. In order to do this, I find that there is most mileage in the constructivist idea that the negotiation between the social and the technical is political and historical.

> "The social and the technical intertwine beyond the design and adoption of technologies to become an ongoing feature of their use. Technology can never be fully understood in terms of a final product or isolated artefact outside of the historical context from which outcomes emerge, are interpreted and understood. It is a historical process with technical clout" [Dawson and McLoughin 2000:164].

A related difficulty in applying Clegg's power analysis to the *Socrate* case study (**Section 7.3**), following Silva's [1997] example, was separating agencies according to time. Silva's analysis contains IS projects clearly delineated in a specific timeframe, they have a beginning and an end, and all agencies seem to appear all the time. Within the *Socrate* project, only some agencies were involved at the beginning, some others were just represented and only became involved later on, and the project became more and more problematic as a result[60]. Analysing complex phenomena at one point in time, or even for the duration of a project in traditional IS terms (initiation, design, implementation), is limited. The research approach chosen in this thesis was more akin to a longitudinal, historical analysis – albeit quite imperfect in these terms. There is little historical tradition in IS research and Mason *et al* [1997] only envisage such as tradition in a Schumpeterian perspective (i.e. competition and 'creative destruction').

In fact, the failure aspects of the case study became less and less important compared to further issues specific to the industry examined and its innovation history. This was revealed to me through the realisation of the crucial role played by the TGV. If there are general lessons to be learned from this particular failure case study, they seem to me impossible to be thought of as dissociated from innovation and change in the transport sector, let alone transposable to other situations. Information systems seem to me just another technological innovation amongst many others and the fields of innovation studies and history of technology, when adopting a social constructivist approach, appear extremely relevant to studying any innovation failure. The next section suggests areas for further research concentrating mainly on historical and political understandings of technical change in the transport industry.

7.5 FURTHER ISSUES AND FUTURE RESEARCH

Setting aside failure issues, this case study is revealing of fundamental and controversial changes taking place in transport. The troubled implementation of an air computerised reservation system at SNCF is symptomatic of the difficult transformations caused by globalisation and the use of information and computer technologies. SNCF adopted knowledge, information, technologies and

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[60] Representativeness and consultation of all concerned agencies were fraught with difficulties during the *Socrate* project for many complex reasons; this is often the case (who speaks with authority on whose behalf, which agenda is voiced, which is hidden, etc.) and this is highly political.

management concepts developed by American Airlines in the 70s and 80s. Paradoxically, it was fascinated with air transport, which is related to the prestige of this technology in the 20th century, when compared to rail transport. Computerised reservation systems are information technologies with the potential to undermine the concept of national sovereignty. Global distribution systems for travel are becoming increasingly transnational. Combined with transport deregulation, they are beginning to erode the role of the State and its responsibilities towards public transport and the transformation of economic progress into citizens' welfare. There are tensions between transport systems perceived as national infrastructure technologies and how global computer technology is threatening national states and cultures.

7.5.1 National sovereignty

It was found that applying airline reservation systems and yield management techniques to French Railways also implied transferring the US air deregulation model to the French rail situation. This is not problem-free. Some of the actors' re-interpretations are leading to unexpected results, a significant example being the redefinition and reorientation of SNCF as a low price mass public rail transport company, with recent positive results. It would seem that SNCF has re-established its legitimacy as a national public service enterprise, despite the use of a global computer technology with the potential to undermine the concept of national sovereignty and which threatens national policy-making. Whether this unforeseen resistance to cultural homogenisation through technology will persist is as yet unclear.

7.5.2 Public service and national policy-making

The logic of yield management software is to support the maximisation of capacity/revenue for profitable lines. This both responds and contributes to transport deregulation and to intramodal (TGVs competing with classical intercity trains) and intermodal (trains competing with cars and planes) competition, firstly within France and eventually in Europe (national rail companies competing with each other, and with cars and planes). It has implications for transport planning through the separate accountability of identifiable and marketable transport segments; and it is associated with the split between rail operations and infrastructures. Yield management was also important to established US airline companies since it enabled them to appear to be competitive with potential entrants in a liberalised market. Whatever role yield management will play on the European scene, it is clear that the use of computerised reservation systems and optimisation software cannot be isolated from the current debate on European transport liberalisation and deregulation [see Cartelier, Fournier and Monnier 1996; Fournier 1993; Julienne 1996]. It will be particularly related to the opposition between the traditional notion of public service in European countries, and that of universal service in Anglo-American societies [Barrère 1998]. The former regards the nation-state as above the market, as facilitating the integration of people as citizens, as a re-distributive mechanism, and as providing equality of access to all. By contrast, universal service considers the market as predominant, is seen as an exception and is limited to the strict minimum for those who cannot afford

anything else, and according to which unprofitable services are charged at their real costs, and are therefore only available to wealthier customers [Barrère 1998].

Whether national transport institutions will be able to transform economic progress into their citizens' welfare remains to be seen. This level of decision-making may be removed, as geographical boundaries of national rail infrastructures seem more and more irrelevant in global and electronic distribution markets. An example of this is what is currently happening in freight transport in Europe (as opposed to passenger transport). Trans-border multimodal freight traffic is increasing substantially and supranational political entities are particularly active, although their relationships with national entities are complicated and difficult [Savy 1997].

7.5.3 Trains, planes and computers

Another theme is the increased mobility of knowledge in the form of information, technologies and management concepts, and the import of American yield management techniques and distribution systems into the French context is a good example of this. Additionally, the dominance of the managerial strategic discourse in the international business press of the late 80s contributed to the appeal of the American Airlines' system. The choice of *Sabre* also confirms the fact that, from the beginning, there was a wish to mimic the air industry. In the words of Metzler (Director of the *Socrate* project) and Lemaître (member of the *Socrate* strategic team):

> "Rail must reach the level of its competitors, particularly air companies. The answer to this challenge is information systems, in the form of modern reservation systems (...) International sales must be facilitated through global distribution systems such as the ones found in air companies" [Metzler and Lemaître 1990:21, my translation].

This reflects the strange fascination of a rail company for aerospace as a celebrated technology of the 20th century, as illustrated through the development of the half-plane half-train TGV; and also noticed in displays of train and plane physical models and posters on the desks, shelves and walls in many offices during my visits at SNCF headquarters.

7.5.4 Transnational technology

Technical systems such as computerised reservation systems are increasingly transnational. In the context of the deregulation of US airlines, computerised reservation systems led to standardisation, increased competition and globalisation of air transport, first within the US then, progressively, in the rest of the world. Air CRS owners set up schemes whereby smaller carriers pay to have their flights appear on the computer screen, to use the system, to rent the hardware, etc. and GDS are now concentrated in a few systems, which dominate distribution channels. 98% of US travel agencies did their bookings on one of the four dominant CRS (*Sabre*, *Apollo*, *Worldspan* and *System One*) in 1991 [Copeland 1991]. From this position of strength, American GDS are making alliances with European, Asian and Australian air reservation and distribution systems. In parallel, air companies are undergoing series of mergers and alliances across the globe. Global distribution systems clearly play an important role in the battles being fought over domination of world air markets and in the global restructuring of the air transport industry. This illustrates how the thrust of

technology has changed direction and now erodes the nation state. However, it is difficult to predict whether the French and European rail transport network will be affected in the same manner by global computerised distribution systems and what shape it will take. SNCF clearly intended that *Socrate* would provide a similar position of domination in the European and international rail distribution market, thereby making SNCF an organiser, distributor and seller of transport.

CRS are also seen as a market themselves. They are very profitable through fees from other companies. *Socrate* offers the capability of hosting services from other rail companies, providing and charging for reservation access through the SNCF network and selling software licensing arrangements and consultancy services (in partnership with American Airlines) to European companies. This has only been successful in the case of European Passenger Services, which use *Socrate* for reservations on the Channel tunnel Eurostar train between London, Paris, Lille and Brussels. American Airlines obviously capitalised on their cultural, technological and economic superiority to sell *Sabre* to SNCF but also to attempt to penetrate other markets for their own benefit. This aim may have been either mistaken judging from the events described in this thesis, or simply premature. In organising multimodal freight transport in Europe, the most intractable problems are the determination of profitability of each transport segment, the co-ordination of bookings, pricing and the allocation of costs between a large number of partners in different conditions across many countries [Savy 1997]. Perhaps computerised reservation and yield management expertise will become more and more appropriate in what may only be a transitional period towards liberalised free markets in European freight and passenger transport. The time period is too short to draw any definitive conclusions on (a) whether this will happen and (b) the role information technologies will play in this globalisation.

7.5.5 Techno-nationalism

SNCF wanted to emulate American Airlines in the globalisation of European rail transport, but interestingly reinjected elements of techno-nationalism. Firstly, SNCF's intention was to preserve its tradition of technological innovation as a source of national strength by: buying into and gaining knowledge of new, modern concepts such as yield management, marketing and computerised distribution networks; and adapting them to rail, in order to become the first, biggest and only rail distribution network in Europe. Among European tourism and transport companies, British Airways, Lufthansa, SNCF, the only rail company, and Club Mediterranée are the only ones generally acknowledged to have top level expertise in CRS and yield management [Arthur Andersen 1997]. In recent years, other areas of the tourism industry have joined airlines in the use of yield management technology, for instance hotel chains, cruise lines and car rental companies. The most strongly perceived threat to the existing tourism sector is online information systems supporting direct sales run by large tour operators, hotels and transport companies. *Socrate* is now connected to Air France's global distribution system, *Amadeus* [Anon 1995], therefore in a position of strength in the European combined air/rail CRS market.

A second element of techno-nationalism is evident in the association of *Socrate* to the TGV, a major French technical achievement, and also perceived as similar to planes. It may have seemed

natural to want to repeat and prolong the success of the French TGV by fusing this train-plane technology with a computer technology. Symbolically, trains are a 19th century technology, planes and computers 20th century technologies. One objective was to launch French-made high-speed trains in European markets. Designing a high-speed train to compete with planes in the early 80s was related to SNCF top executives' and engineers' enthusiasm for advanced rail technology and for ensuring the future of rail through modernism and progress. Its success certainly increased their fascination with high-speed technology and in drawing parallels between the TGV and planes, which provided fertile grounds for adopting an air CRS. The same top engineers seemed also to have been captivated with the complex mathematics and statistics of yield management techniques. As Archibugi and Michie [1997:13] remark, both technology-specific and nation-specific factors shape the innovative process.

7.5.6 Information systems as intervening in transport

Technology does make certain social relations stable, through, in this case, integrated global computer systems. What remains unknown and to be further investigated is the relationship between global electronic reservation travel markets and the evolution of European transport industries in the political context of conflicting market and non-market principles. Globalisation of information technology infrastructures is also believed to increase risk and the importance of unintended consequences [Ciborra and Hanseth 2000:7].

IS research areas which could be investigated further are: the link between deregulation and electronic markets; whether information technology is an instrument or a surrogate for 'free', contestable, electronic markets; how the new concept of customers' (as opposed to passengers') buying behaviour relies on a rational decision-making model and is mediated via information systems; what is the role of IS in this notion of customer choice and equality of access; how the technology intervenes in the management of commercial and non-commercial intermodal transport activities, particularly through computer-aided mechanisms of charging operators for use of infrastructures; what is the relationship between global reservation travel systems and the evolution of European transport industries; whether and how the tourism, transport and travel markets will be affected and redefined by electronic markets.

Technology transfer across different cultural contexts is another research area of interest. Silva [1997:233] for instance found that cultural elements of social integration were different when comparing IS institutionalisation in the UK and Latin America. A comparison between France, the UK and other European countries would be worthwhile, especially as UK transport liberalisation is more advanced and open to competitors from Europe [Harper 2000]. A possibility could be investigating pricing, reservation systems, customer buying behaviour – using web sites such as *Trainline.com* – accounting information systems and charging mechanisms and the evolution of transport policy making in different European countries.

Public utilities are particularly interesting as they are crossroads of the economic, the social and the political in which innovations are caught. Social constructivist theories can help gain a better understanding of these processes, as undertaken in this thesis. Further theoretical work on the

relationship between these theories and the critical concepts of power and politics is required. IS research needs to continue drawing on other disciplines such as history and sociology of technology to compare IS with other innovations. IS failure is only a small piece of the action yet it may also provide insights for researchers studying other technological innovation processes, as long as its analysis goes beyond technicist and managerialist accounts.

7.6 EVALUATION AND LIMITATIONS

The theoretical motivation behind this thesis was a frustration with mainstream positivist hypothesis testing IS research [e.g. Boudreau *et al* 2001] and its associated managerialist and technicist accounts of complex social phenomena such as IS failures. The recently developed interpretive IS research tradition was seen as a more appropriate starting point (**Section 1.4.1**), as it concentrates on actors' multiple interpretations and acknowledges the importance of context.

Interpretive research is generally associated with qualitative empirical research methods which support the investigation of in-depth, rich, intensive, 'thick', longitudinal studies of case material, showing multiple levels and conflicting interpretations, and thereby exposing the complexity of the use of IS in organisations (**Section 2.4**). This does not preclude the use of quantitative research techniques (there is no strict equivalence between quantitative methods and positivism or qualitative methods and interpretivism, see **Section 2.4.1**) which were only used in a very limited way in this thesis (to compare demand projections to actual figures, see **Section 3.1.1**). Quantitative methods, in particular economic analysis techniques, would have been very appropriate to study for instance the financial impact of yield management and differentiated pricing on changes in buying patterns, traffic figures, revenues and profit, marketshare, distribution, labour and maintenance costs, etc. This would have required economic expertise which I do not possess and could have led to a better exploration of the contested strategic and economic role of CRS, GDS and yield management in transport deregulation.

Raising the level of empirically based qualitative social IS research is a difficult and ambitious goal. ANT, as a post-structuralist non-essentialist endeavour, proved to be a pragmatic 'network-tracing' sensitising device for qualitative research. This is illustrated in a few other IS researchers' attempts at using ANT for the empirical description of actor-networks around various information technologies, e.g. geographic IS [Walsham and Sahay 1999], hospital IS [Bloomfield *et al* 1997] and IT infrastructures [Monteiro 2000]. It would be useful to compare such efforts at using ANT to improve IS qualitative empirical work, but it is difficult as journal papers are often too short to allow such comparisons.

The theoretical lens of ANT and sociology of translation was useful in:

- moving beyond the notion of 'context' (**Section 2.1.3**) often used in IS research as a separate, external entity, which 'affects' IS adoption and use;

- overcoming the divide between the 'social' and the 'technical'[61] and exploring how this boundary is socially constructed **(Sections 1.3.2 and 7.2.2)**;
- deconstructing the concept of failure using the idea of 'symmetry' between success and failure[62] **(Sections 2.1.6, 2.2.1 and 7.5.1)** and contrasting such an analysis to conventional accounts of failure **(Section 7.4)**. This deconstruction of failure is commensurate with the notion of unintended consequences, introduced in **Section 2.3.5**.

One of the most important contributions of this thesis is probably its in-depth and extensive exploration of a case study, which are still rare in IS research **(Section 2.4)**. Perhaps more interestingly, this was facilitated by a still unusual theoretical stance in the IS field, social constructivism, of which ANT is one expression (see **Figure 2.2**). It forced me to broaden the scope of analysis and to avoid either technologically or sociologically deterministic explanations, which I may not have done too successfully. A particularly useful ANT instrument was the sociology of translation (see **Sections 2.2.3** and **7.2**) which appeared to apply to this case material quite easily. In fact, one of the perhaps less theoretical reasons for adopting ANT was the obvious potential of this instrument to analyse the case study. Structuration theory, for instance, did not offer any obviously applicable technique to the material at hand. I am again aware that I may have used this instrument in a simplistic manner. The question remains open: was this analytical device appropriate to the case material or was it employed inadequately? This is where comparing to similar research work with other qualitative case studies could be valuable.

In my application of the sociology of translation, I found I had to simplify (shortcut?) and re-introduce macro/meso/micro levels (see **Figure 1.2**). This is in total contradiction to the theoretical outlook of ANT[63]. Moreover, it was also extremely difficult not to appeal to some overarching, general analytical constructs, outside the empirical events and relationships that ANT described, which brought another level of explanation (e.g. the notions of public service or deregulation, see **Sections 2.4.2** and **7.4.3**). The micro/macro dilemma was very difficult to escape from, let alone solve, unsurprisingly **(Sections 2.3.5** and **7.5)**. The question of complex and overlapping actor-networks seems central to this dilemma, as discussed above **(Section 7.4.3)**. It is impossible in practice not to delineate boundaries ('black-boxing' in ANT jargon) to limit the scope of the research.

The macro/micro dilemma is also linked to the criticism of ANT as apolitical and oblivious to social structures **(Section 2.2.5)**. Several IS researchers have drawn on other social theories to address these weaknesses. Structuration theory, advocated by Walsham [1997] was discounted as it does not specifically focus on the relationship between technology and society, which seems central

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[61] The consideration of both the social and the technical in the 'socio-technical' systems IS research tradition (e.g. Mumford, Land, Checkland) was in fact a progress from the previously strictly technical approaches to the study of computer usage.

[62] Symmetry in ANT usually refers to the symmetry between non-human and human actors. It is judged as controversial by many critics of ANT, in that it bypasses the notion of intentionality and can potentially lead to an insufficient account of the consequences of action. This human-nonhuman symmetry was marginal to this thesis. Technology as a non-human actor was found to be only relevant in the context of the TGV as an antecedent technology to *Socrate* **(Section 5.3)**.

[63] Although a critique of ANT can be made on the grounds that the notion of actor is difficult to stretch to large 'macro' actors such as organisations, political institutions or nations.

to the implementation of IS in social organisations, and is the strength of ANT (**Section 2.2.6**). On the other hand, structuration theory may have brought useful analytical insights to the micro/macro problematic. Other authors are for instance combining Heidegger to ANT [Ciborra and Hanseth 1998], drawing on Foucault to study computer networks in the financial services industry [Knights *et al* 1997] (**Section 2.3.1**), or applying institutionalisation theory [Silva 1997] (**Section 2.3.3**). Heidegger and Foucault's focus on the construction of identity might be useful for further research on the changing notion of citizenship (versus technology-mediated customers, see **Section 5.2.1**). None of these theories concentrate specifically on technology, unlike the field of science and technology studies [Biagioli 1999], where ANT is situated. Bringing a critical political perspective to IS research has been mainly carried out using Habermas over the last decade or so (e.g. by Hirschheim, Lyttinen and Klein).

In a paper to be presented at the *Critical Research in Information Systems Workshop* in July 2001, which itself calls for (re)defining critical research in IS, Doolin [2001] emphasises the importance of developing a critical IS research agenda other than by using Habermas. He suggests exploring the relationship of ANT, qualitative empirical work and a critical approach. He agrees with Knights [1995], a critical organisational theorist, that the contribution of case research lies in adding depth to more conventional approaches, but also in that the in-depth analysis facilitates the disruption of existing assumptions and certainties and can therefore be more critically oriented. A political dimension could have been added in this thesis using either Foucault or Clegg (who fit in the same area of the matrix of theoretical approaches in **Figure 2.2**, where they both share a localised focus and see politics as inescapable). Silva [1997] used Clegg's circuits of power to investigate IS failures, combining them to some ANT concepts (obligatory passage points, problematisation, enrolment, intéressement) and also institutionalisation theory. It seemed therefore more appropriate to choose Clegg's circuits of power (**Sections 2.3.2** and **2.3.4**), following Silva's example. Institutionalisation of IS was also briefly reviewed (**Section 2.3.3**) but the sociology of translation seemed to suit the case study better. Analysis of the case material using the circuits of power provided some interesting results (**Section 7.3**) and were a valuable complement to ANT.

However, Clegg's 'exogenous contingencies' (**Section 7.4.3**) did share the same weakness as ANT in that they appeared to encompass different contextual 'macro' structures with little distinction. These 'exogenous contingencies' seem to be construed as external, unlike ANT where they are just 'another' actor-network, but like most qualitative IS research which sees the context as important, but as 'affecting' IS from the outside. Silva [1997] made a similar remark (with reference to the cold war as an external event), reported above in **Section 7.4.3**. The mechanism by which local events and networks become 'macro' or global structures is key: ANT declares that they are the same thing; but it is not a simple additive or combinatorial process, which ANT seems to push towards in the practice of research and analysis, and which I ended up resisting.

In a critique of Latour's [1993] *We Have Never Been Modern*, Cohen [1997:351] argues that: "anthropological totality [as represented by ANT] may be said to replace historical totality (...) [and is] a functional universal [which] is an absorptive cultural 'logic' (...) and negates modern time-differences"; and that: "conditions of possibility are not made explicable if the network-model is

transcendental" (p. 357). I found this philosophical paper complex and difficult but one clear message is that ANT is ahistorical and tends to the universal. Historical analysis might have provided better insights into this case study. Perhaps crudely, I tried to include an unusually long period (in IS research terms) before and after the events related to provide some historical dimension, I hope not too unsuccessfully; for instance by paying some attention, albeit limited, to the historical shift from regulation to deregulation in transport: they not only refer to 'macro structures' but also position them historically.

More serious limitations can be found in the unsophisticated research methods employed. The conventional (in IS research terms) split between primary and secondary data[64] does not pay attention to the time dimension; a more refined chronology and dating of what was stated (in a written or oral form), by which player, in response to which event and when, would have allowed a more precise and historical tracing of actions, decisions, influences on actors' thinking, constraints, evolution of arguments, etc. An example would be the diagram representing the power struggle in the episodic circuit (**Figure 7.1**) which in fact is a crude approximation (as outlined in **Note 55**): several such diagrams at different times would be necessary to give a more precise picture. Knowledge of historical research methods would have instigated more sophisticated and extensive data collection and supported better cross-validated data analysis.

Other theoretical traditions within science and technology studies may be more historically oriented and could have brought a different light to this case study. Biagioli's *Science Studies Reader* [1999] includes for instance papers on: the social construction of technology, sociology of science and technology, anthropology of science, social shaping of technology, ANT, history of technical innovation, cultural studies of science, and also 'large technological systems' [Hughes 1999] which could be particularly relevant to the study of large IS. Noticeably, there is only one IS-related paper in this collection of seminal papers (by Sherry Turkle on 'thinking about computers'). Many of these theoretical themes preceded ANT and in fact some were partly responsible for its initial conceptualisation and development. The current fascination with ANT in the IS research community runs the danger of applying it as a simplifying universal tool; and IS researchers may benefit from drawing on some of its predecessors.

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[64] Primary data as something said by actors directly to the researcher versus secondary data as something said indirectly, e.g. on paper.

APPENDIX 1

'Lettre aux voyageurs'

Poster, SNCF, 1993

Lettre aux voyageurs.

Depuis quelques jours, la SNCF met en place un nouveau système de vente et de réservation. On l'appelle Socrate. C'est vrai, il y a quelques difficultés et certains d'entre vous ont pu en subir les inconvénients. Nous vous prions de nous en excuser.

5 millions de réservations dans les trains in 1970, 50 millions en 1992 et presque 150 millions en 1995: vous êtes et vous serez de plus en plus nombreux à vouloir voyager, en ayant l'assurance d'une place assise.

Nous avons changé notre système de vente et de réservation pour deux raisons. D'abord, parce que le système actuel (on l'appelle Résa), est saturé. Bientôt, dès le mois de mai prochain, les T.G.V. Nord Europe, et l'année prochaine, les T.G.V. du tunnel sous la Manche seront là. Vous serez encore plus nombreux à prendre les trains Grandes Lignes et vous voulez être sûrs d'avoir une place dans le train que vous choisirez. Ensuite, parce que nous souhaitons vous proposer un système plus simple et plus complet. Tout simplement plus efficace.

En voici deux exemples:

Avant, si le train que vous aviez choisi était complet, vous ne saviez pas s'il y avait de la place dans les autres trains: une interrogation train par train était nécessaire. **Avec Socrate**, instantanément, vous savez tout sur la destination désirée: les heures, les disponibilités de places, les prix du voyage. **Socrate vous informe**: si le train souhaité est complet, vous savez aussitôt dans quels autres trains du même jour et des jours suivants des places sont encore disponibles.

Avant, vous aviez en main deux billets: l'un était le billet du trajet et l'autre la réservation du train que vous preniez. Parfois même il y avait trois billets lorsque vous preniez un train à supplément. **Avec Socrate**, vous n'avez qu'un seul billet, sur lequel toutes les informations sont rassemblées, en particulier le prix et le numéro de la place. Un seul geste donc pour le composter. **Socrate vous aide**: il facilite votre voyage en vous donnant toutes les informations, il rassure ceux qui craignent de perdre un des billets on de ne pas avoir en main celui qui convient.

La SNCF et son personnel (commerciaux, informaticiens...) s'attachent à faire face aux défauts de jeunesse rencontrés dans la mise en oeuvre de Socrate. Bien sûr, avant de l'installer, nous avons effectué de nombreux tests. Mais pour un outil de cette ampleur, seule l'expérience quotidienne permet d'obtenir la fiabilité du système et sa maîtrise par le personnel commercial.

Nous avons donc décidé que, durant cette période de rodage, jusqu'au 31 mars 1993, chaque voyageur qui montera dans un train sans avoir pu acheter sa réservation (dans les T.G.V. en particulier), pourra, sans aucune pénalité, la régulariser auprès du contrôleur.

APPENDIX 2

Interviewing schedule

The following questions were prepared for interviews with the members of the Socrate team. They were slightly modified when interviewing other SNCF executives and managers who were not directly involved in Socrate. Interview questions to other interviewees such as sales staff, union representatives or tourism experts were formulated differently to suit their circumstances. On many occasions I let interviewees follow their own train of thoughts; and I only intervened when, for instance, a point was unclear or worth expanding, there was a connection with another point of interest on which I wanted their opinions, or the flow came to a natural halt and needed recapitulating before addressing another set of issues. Interviewees were all articulate, some extremely, very willing to talk and highly involved in the issues. Some were difficult to stop... Early in the interviewing process I was less familiar with the concepts and vocabulary and asked questions in a simplistic way (as perceived by the interviewee) which provoked strong reactions and even anger on one occasion [CQ Interview 10]. This proved very useful retrospectively, if unnerving at the time: I discovered when transcribing the tape that this had allowed interviewees to express strong opinions very clearly which might not have been the case otherwise.

- Introduce/check respective names and positions, remind interviewee of who gave me his/her name, how/when I contacted him/her or his/her secretary, thank him/her for meeting me, check amount of time available

- Check s/he received confidentiality statement, restate university status and academic 'pure' research rather than commercial or journalistic motives

- Say who else I have/am going to interview (not necessarily exact names, depending on interviewee's status, position and groupings)

- Ask if audio-taping acceptable, if so explain I may need to turn tape over, start tape

- Announce general order of questions and overall structure and format of interview, emphasise that it is not a rigid order but open-ended and informal

- Overall structure

  - My research aims
  - Interviewee's background and role in *Socrate* project
  - Organisation in general
  - *Socrate* aims, architecture and project
  - Reasons for failure
  - Organisational changes
  - Future

- My research aims

  Introduce myself, PhD project, UK/France, short biography, MBA (mainly for top executives!) academic, IT and management, *Sabre* and strategy, failures complex and not clear cut, *Taurus*, London Ambulance Services, want to hear about their experiences, thoughts and lessons learned, how to introduce such a complex innovation, emphasise that I have only done some secondary research so far which gives a limited picture, and that I need their input to get a fuller, richer understanding

- Interviewee's background and role in *Socrate* project

  Ask for interviewee's previous positions inside and outside SNCF, career progression, areas of expertise and interest, major past achievements, how/when/why s/he joined the *Socrate* project, what they personally learned from it, how they have evolved, their current position if different, how it relates to *Socrate* now

- Organisation in general

  Their understanding and experience of the organisation, structure, culture, subcultures, divisions, history, major changes, past successes, staff profile and movements, restructuring, cultural shifts, relationship with the public, the government, the unions, opinions about what the organisation is good/bad at, why, whether they are satisfied with its general direction, how they would improve it, how they see themselves in it

- *Socrate* aims, architecture and project

  Their understanding and views about CRS, yield management, components, GDS market, history, previous system, how they saw then the role of *Socrate*, initial aims, how important they thought it was, how they were convinced of its usefulness, technical challenge, how the project was set up, how support was negotiated, relations with the rest of the organisation, relations with American Airlines staff, internal project management, software engineering, how the analysis/design/programming was split, team involved, working atmosphere, pressures, constraints, tensions, achievements

- Reasons for failure

  Minor and major mistakes, reasons, internal, organisational, external, training, human relations, internal communication, sales staff, qualifications, public, technical, external communication, PR, pricing, timing with TGV Nord, what could have been done differently, what could have been avoided or not, what was successful, why, what has been learned, not learned

- Organisational changes

  How they dealt as *Socrate* members with the fallout, personally, as a team, in the organisation, how the rest of the organisation reacted to the crisis, what has changed as a result, how it affected their career/reputation, what new things have been achieved and/or abandoned since, how pricing has evolved, whether data accumulation for yield management has brought some new information, whether there has been some new reorganisation, new priorities, what are their opinions on these

- Future

  Market changes, future demand, effects of pricing, traffic forecasts, market segmentation, long distance vs regional vs local, travelling habits, buying behaviour, public image, selling techniques and staffing, evaluation of yield management, cross-subsidising, access to transport, air/road/rail, future of transport, management priorities, cultural changes, role of the organisation, role of the state, Europe, obstacles, difficulties, unresolved issues, their vision of the future of the organisation and their role in it

- Closure

  Recap, check that I got it right, elicit further if necessary, ask if they can suggest anybody else they think I should interview, thank them for time and contribution, how much I have learned, how much they have enriched my understanding and revealed how complex it all is, restate academic output, which when finished could be made available (joke about time-consuming PhD and how material they provided will need many years to digest!), wish them best of luck in such a challenging environment

APPENDIX 3

List of interviewees

(Paris, 1994-95)

ORGANISATION/ DEPARTMENT	POSITION at time of interview and PREVIOUS ROLE in *Socrate* project if different (*)	INTER VIEW NO.	PERSON CODE
SNCF, Services Grandes Lignes, Relations Internationales, Paris	Directeur (*) Directeur Voyageurs Grandes Lignes et Directeur du projet *Socrate*	1	JMM
SNCF, French Railways Ltd, London	Computer Department Manager Marketing Manager	2	AP DC
SNCF, Service Grandes Lignes, Département Communication, Paris	Délégué aux Missions Extérieures Déléguée Adjoint	3	EC AH
SNCF, Service Grandes Lignes, Maîtrise d'Ouvrage *Socrate*, Paris	Gestionnaire de Projet	4	SEB
SNCF, Service Grandes Lignes, Service de Veille Technologique, Paris	Documentaliste Chercheur	5	MJA BT
SNCF, Direction des Services Communs à la Clientèle Voyageurs, Pôle Service et Distribution, Département Chaîne Clientèle Voyageurs, Paris	Manager de la Formation (*) Responsable des relations humaines du projet *Socrate*	6	GC
SNCF, Service Grandes Lignes, Département Marketing, Paris	Manager	7	MP
SNCF, Service Grandes Lignes, Direction du Contrôle de Gestion, Paris	Manager Audit de Gestion (*) Responsable des Ventes Grandes Lignes et membre de l'équipe *Socrate*	8	LDM

ORGANISATION/ DEPARTMENT	POSITION at time of interview and PREVIOUS ROLE in *Socrate* project if different (*)	INTER VIEW NO.	PERSON CODE
SNCF, Direction de l'Informatique, Maîtrise d'Oeuvre Informatique Voyageurs, Paris	Gestionnaire de Projet (*) Responsable informatique du projet *Socrate*	9	JPD
SNCF, Direction de l'Informatique, Pôle Recherche Opérationnelle, Paris	Responsable Informatique (*) Experte en yield management du projet *Socrate*	10	CQ
SNCF, Service Grandes Lignes, Direction du Personnel, Paris	Liaisons syndicales	11	HG
SNCF, Service Grandes Lignes, Comité Central d'Entreprise, Paris	Coordinateur	12	JMP
SNCF, Gare Paris Montparnasse, Service Ventes	Vendeur Guichet Vendeuse Guichet Inspecteur Trains	13	SLG NR DP
Club Méditerannée, Direction de l'Informatique et des Télécommunications, Paris	Directeur Informatique (*) SNCF, Responsable des ventes Grandes Lignes et membre de l'équipe *Socrate*	14	GV
Nouvelles Frontières, Unité d'Enseignement du Tourisme, Paris	Chargée de Formation Responsable d'Agence	15	KM HB

ORGANISATION/ DEPARTMENT	POSITION at time of interview and PREVIOUS ROLE in *Socrate* project if different (*)	INTER VIEW NO.	PERSON CODE
Confédération Française Démocratique du Travail, Fédération Générale des Transports et de l'Equipement, Branche Cheminots, Syndicat des Cheminots et Travailleurs des Activités Ferroviaires de Paris Ouest Rive Gauche	Secrétaire Général Adjoint	16	PLR
Confédération Générale du Travail, Syndicat des Cheminots de Paris Montparnasse	Secrétaire Général Secrétaire Adjoint Membre	17	MG MN RL
Fédération Nationale des Usagers du Transport, Paris	Secrétaire Générale Secrétaire Adjoint	18	SIB GDA

APPENDIX 4

Identifying categories in interview data

CATE-GORIES	EXTRACT OF INTERVIEW 16 (PLR)
	Q. Comment envisagez-vous le rôle de votre syndicat?
Role of unions Company strategy	**A.** L'organisme syndical, son créneau c'est avant tout les revendications professionnelles. Qui ne sont pas forcément liées à la politique économique de l'entreprise ou de la collectivité. D'ailleurs l'entreprise peut jouer là-dessus. Si je fais payer plus cher les voyageurs, les recettes seront plus importantes, il y aura moins de déficit, donc peut-être que les cheminots seront mieux rémunérés, ou qu'ils travailleront moins longtemps, pour le même prix.
	Q. Que pense donc votre syndicat de la politique économique de l'entreprise?
Transport policy in general Rail vs motorway **4.3.4**	**A.** On en pense pas grand chose. C'est des mots, c'est ce qu'on écrit sur du papier glacé. Pour mener une politique sociale il faut des recettes; soit elles viennent de la collectivité soit elles viennent des voyageurs. On tranche le débat avec forces sondages, le contribuable français préfère que les autoroutes soient gratuites et que le train soit plus cher. L'alternative posée dans le sondage, avec toutes les réserves qu'on peut faire autour la manière dont les questions sont posées – le journal Le Nouvel Economiste par exemple en a publiés - l'une des alternatives: vaut-il mieux que les autoroutes soient gratuites ou le train plus cher, 68% pour que le transport individuel soit le moins cher, le moins taxé possible, et que le transport collectif ils estiment qu'il doit être solvable.
	Q. Et à la SNCF?
Local, regional & national transport Market segmenta-tion and cross-subsiding **5.1.3**	**A.** Dans l'entreprise, beaucoup de dirigeants (l'ancien président Fournier par exemple) estiment aussi que l'offre de transport SNCF est solvable. Sauf les trajets de la vie quotidienne, du domicile au travail, l'Ile de France et quelques banlieues de grandes villes, où là effectivement on isole çà en disant c'est tout à fait illusoire de penser que, çà puisse être, faut bien que la collectivité subventionne. Elle même ayant un retour des subventions. Tout le reste, tous les pouvoirs publics, y compris les différentes sensibilités de ces dernières années, estiment que sur le fond, c'est solvable. Que les voyageurs doivent payer ce que çà coûte.
Commer-cial aim of *Socrate* Air pricing **3.3.3**	D'où la déclinaison de toute une politique commerciale *Socrate*, où l'objectif était bien d'augmenter les recettes, la contribution commerciale, dans les trains les plus demandés. En contrepartie, pour faire un peu passer la pilule, de brader certaines places. Un peu comme font les compagnies aériennes, où il y a des écarts de prix de 400% entre deux voyageurs, entre celui qui a acheté son billet charter, et celui qui a acheté tarif normal, tarif du marché.

	Q. Est-il viable d'avoir les mêmes écarts que les avions dans les trains?
Differen-tiated pricing **5.1**	**A.** À la SNCF peut-être pas. On a déjà joué sur des fourchettes de prix plus basses. Par exemple avec Joker: les associations de consommateurs trouvent çà très bien. Nous de l'intérieur, Joker s'appelle comme çà, parce que çà a une consonance avec les charters. Çà a été fait au départ simplement pour servir de prétexte à une campagne publicitaire, sous le thème "Joker c'est pas du vol". Dans certains trains il y avait une place Joker, sur un train de 1000 places. C'était à la limite de la publicité mensongère.
Fascina-tion with air **3.1.1**	
Yield manage-ment: 'niveaux' **5.1.3**	Depuis çà a évolué puisque tous les TGV notamment aux Niveaux 1 et 2, le Joker n'est pas contingenté. Jusqu'à 8 jours avant on en vend autant qu'on nous en demande. Par contre, il est contingenté sur les autres niveaux à un nombre 'significatif' de places, personne ne sait, il parait que c'est 10%. C'est écrit nulle part. Comme c'est de la politique commerciale, ca ne relève pas du cahier des charges du plan public. Quand çà râle de trop les pouvoirs publics veulent intervenir.
Social pricing **5.1.1**	Ils n'arrêtent pas d'intervenir d'ailleurs, les pouvoirs publics ont fait changé il y a quelques années la date de la carte vermeille pour les personnes agées. La SNCF, sa politique commerciale (50% de réductions) la donnait à 60 ans pour les femmes et 65 pour les hommes. Les hommes ont tendance à travailler plus longtemps, et elle craignait que la carte vermeille pour les hommes entre 60 et 65 ans se substitue à un certain nombre d'abonnements qui sont autrement tarifés, et qui rapportent des recettes autrement plus importantes. Les pouvoirs publics ont decidé, durant une campagne électorale présidentielle, que c'était vraiment injuste. Çà a choqué tout le monde: mais de quoi ils se mêlent, ou c'est un tarif social, ils ont qu'à dire à 40 ans s'ils veulent, et de compenser à la fin de l'année le budget de SNCF de la perte telle qu'on aura pu l'estimer.
Equality of access	
State contribu-tion **4.3.1**	Avec ou sans tarifs sociaux la rémunération de l'entreprise elle est toujours forfaitaire. Le Ministère des Finances fixe une enveloppe au titre des tarifs sociaux. Jospin a annoncé le chiffre de 10 milliards de centimes, 1/3 du chiffre d'affaires (3 milliards de chiffre d'affaires).
Accoun-tability	Militaires, familles nombreuses, congés annuels. L'idéal çà serait qu'à chaque fois qu'on délivre un titre de transport, qu'on fasse une facture... Donc c'est évalué forfaitairement. Dans l'entreprise, finalement que çà a évolué forfaitairement c'est pas plus mal, parce que si un jour quelqu'un se mettait à vérifier, à tout compter, on y perdrait. C'est un sujet tabou. Parce que les pouvoirs publics, quand ils veulent faire un mauvais coup sur les tarifs sociaux, ils disent que c'est la SNCF. **Q.** Et les associations de consommateurs?
Consumer associa-tions	**A.** Souvent quand on lit, les associations de consommateurs (par exemple pour les billets de congé annuel les réductions qui étaient à 30% sont passées à 25% il y a quelques années). On a eu dans la presse

5.2.2 SNCF budget - Relations with State **4.3.1**	consumériste, "SNCF c'est scandaleux, c'est plus cher". Alors que la SNCF avait donc ces 5% de moins à ce titre-là dans son budget. C'était les pouvoirs publics qui avaient pris la décision. Quand çà les arrange ils prennent une décision qui s'apparente à une décision sociale, mais à la charge du budget social de l'entreprise. Autrement ils se font discrets.
	EXTRACT OF INTERVIEW 9 (JPD)
Yield manage-ment State interven-tion post *Socrate* **4.3.3** Other staff **3.4** Future full use of YM **4.3.3** Link with TGV Nord **5.3** Public relations **5.2.2** Buying behaviour **5.2.1** Market segmenta-	**Q**. Comment expliquez-vous le rôle des techniques d'optimisation commerciale? **A**. L'optimisation commerciale est un système de régulation automatique où on joue sur les capacités et les discounts pour essayer de remplir les trains au plus profitable. Au moment des ennuis de *Socrate*, une commission a été créée, une commission gouvernementale. Pour ne pas affoler la population on nous a mis des limitations. Ce qui fait que le yield management ne peut pas rapporter tout ce qu'il peut rapporter. Vous avez un système d'optimisation dont vous fixez des paramètres, çà sert pas à grand chose. Limitations du style "garder au moins 10% de ceci ou de cela". Donc elle (CQ **Interview 10**, SNCF expert en yield management) est un peu gênée car l'historique qu'elle est en train de constituer n'est pas un historique. Elle va baser les prochaines décisions sur l'historique, et il est pippé, car on bute, par des contraintes. Çà va se libérer petit à petit, c'est une période transitoire. **Q**. Vous croyez que le public y sera préparé, éventuellement? **A**. Il y a eu un amalgame dans les média. *Socrate* est venu avec le TGV Nord, avec les prix de marché, et les contraintes du YM, même bridées un peu au départ. Donc il y a eu une révolution (je vous ai déjà parlé des ennuis au niveau des vendeurs) mais il y a eu une révolution dans l'esprit des clients. Donc il y a eu un amalgame, *Socrate*, c'est plus tellement l'informatique *Socrate*, c'est la tarification *Socrate*. D'un projet informatique, ou aurait très bien pu faire un renouvellement d'ordinateurs sans changer la tarification, on aurait pu changer la tarification sans faire *Socrate* à l'inverse, mais on a fait les deux en même temps. Ce qui fait que maintenant il y a un cafouillis, les gens y disent, le train est trop cher, c'est la faute à *Socrate*. Il faut que çà passe dans les moeurs, on va peut-être être amené à faire une petite marche arrière par çi par là, mais c'est vrai qu'il y a des gros problèmes. Vous habitez à 15 kms de Paris, vous mettez 1h pour venir travailler. Et vous avez une carte orange à 300 FF. Vous travaillez près de la Gare du Nord, vous habitez Lille, vous mettez 1 h aussi pour venir, à 250 kms, vous venez à 300 kms à l'heure, et les gens disent il y a pas de

tion **5.1.3**	raison que je paie pas 300 FF pour venir travailler un mois à Paris puisque je suis à 1h de Paris. À partir du moment où les associations de consommateurs disent les abonnements sur Lille sont trop chers c'est la faute à *Socrate*...
Regional develop-ment **4.3.4**	Est-ce que la SNCF c'est la poubelle de la DATAR??? (Direction de l'Aménagement du Territoire et à l'Action Régionale). *[loudly, said as a joke, but angrily]*
Neutrality of techno-logy **7.1** Internatio-nal sales **4.4.2**	Tenez, je vais vous raconter.... *[smiling, intimately, again as a good joke]* Quand j'ai essayé de vendre *Socrate* à des Tchèques, je leur disais c'est vrai le yield management c'est mettre des contraintes et des priorités, nous on a tendance à donner priorité à ceux qui paient plein tarif, vous si voulez donner priorité à un officier supérieur de l'armée rouge... *[laughing]* Q. Que reste-t-il de cette expérience pour vous?
Technical success **7.1** Living through a failure	A. Je passe pas beaucoup de temps, je ne me suis pas mis en première ligne comme d'autres, il y a encore beaucoup de boulot, de temps en temps c'est marrant de parler comme çà tout haut, parce que çà fait revivre. On aurait pu en faire un bouquin en prenant des notes au début. C'est typiquement le genre de succès technique. Il y a eu une période où vous ne pouviez plus sortir de la SNCF sans se faire agresser sur *Socrate*, dans la famille, les amis... Tellement marre on est allé au chansonnier. Le chansonnier a commencé à faire des blagues sur *Socrate*... *[laughing]*
Social failure, technical success **7.1**	Dans l'esprit du public et des journalistes, *Socrate* c'est encore une foirade de la SNCF, quand vous parlez à des gens d'IBM, des constructeurs d'ordinateurs, ou de sociétés de service, ils savent qu'on a fait le plus beau truc du siècle, pratiquement. Maintenant il y a presque des gens qui hésiteraient à mettre *Socrate* dans leur CV, c'est quand même idiot. Si je cherche du boulot dans l'informatique, j'aurais pas honte de dire que j'étais chef de projet *Socrate*. Mais dans la vie de tous les jours, c'est une tare. Dans mes projets précédents, par exemple *Rétipac*, c'était une question de technique pointue. C'était le début des réseaux, télécoms etc. On se battait avec des bits et des octets et des modems, mais pas contre le public, contre notre propre Direction Générale qu'il fallait convaincre. C'était pas la même ampleur, mais *Rétipac* c'était un projet purement technique pour ngénieurs, alors que là il y a tout. **Q**. Est-ce que cette image négative peut être rattrapée? **A**. Oh vous savez... la liberté de la presse. Des fois ils nous gênent à l'exportation, çà nuit. Tout ce qu'ils ont pu écrire, les ambassades, etc. Çà a été lu en Allemagne, en Angleterre, en Corée. La seule chose qui comptait, c'était les ennuis que vous avez eu etc. On espère que çà va se calmer. En fait, on a été complètement abandonné pendant tout le premier semestre 1993.
Role of media **5.2.2**	

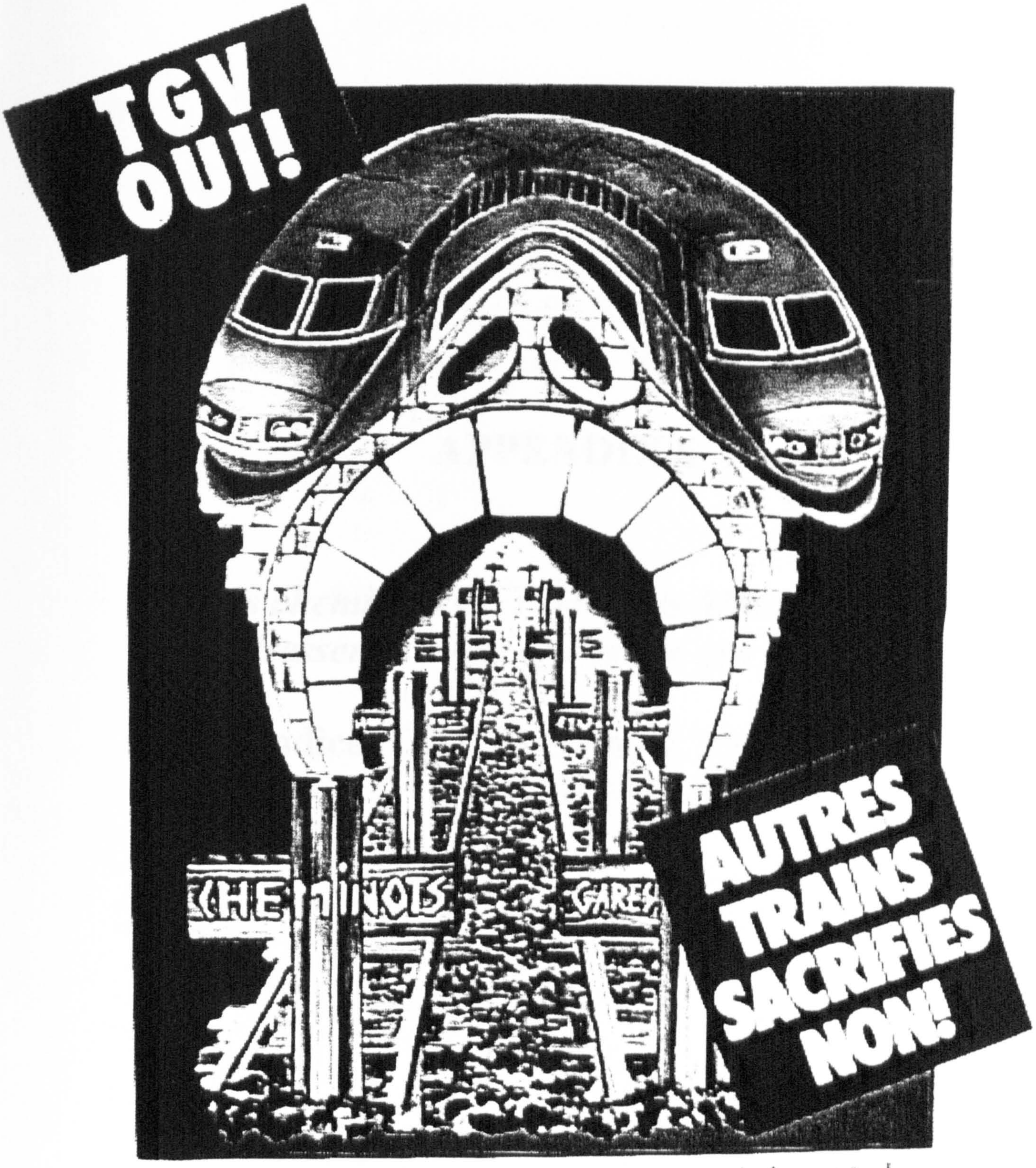
	Q. Et de façon interne à la SNCF?
Organisational structure Organisational culture **6.1.4**	**A**. Il y a eu deux discours. On a été lâché même en interne. La présidence et la DG (Direction Générale) nous ont soutenu jusqu'à ce qu'elle a pu, mais elle a été obligée par la pression extérieure, de lâcher un peu Metzler (JMM **Interview 1**). Lui il a été franchement lâché. Lui chapeau, il nous a défendu. Dans les couloirs, il y a eu des gens haut placés qui déblatéraient sur *Socrate*. C'est devenu le défouloir, "Ah ouais, c'est encore *Socrate*"... Il y a quelque chose de très culturel chez les français: dire du mal de son pays, le cheminot dit du mal de la SNCF au bistro du coin... Pas facile à vivre.
Inflated demand forecast? **3.1.1**	On a dit que *Socrate* a fait perdre 6% de trafic à la SNCF. Il y a eu la crise économique. Il y a pas mal de rhétorique. Elle a aussi perdu 13% de son trafic marchandise. Ils avaient pas *Socrate*. Arrêtez de dire des conneries!! *[getting angry, loud]*
	Q. Quelles leçons peuvent être tirées?
Organisational culture **6.1.2**	**A**. Il y a une critique faite dans les journaux sur la SNCF qui est un peu vraie... c'est vrai que moi je suis un ingénieur, j'ai pas la prétention de vouloir faire la communication de la SNCF, les finances, ou le juridique. On est peut-être un peu trop mentalité ingénieurs. C'est-à-dire que quand çà réagit mal dans le public, le public, on attrape pas les mouches avec du vinaigre, les clients il faut aller les chercher, il faut les satisfaire, et on est peut-être trop technicien encore. Mais à *Socrate* j'avais le rôle technique, j'avais pas le rôle de...
Personal implications	Çà restera une expérience, sur le plan professionnel des gars comme Metzler (**Interview 1**) et moi, maintenant on aura peut-être des malheurs, mais on fera pas une dépression nerveuse pour le boulot. On a été vacciné.
Other staff and link to TGV **5.3.1**	C'est tout de même maintenant une perte humaine terrible d'avoir cette équipe éclatée. Il y a pas beaucoup de pays ou d'entreprises qui sont suffisamment riches pour un gâchis pareil. On avait là un noyau-coeur. C'est mal utilisé actuellement. Metzler a certainement des défauts comme tout le monde, vu de la DG il est difficile à manager, mais quand on a réussi à faire Socrate et le TGV, hein!

APPENDIX 5

'TGV Oui! Autres trains sacrifiés non!'

Union poster, CGT, 1993

CGT CHEMINOTS AUSTERLITZ-MONTPARNASSE



NON A LA MORT... des métiers de cheminots, des gares, des triages, des lignes régionales...

ENSEMBLE, LUTTONS POUR UNE SNCF VERITABLE SERVICE PUBLIC

APPENDIX 6

'Les cheminots CGT de Paris Montparnasse s'adressent à vous: Qu'est-ce que Socrate?'

Syndicat CGT Cheminots, 3 juin 1993
(CGT 1993b)

LES CHEMINOTS CGT DE PARIS MONTPARNASSE S'ADRESSENT A VOUS

QU'EST-CE QUE SOCRATE ?

SOCRATE

Tarifications – Desserte –

Sécurité

Qualité du service

SOCRATE C'EST QUOI ?

. Rentabilité en supprimant de nombreux points de vente (et en les équipant de distributeurs de billets).

. Remplissage maximum des trains avec des voyageurs au plein tarif.

. Les usagers n'auront plus le choix de l'heure ni du jour de départ à cause des restriction sur les tarifs à caractère commercial.

. Des voyageurs dans un même train avec des prix de billets variant en fonction de la date d'achat.

. Suppression des bureaux info sur l'ensemble de la SNCF dû à la mise en place de SOCRATE.

. Coût plus important pour de nombreux parcours.

. Temps de délivrance plus long que par le passé d'où allongement des files d'attente.

. Voyage avec obligation de réserver sur tous les trains.

POUR LES USAGERS

. Impossibilité de vérifier le prix du billet (résas, suppléments inclus dans le prix du billet).

. Délivrance d'un titre unique de transport presqu'illisible.

. D'énormes difficultés pour l'obtention d'un billet international ou pour des échanges de billets.

. Disparition de trains sur des lignes jugées non rentables.

POUR LES CHEMINOTS

Dégradation importante des conditions de travail.

. 4 visions sur un même écran, avec des petits caractères accentuant les troubles de la vue, avec une augmentation de la charge de travail, de la tension nerveuse.

. Suppressions d'effectifs.

. Difficultés liées aux erreurs dues aux anomalies du logiciel.

. Temps de transactions beaucoup plus long.

. Difficultés avec les usagers.

. Reconnaissance insuffisante de la qualification.

. Suppression de nombreux services (Information – Service Clientèle...).

NOS PROPOSITIONS

- Réouverture des bureaux de réservation internationaux les dimanches et fêtes.

- Réouverture du bureaux de Résa dans les gares banlieues dimanches et fêtes.

- Augmentation du nombre de guichets afin de servir correctement la clientèle.

- Accueil suffisant dans les gares.

- *Départ des TGV branche Aquitaine de Paris Austerlitz en utilisant l'inter-connexion de Massy Palaiseau afin de développer l'offre sur la Bretagne et le Sud Ouest, la gare de Paris MP étant à saturation.*

- Amélioration de la ligne Paris-Argentan Granville.

- Mise en place de matériel roulant moderne de jour comme de nuit.

- Mise en place de personnel suffisant pour répondre aux besoins des usagers.

- Plus de formation pour les cheminots.

SOUTENEZ CES PROPOSITIONS

NOM

Signature

VOS REMARQUES ET SUGGESTIONS

LE 3 JUIN A PARTIR DE 10 HEURES, LES CHEMINOTS CGT SERONT PRESENTS DANS LA GARE DE PARIS-MONTPARNASSE POUR RECUEILLIR VOS SUGGESTIONS ET DEBATTRE AVEC VOUS DE L'AVENIR DE LA SNCF.

vous pouvez transmettre vos remarques et suggestions au Syndicat CGT Cheminots de Paris-MP : 17 Rue du Cotentin 75015 PARIS.

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Please note:

Different font types are used to indicate the type of references as follows:

- Secondary sources (Sections 2.4.1 and 2.4.2) are printed in **Lydian font type (bold)** to differentiate them from academic references. Secondary sources include SNCF internal administrative documentation and technical documents (e.g. computing systems, CRS and GDS, pricing, marketing, yield management, ticketing, training), union and passenger associations publications, government and audit reports, consultants' documents, press material.
(References in Lydian font type (NOT bold) are secondary material about other IS failures than *Socrate*).

- Academic references are printed in Times New Roman font type like the main text of the thesis (apart from this note). They refer to research in the fields of information systems, organisation theory, management, sociology of technology.

- Academic transport literature is indicated in Arial font type and cover air and rail transport in the US and Europe.

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