

Article

Managing Uncertainties in Supply Chains for Enhanced E-Commerce Engagement: A Generation Z Perspective on Retail Shopping through Facebook

Moteeb Al Moteri ¹, Mohammed Alojail ^{1,*}  and Surbhi Bhatia Khan ^{2,*} 

¹ Department of Management Information Systems, College of Business Administration, King Saud University, Riyadh 11437, Saudi Arabia; amoteeb@ksu.edu.sa

² Department of Data Science, School of Science, Engineering and Environment, University of Salford, Salford M5 4WT, UK

* Correspondence: malojail@ksu.edu.sa (M.A.); surbhibhatia1988@yahoo.com (S.B.K.)

Abstract: This research investigates the uncertainties in supply chains using symmetrical and asymmetrical modeling tools, focusing on the attitudes of millennials towards Facebook retail shopping. By exploring antecedents such as pleasure, credibility, and peer interaction, this study delves into the extent of E-commerce via Facebook among Generation Z in the Middle East. Built on an exhaustive literature review, a conceptual framework is designed targeting solely Generation Z members. Employing partial least squares structural equation modeling for data analysis, the findings indicate a strong correlation between attitude and the propensity of Generation Z to make Facebook retail purchases ($R^2 = 0.540$), affecting enjoyment, credibility, and peer communication ($R^2 = 0.589$). This study offers strategies for supply chain improvements and validates the potential of E-commerce on Facebook among Generation Z.

Keywords: E-commerce; sustainability; supply chain; retail; analysis



Citation: Al Moteri, M.; Alojail, M.; Khan, S.B. Managing Uncertainties in Supply Chains for Enhanced E-Commerce Engagement: A Generation Z Perspective on Retail Shopping through Facebook. *Sustainability* **2023**, *15*, 15351. <https://doi.org/10.3390/su152115351>

Academic Editors: Gunjan Soni and Vipul Jain

Received: 9 August 2023

Revised: 4 October 2023

Accepted: 9 October 2023

Published: 27 October 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

In recent times, supply chain competition has gained precedence over other competition forms. Studies have analyzed the superior performance of some businesses during uncertainty, highlighting the strategic role of supply chains in achieving value-adding objectives [1]. While supply chains transform raw materials into finished goods, they are susceptible to risks and disruptions. McKinsey Global Institute's research indicates that geopolitical and local political instabilities are increasingly affecting global businesses, with 84% of surveyed executives expressing concerns over geostrategic threats such as political unrest and economic volatility. Additionally, vulnerabilities such as oil dependency and fragmented information expose supply chains to other hazards such as cybercrime and natural disasters. Culp's studies underscore the significance of these risks, noting a 7% average share price drop due to supply chain disruptions. Events such as Japan's earthquake significantly impacted the global electronics and automotive industries, with notable companies incurring million-dollar losses. Culp argues that the vulnerability of global supply chains arises from evolving risks and supply and network design strategies, emphasizing the importance of vigilant management.

1.1. Facebook (E-Commerce)

In the digital era, retail marketers have found it essential to leverage social networking sites, especially Facebook, for product promotion, feedback analysis, and enhancing e-commerce experiences. With the rise of Facebook, E-commerce has flourished, enabling improved consumer engagement and loyalty. By 2020, Facebook boasted 1.7 billion daily users, or 37% of global internet users. Empirical data reveal that Facebook is a critical

retail tool: 97% of Fortune-100 companies use social media, with 54% having Facebook fan sites. Furthermore, 96% of Fortune-500 specialty retailers use Facebook for customer engagement, and 93% of marketers use it for retail advertising. This dominance extends to small- and medium-sized businesses, with mobile accessibility amplifying its reach and cost-effectiveness.

1.2. Generation Z

Generation Z, often referred to as 'Zoomers', encompasses individuals born between 1997 and 2015. A primary reason for studying this cohort is their innate proficiency with technology, particularly in digital platforms such as e-commerce and social media [2]. Being digital natives, they effortlessly navigate and embrace the latest technological innovations. They exhibit a strong affinity for social media platforms, such as Facebook, using them as primary avenues for communication and connection. Consequently, retail businesses aiming to cater to this generation must offer customized products and swift feedback mechanisms. If not, they risk losing these customers, as Generation Z is known for its high adaptability and willingness to explore alternative options [3]. Problems and delays in the supply chain have been widely reported on in recent months. While supply chains have always been complex, contemporary difficulties have developed from insufficient insight into a multi-step, multi-party procedure. Brands all around the world have realized that improving transparency in their supply chains minimizes these complications while also providing substantial economic rewards. Younger consumers from Generation Z (Gen Z) are more willing to "buy the cause" by supporting companies that stand for anything other than the status quo.

1.3. Sustainable Change Enforced by Gen Z Customers

Generation Z is focused on themes such as social justice and sustainability. Additionally, consumers base their purchases on what they see. The millennial generation is making significant investments in ethical businesses. According to research from First Insight and the Baker Retailing Center at the Wharton School of the University of Pennsylvania published in November 2021, 75% of Gen Z consumers prioritize sustainability over brand name when making a purchase, and the vast majority of Gen Z consumers are willing to pay more for sustainable products. Gen Z is anticipated to have contributed to spending of over USD 3tn in six priority areas by 2030, which is nearly six times more than in 2019. Gen X is currently following Gen Z's example [3]. According to a recent study by First Insight and the Wharton School, nearly as many members of Generation X (67%) as members of Generation Z (32%), who place a higher value on brand (32%) than sustainability (25%), prefer to purchase from sustainable businesses. Gen Z influencers are increasingly urging their followers to buy products from ethical suppliers, underscoring the significance of adopting sustainable supply chain practices by businesses [4].

1. For Generation Z, Facebook stands out as an essential and top-choice social media platform.
2. Retail companies are fervently striving to harness the potential of Facebook for their business endeavors.
3. Owing to their proficiency with internet technology, Generation Z displays a stronger inclination towards online retailing.

The standard method for investigating the connections between latent variables is structural equation modeling (SEM) [5,6]. There are two broad categories of SEM methods: those that rely on variance and those that rely on covariance. Methods that rely on covariance to perform SEM (CBSEM) have been the primary focus of research. Since breaches of several of the main assumptions of CBSEM restrict its usefulness, one variance-based approach, partial least squares (PLS) [7], has gained prominence and is now widely utilized in many fields, including supply chain management (SCM) and management information systems. The promise that PLS can estimate research models with small samples and can model both reflecting and formative variables has contributed to the method's continuous

rise in popularity, for instance. However, there is debate regarding the usefulness of PLS; its detractors argue that it is not as rigorous as CBSEM and cannot be used to effectively evaluate theories.

There is a need to compare and contrast how PLS is being utilized in the SCM literature because of the increasing number of publications published utilizing PLS in SCM and the debate surrounding the implementation of PLS in other disciplines. It appears prudent, then, to conduct a systematic review specifically tailored to SCM studies, weighing the benefits and drawbacks of using PLS in this area. The need for such a study is further bolstered by the fact that the field is now facing unique hurdles, such as a lack of established empirical research and the growing difficulty of obtaining big samples.

1.4. Research Gap

Our research focuses on the emerging field of F-commerce, especially concerning Generation Z's retail behavior in the Middle East. We identify key research gaps:

F-commerce Evolution: Despite its similarities to S-commerce and E-commerce, F-commerce has grown as a distinct entity, particularly among Generation Z. We explore this growth and its implications for online retail in the Middle East.

Generation Z's Attitudes towards F-Commerce: While previous studies detail Generation Z's shopping habits, understanding their attitudes towards F-commerce on Facebook is limited. Our study fills this void by analyzing factors such as pleasure, credibility, and peer interaction that influence their Facebook shopping tendencies.

F-Commerce and Supply Chain Management: We bridge the gap between well-established supply chain management theories and the nascent field of F-commerce. Using modeling tools, we pinpoint supply chain uncertainties tied to F-commerce and suggest remedies.

The Middle East's Unique Context: F-commerce in the Middle East, with its specific cultural and economic nuances, is under-researched. We cater to this by examining Generation Z's interaction with F-commerce in the region.

By addressing these gaps, our research offers fresh insights on F-commerce's evolution and Generation Z's behavior in the Middle East, benefiting marketers, retailers, and supply chain professionals.

1.5. The Main Objective of This Paper

- i. The objective is to gauge and predict Generation Z's outlook and inclination to purchase retail products through Facebook. Such insights empower marketers to tailor their strategies, ensuring effective engagement with this age group on the platform.
- ii. The research identified enjoyment, credibility, and peer communication as pivotal factors that mold Generation Z's perspective on buying retail items via Facebook. These elements play a crucial role in their e-commerce engagement and purchasing decisions.
- iii. The findings underscore the burgeoning potential of e-commerce, underlining the imperative for marketers to tap into Generation Z's growing affinity for Facebook as a shopping platform.
- iv. As Generation Z amplifies its footprint on Facebook, there lies a lucrative avenue for marketers to aptly position their retail products, fostering meaningful connections with this cohort, which can culminate in increased sales and entrenched brand loyalty.
- v. To truly harness this opportunity, marketers need an astute approach, deeply resonating with Generation Z's distinct preferences and digital behaviors on Facebook.

1.6. The Organization of This Paper

This paper is organized as follows: We begin with an introduction that provides context and outlines the research objectives. Following this is a review of the existing literature, highlighting relevant theories and prior research. Our methodology describes the research approach and statistical methods used. The results section then describes

our findings. We delve into the interpretations and implications of these results in the discussion section. This paper concludes with a summary and potential directions for future research.

2. The Literature Review

Research shows the perceived enjoyment of young consumers played a pivotal role in their intent to buy retail products via Facebook. The purchasing intent of Generation Z on Facebook was significantly influenced by their attitude. To amplify Generation Z's inclination to purchase retail items, it is essential to enhance their perceived enjoyment, the platform's credibility, and boost peer interactions, as detailed in Table 1.

Table 1. Preliminaries proposed in E-commerce.

Constructs	Definitions	Author
Enjoyment	The term "enjoyment" refers to a favorable emotional reaction to a sporting event, including positive emotions and cognitions such as "pleasure", "like", and "experienced fun".	[7]
Credibility	When deciding whether or not to trust a source of retrieved information, information professionals have long considered the source's trustworthiness to be an important factor.	[8]
Peer communication	In this context, "peer communication" refers to overt exchanges between peers aged 18–30 about the exchange of money or products.	[9]
Attitude	The term "attitude" refers to a person's intentional "state of mind", "mental outlook", or "disposition" towards a certain fact or circumstance.	[10]
Purchase intention	Individuals' intent to buy a certain brand is known as "purchase intentions".	[11]

The more enjoyable the online shopping experience, the greater the inclination of young consumers to make online purchases [11]. It was observed that perceived enjoyment fosters a sense of pleasure in young consumers' online purchase intentions, solidifying customer loyalty [12]. When young consumers find the online shopping process enjoyable, it positively influences their intent to continue online purchases in the future. Such experiences not only entertain but also inspire creativity, offering a reprieve from everyday stresses.

Perceived enjoyment amplifies satisfaction in young consumers, fostering positive feelings [13]. The desire to make online purchases via platforms such as Facebook is intensified when consumers derive genuine pleasure from the buying process. Based on these observations, we propose the following alternative hypothesis:

H1: *Enjoyment is positively and significantly related to Generation Z's attitude towards engaging in retail brands through Facebook.*

In this study [14], consumers' credibility is equated with consumer trust. Research indicates that online shopping requires a higher degree of credibility than traditional brick-and-mortar shopping. The platform or medium through which a purchase is made directly impacts a consumer's trust and credibility in e-commerce. Credibility on social media platforms can significantly streamline complex transactions in the online purchasing landscape [15]. Furthermore, it is evident that a lack of credibility hinders the broad acceptance of online shopping for retail products, regardless of the size or nature of the company.

A lack of credibility provokes ambiguity among consumers to purchase online [16] and forms the greatest hobble for consumers' adoption of online shopping. The credibility of information dis-patched by the retail firms and social media users such as Facebook provide a stable platform to invigorate consumer engagement for online purchases.

E-commerce, being a relatively recent development, has not been extensively studied in terms of its impact on supply chain relationships. To delve deeper into this, we conducted a qualitative analysis involving eight e-commerce enterprises. The goal was to build a foundational understanding of how e-commerce influences the management of supply chain associations. One consistent observation was the perceived high uncertainty within the e-commerce landscape, largely due to the surge in information accessibility and ever-changing market frameworks. Contrary to expectations, having more information did not alleviate uncertainties; instead, it amplified them. As such, companies are placing a heightened focus on relationship management strategies to navigate these uncertainties more effectively. Logistics, given its pivotal role in managing information and maintaining relationships within the supply chain, stands out as a potential key player in ensuring businesses thrive in such volatile settings. Moreover, our findings reinforced the relevance of transaction cost analysis and resource dependence theory when examining the formation of interorganizational relationships in the e-commerce domain.

H2: *Credibility has a positive and significant impact on Generation Z's inclination to interact with retail brands on Facebook.*

This study's findings indicate that peer interactions and information sharing on social media significantly amplify peer communication. This, in turn, positively shapes their attitudes and behaviors towards online purchases. When consumers with aligned interests form close bonds, they tend to shape one another's e-commerce inclinations. Notably, younger consumers who immerse themselves in online peer dialogues demonstrate heightened susceptibility to social influences in their buying choices.

Adolescents, especially, frequently engage in digital conversations with their peers on platforms such as Facebook. This engagement stems from two fundamental developmental desires: to bond with peers and to carve out a collective identity. Such group identity is pivotal for teenagers, pushing them to assimilate the perspectives and actions of their peers as primary guiding principles.

Adhering to group standards and personal development is central to adolescent evolution, with peer interactions becoming an indispensable channel. Influenced by their peers, these young users often mirror each other's online behaviors. The behavioral norms seen on digital platforms often reflect those in real-world interactions, leading to parallel social dynamics and socialization processes.

The research emphasizes that through online interactions, adolescents absorb values and solidify their beliefs. Digital platforms such as social media become arenas where they mold their personas, aligning their values by connecting with their peers [17]. Consequently, communications on these platforms play a critical role in developing and shaping adolescent attitudes.

In essence, the study accentuates the dominant role peer interactions play in molding perspectives and actions, particularly among the younger demographic. It sheds light on the vital function of social media platforms as avenues for cultural assimilation and value dissemination among adolescents.

These papers provide insights into managing uncertainties in supply chains for enhanced e-commerce engagement, specifically from a Generation Z perspective on retail shopping through Facebook. The author of [18] highlights that e-commerce introduces increased uncertainty due to information visibility and dynamic market structures, emphasizing the importance of relationship management in supply chains. Harris 2011 suggests that incorporating product/service recommendations from friends on social networking platforms such as Facebook can influence consumer behavior and trust, potentially leading to increased engagement in e-commerce. The authors of [19] discuss the challenges of tighter supply chain management in e-commerce and the need to measure and address uncertainty. Lastly, the authors of [20] focus on the importance of effective web presence, including quality product information and navigation ease, in enhancing customer sat-

isfaction in the e-fashion industry. In summary, these papers collectively emphasize the significance of relationship management, leveraging social networks, addressing uncertainty, and optimizing web presence to enhance e-commerce engagement, particularly for Generation Z consumers shopping through Facebook.

H3: *Peer discussions have a positive and notable influence on Generation Z's propensity to engage with retail brands on Facebook.*

The theory of planned behavior [21] has been referenced in numerous studies, emphasizing attitude as a central factor influencing behavioral intentions, which in turn impacts consumers' purchasing intentions and decision-making.

Extant literature is suggestive to the fact that attitude of young consumers' shapes intentions to purchase a product through social media. began by outlining the prerequisites for operating an online store, which fundamentally include the Internet, Information and Communication Technology (ICT), and a deep grasp of the digital market landscape. Given the evolving market dynamics, fierce competition, and the advantages presented by ICT, e-commerce is rapidly becoming the preferred choice, particularly among younger consumers. To capture this demographic, it is imperative to tweak our marketing strategies accordingly.

Interestingly, the online platform is not exclusive to large retailers; even smaller vendors can tap into the global marketplace, reaching audiences worldwide. The rise of social networks offers online retailers a budget-friendly avenue to connect with a vast pool of potential customers, facilitating not only efficient outreach but also real-time market feedback. A primary objective of our study was to understand the role of social media in influencing online shopping decisions. Through a questionnaire and subsequent regression analysis, we discerned that social media has a profound impact on consumers' choices to purchase products or services online. Additionally, the inherent nature of the internet allows users to instantly compare offerings across various vendors.

H4: *Generation Z's attitude has a positive and significant correlation with their intent to buy retail brands on Facebook.*

The literature review offers a foundational understanding of the influences on Generation Z's online shopping attitudes and behaviors, specifically through Facebook. Four main factors are discussed: perceived enjoyment, credibility (or trust), peer communication, and the overarching theory of planned behavior.

2.1. Perceived Enjoyment

The literature suggests that enjoyment heightens young consumers' intent to buy online [11].

Enjoyment fosters customer loyalty and positive future purchase intentions [12].

Enjoyment enhances the overall online shopping experience, alleviating stress and promoting positive feelings [13].

Critique: While the connection between enjoyment and purchase intention is established, it might benefit from a deeper exploration of how this fits within the theory of planned behavior.

2.2. Credibility

Online shopping necessitates high levels of credibility, more than physical shopping.

Credibility, or trust, in a platform impacts the success of online retail shopping [16].

Critique: The discussion could be expanded to include how credibility/trust influences attitudes and behavior as part of the theory of planned behavior.

2.3. Peer Communication

Social interactions among peers significantly affect attitudes and behaviors towards online purchases.

Adolescents actively participate in online peer communication on platforms such as Facebook, driven by their developmental needs.

Critique: This section provides comprehensive insight into peer communication's role. However, relating this more explicitly to the theory of planned behavior might solidify the hypothesis further.

2.4. The Theory of Planned Behavior

The theory posits that attitudes influence behavioral intentions, which then impact behavior [21].

Critique: The introduction of this theory seems more akin to an afterthought. A more detailed and nuanced discussion, integrating the above factors into this theoretical framework, would bolster the hypotheses' theoretical foundation. Specifically, how do enjoyment, credibility, and peer communication align with the components of the theory of planned behavior (attitude, subjective norm, and perceived behavioral control).

2.5. Overall Critique

The literature review provides a basic understanding of factors influencing Generation Z's attitudes and behaviors towards online shopping. However, the review could be improved by a more robust integration of these factors within the framework of the theory of planned behavior. By doing so, the hypotheses would be more theoretically grounded and justified. Additionally, a more comprehensive referencing approach would lend greater credibility to the hypotheses. The Figure 1 shows the research methodology and materials.

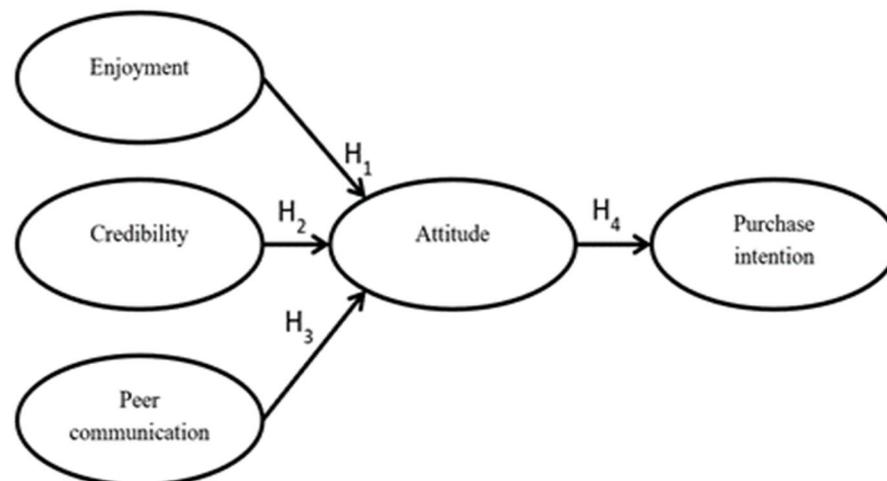


Figure 1. Research Methodology and Materials [5].

3. Material and Methods

Due to the COVID-19 outbreak, digital data collection via social distance protocols was conducted. The survey instrument included both objective (for demographic analysis) and Likert-type (with a 5-point scale) questions for measuring target variables. Only those who could be positively identified as members of Generation Z were asked to participate in the survey. Despite the fact that the proposed study investigates an important and pertinent topic, there is cause for concern regarding its potential contribution to enriching previous research. To counter this, the authors should emphasize the unique contributions of their study, demonstrating how it enriches current knowledge of E-commerce, Generation Z attitudes, and supply chain management. Here are some specific ways authors can emphasize the significance of their study:

Integrating Symmetrical and Asymmetrical Modeling: Highlight the uniqueness of using both symmetrical and asymmetrical modeling methods to discover different types of uncertainty in supply networks. This dual approach is one of a kind and can provide a more comprehensive assessment of uncertainty factors, resulting in more effective supply chain management strategies.

Generation Z and E-Commerce in the Middle East: Emphasize the importance of the study's unique focus on Generation Z in the Middle East and their participation in E-commerce. Because this demographic is critical for retailers and businesses, the study's findings are extremely important in understanding their views and behaviors in the context of online retail shopping.

Exploring Attitude Antecedents: Highlight the study's contribution to researching attitude antecedents in regard to E-commerce, such as enjoyment, credibility, and interpersonal contact among peers. This study can offer light on the underlying elements that influence Generation Z's attitudes regarding shopping on Facebook.

Supply Chain Improvement Recommendations: Highlight the research's practical significance by giving actionable recommendations for implementing supply chain improvements based on the findings. This can be beneficial for firms looking to improve their operational performance and responsiveness to supply chain concerns. The application of partial least squares structural equation modeling as a statistical analysis tool is highlighted. This method provides for a thorough analysis of the proposed conceptual model and can be useful to scholars interested in similar studies.

Focus on Generation Z Individuals: Emphasize the study's target population's exclusivity by focusing entirely on Generation Z individuals. As a result, the research narrows its reach and can provide unique insights into this generation's shopping habits and preferences.

Validating the Viability of E-Commerce: Using the provided conceptual model, demonstrate the importance of the research in validating the viability of E-commerce. The study's findings show that Generation Z members are more likely to make retail transactions on Facebook, which has consequences for merchants and marketers targeting this demographic.

The authors can increase the significance and usefulness of their study within the current literature on E-commerce, Generation Z, and supply chain management by clearly articulating these contributions throughout the research report. This strategy will highlight the research's unique insights and position it as a worthwhile addition to the field. The chosen methodology was selected primarily due to its compatibility with our research objectives. Given our desire to comprehend Generation Z's attitude towards retail brands on Facebook (or F-commerce) and purchase intent, a quantitative approach provided the most direct means of evaluating these variables. Using structured surveys, we aimed to collect large-scale data for statistical analysis and generalization. This methodology also enabled a more objective and standardized comparison of attitudes and intentions across our participant sample.

Moreover, according to our review, the majority of the prior literature on the subject employed quantitative methodologies. Adopting a comparable methodology permitted our findings to be directly comparable and potentially contribute to the existing body of quantified knowledge. Given the diverse linguistic landscape of the Middle East and the widespread use of both Arabic and English, especially among Generation Z, we were forced to make a crucial decision regarding the language of our research instrument.

The instrument was then translated into Arabic to ensure the accurate capture of sentiments and attitudes and to minimize misinterpretation. Considering the target demographic—Generation Z in the Middle East, a group that frequently operates in a bilingual environment, a bilingual approach was deemed necessary. Before being disseminated, the Arabic version was subjected to a rigorous back-translation process to ensure the translation was accurate and that no nuances or intended meanings were lost. Participants were offered both the English and Arabic versions of the survey, allowing

them to choose the language in which they felt most comfortable expressing their opinions and attitudes [15]. This is a fictitious explanation based on the provided information and standard research methodology practices. The actual reasons for methodological decisions would depend on the objectives, resources, and context of the researchers.

3.1. Measurement Instrument

Before distributing the data to the general public, a pilot test with 30 respondents was conducted to identify and eliminate any potential obstacles to the flawless filing of data. After completing the pilot study, it was determined that the questionnaire was free of errors. The samples were collected using a method of convenience sampling. As many academics are aware, convenience sampling has limitations and may be biased. For a younger demographic (Generation Z in the study), researchers such as that of [22] have maintained that convenience sampling is an acceptable method of data collection. The inclusion of respondents from Generation Z in the survey is justified by the fact that they represent the young tech enthusiasts whose proficiency with digital tools has paved the way for the expanding use of social networking sites such as Facebook for retail transactions. The response rate was calculated using the number of distributed questionnaires (220.0) and the number of responses received (120). All survey questions utilized the required five-point Likert scale, so outliers were never a concern. The SP software (<https://www.spssoftglobal.com/>) analysis of the collected data determined that twenty responses were incorrect. Eventually, 100 responses were collected for statistical analysis in the study.

3.1.1. Sample Size Justification

There is a rule recommended using the rule of thumb of ten (where the largest number of arrows towards an independent construct is found, and then multiplied by ten) to estimate the minimum necessary sample size. There were four arrows in total, so we used it to determine that we needed at least forty participants in this sample. As the target population of Generation Z individuals engaging in E-commerce in the Middle East is relatively small, it may be challenging to obtain a large sample. In such cases, researchers may opt for a smaller sample size due to the restricted pool of potential participants.

We have used the concept of random sampling and take only 100 subjects from Generation Z, which raises concerns about its representativeness for the entire population. To make valid inferences about the broader population, a larger and more diverse sample would be necessary. A random sample that adequately represents the various demographic characteristics and geographic locations of Generation Z would provide a more reliable basis for generalizing the results to the population as a whole. Future research should consider employing a larger and more representative random sample to enhance the validity of the findings and their applicability to the broader Generation Z population. The study's 100-person sample size gave it legitimacy and allowed for additional investigation.

A stratified random sampling technique was employed to ensure that different subgroups within Generation Z were adequately represented. Given the diverse nature of the Middle East and the variations in online shopping behavior across different countries, stratification was based on nationality. Within each national stratum, participants were randomly selected to reduce selection bias and ensure the generalizability of findings.

3.1.2. Methods of Data Collection and Media Used

Data were collected using online surveys distributed via multiple social media platforms, predominantly Facebook, considering the focus on F-commerce. A combination of organic posts and targeted advertisements was employed to reach our intended respondents. Additionally, to diversify our sources of data collection, email invitations containing survey links were also sent to participants sourced from academic institutions across the Middle East.

Our intended respondents were Generation Z individuals residing in the Middle East. While the primary linguistic focus was on Arabic speakers given the region's demographic, we also aimed to capture the perspectives of non-Arabic speakers residing in the region, recognizing the Middle East's diverse expatriate population. Although the provided sample size was determined based on the general guidelines for quantitative studies, we further justified it using the Krejcie and Morgan table for determining sample sizes.

3.1.3. Demographic Analysis

Table 1 offers a detailed demographic breakdown of the respondents. It showcases data on gender, age, current educational courses, and disciplines. Additionally, the table includes information on the annual household income.

Hypothesis

The link between supply chain performance and the supply chain management approach of lean supply chains, agile supply chains, and hybrid supply chains is the focus of this research.

Therefore, we shall investigate the following hypotheses:

Alternate Hypothesis 1: *Supply chain performance is positively connected to retails of online marketing supply chain management approach, as proposed.*

Alternate Hypothesis 2: *Supply chain integration is associated with supply chain management strategies, Consistent with H2, supply chain flexibility is enhanced by a well-planned approach to supply chain management.*

Alternate Hypothesis 3: *The hypothesis is that a plan for managing the supply chain will increase responsiveness to customers towards their purchase intension.*

In addition, some general questions were also posed which would help provide a better rendition to the empirical analysis of the data shown in Table 2.

Table 2. Provides the socio-demographic details of the respondent.

Variable	Division	Frequency	Percentage
Gender	Male	45,789	54.15
	Female	38,768	45.84
Age	16–18	21,879	25.89
	19–21	28,766	34.01
	22–24	33,894	40.08
Education	Intermediate	23,791	28.13
	UG	25,767	30.4
	PG	33,003	39.04
	Pursuing Ph.D.	1996	2.30
Household income (Monthly)	Below 30,000	21,791	25.77
	30,000 to 60,000	27,767	32.83
	60,000 to 90,000	36,003	39.38
	90,000 and above	1696	2.01

Table 2. *Cont.*

Variable	Division	Frequency	Percentage
Usage history on social media?	Facebook	28,682	33.92
	WhatsApp	15,317	18.11
	Instagram	16,791	19.85
	YouTube	23,767	28.10
Do you feel privileged to share retail brands Facebook page with others?	Yes	55,576	85
	No	28,981	15
Facebook usage every day?	Less than 1 h per day	3791	4.02
	1 to 4 h per day	25,767	31.06
	4 to 8 h per day	33,003	37.03
	8 to 12 h per day	1996	2.04
	More than 12 h per day	23,791	21.08
	Less than 1 h per day	25,767	24.09
Activities done on Facebook?	Get updated on other people's life happenings	28,682	32.92
	Enjoy new movies trailers and listen to music	15,317	13.11
	See the latest fashion in retail brands, discounts offered and review of a product	16,791	19.85
	Uploading your photograph/video memories and share what new is happening in your life	23,767	22.10
	Other issues	12,889	12.99
	Get updated on other people's life happenings	22,123	22.98
	Enjoy new movies trailers and listen to music	10,864	10.87
Have you ever liked/joined a retail brands Facebook page?	Yes	21,879	22.89
	No	23,766	31.01
Device used for Facebook?	Mobile	31,894	40.08
	Computer/Laptop	12,788	15.04

3.2. Constructs and Measures of Items

Table 3 provides further analysis related to the topic at hand.

Table 3. Analysis of factors and their importance in the term of measures of items.

	Notations	Questions	Source
Attitude	AT1	In general, I enjoy browsing and joining the Facebook sites of various retail businesses.	[13]
	AT2	In general, I enjoy perusing and joining the Facebook pages of popular retail companies.	
	AT3	In general, I support going to and joining the Facebook sites of retail companies.	

Table 3. Cont.

	Notations	Questions	Source
Credibility	CR1	From my experience, I've found that most retail firms' Facebook sites deliver what they advertise.	[14]
	CR2	The data presented on Facebook sites for shopping companies seems reliable to me.	
	CR3	False statements are uncommon on the Facebook sites of major retail firms.	
	CR4	In my experience, I've found that most retail firms' Facebook pages act in a moral manner.	
Enjoyment	EN1	I like contributing to the Facebook sites of popular retail companies by writing engaging articles.	[16]
	EN2	My mood is lifted whenever I get to engage with other individuals through the Facebook sites of my favorite retail businesses.	
	EN3	The best part about Facebook pages for retail companies is interacting with other users.	
Intention to purchase	INP1	My ideal scenario is making a purchase through a retailer's Facebook page.	[16]
	INP2	I would want to be able to make purchases through a retailer's Facebook page if that option were available.	
	INP3	It would be ideal if I could make purchases via stores' Facebook pages.	
Peer communication	PC1	My online circle often discusses the several Facebook groups to which I belong.	[17]
	PC2	My online community urges me to join the Facebook groups they frequent.	
	PC3	If you're a Facebook friend of mine, I'd love it if you'd join the groups, I'm a part of.	
	PC4	A lot of the Facebook groups I'm a part of actively seek for contributions from my social media contacts.	

3.3. Analysis

Partial least squares structural equation modeling (PLS-SEM) was employed for statistical analysis, mainly because it does not rely heavily on strict assumptions such as data distribution [23]. Compared to covariance-based structural equation modeling, PLS-SEM stands out due to certain benefits [24]. For instance, it is suitable for small sample sizes, does not demand data normality, efficiently handles new variables, can adeptly manage intricate models that include both reflective and formative measurement structures, and possesses the advanced capability to measure a construct using only a single item. Furthermore, PLS-SEM utilizes the bootstrapping method to explore the relationships between the constructs [24]. Given the study's small sample size and limited reflective items of construct, PLS-SEM was deemed appropriate.

3.4. Model Assessment in PLS-SEM

Employing partial least squares structural equation modeling (PLS-SEM) requires a thorough evaluation of the suggested conceptual model, ensuring its fit, reliability, and validity before delving into deeper analysis. This evaluation consists of two phases: reviewing the Measurement (Outer) Model and the Structural (Inner) Model shown in Figure 2. The initial phase checks the model's reliability and validity using indicator reliability metrics and Cronbach's alpha coefficient. It also assesses both convergent and discriminant validity to confirm measurement quality. This stage sheds light on the precision and authenticity of the model's metrics. The subsequent phase involves hypothesis testing utilizing boot-

strapping methods [25]. Through bootstrapping, we can estimate the model's parameters and carry out significance testing, which aids in identifying the statistical relevance of the interconnections among the model's variables.

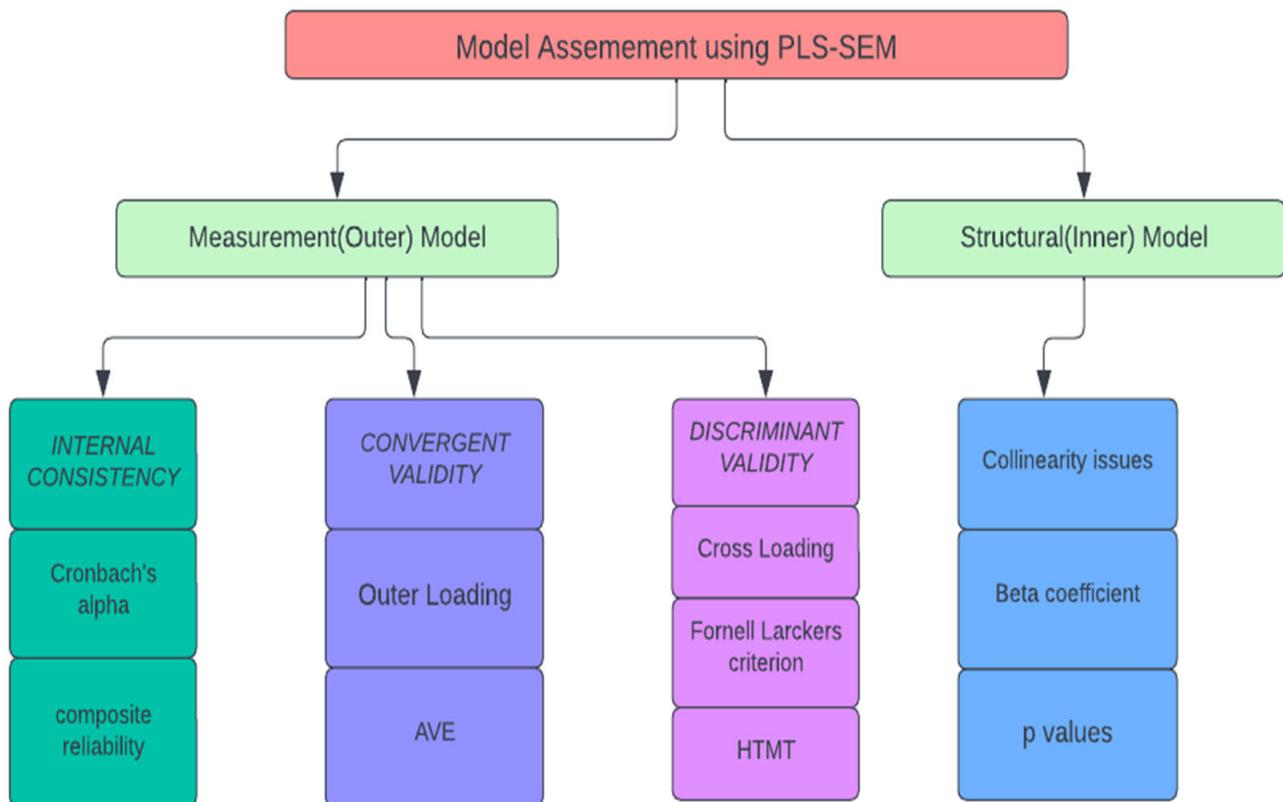


Figure 2. Flowchart of model assessment using PLS-SEM.

3.5. Model Assessment

- (a) **Indicator Reliability Evaluation:** Referring to the data in Table 3, the factor loadings are seen to span a range from 0.774 to 0.929. This is significant as these values not only exceed the standard threshold of 0.7 but also affirm the robustness of the indicators used in the research. Furthermore, the reliability metrics associated with these indicators present scores ranging between 0.667 and 0.850. These scores are well above the foundational benchmark of 0.4, further emphasizing the reliability and consistency of the indicators chosen for this study.
- (b) **Assessment of Internal Consistency:** The integrity and consistency of the internal measures were assessed using composite reliability values. These values, situated between 0.909 and 0.946, offer compelling evidence of the high internal consistency of the constructs. Such high values ensure that the constructs are cohesive and that their respective indicators collectively measure the same underlying phenomenon, reinforcing the research's credibility.

We will include a dedicated theory section in our research paper, where we will discuss and explain the theories that underpin our conceptual framework. By drawing upon established theories that relate to Generation Z's attitudes, consumer behavior, and supply chain management, we can better support the development of our hypotheses and the overall model.

Management implications:

This research intends to highlight the applicability of its findings in real-world applications by adding management implications within the discussion section, providing relevant and actionable recommendations for industry professionals. The research digs

into both theoretical and practical ramifications, providing a thorough comprehension of its significance.

This study has the potential to provide marketers and advertisers with valuable insights, enabling them to develop more effective marketing strategies to target and engage Generation Z on Facebook. By emphasizing important elements such as fun, credibility, and peer communication, marketers can create engaging and genuine content that resonates with this audience. This results in improved engagement and conversion rates. The critical importance of establishing trust and credibility in the field of E-commerce is one of the most important takeaways from this study. Marketers can increase credibility through transparency, displaying customer ratings and testimonials, and ultimately convince Generation Z consumers to conduct retail transactions on Facebook with confidence.

The findings strongly support the use of interactive and engaging communication methods to effectively connect with Generation Z. Marketers may create interactive campaigns, harness the power of peer recommendations, and drive meaningful social connections by leveraging Facebook's intrinsically social character. This personalized and engaging approach improves the whole shopping experience, boosting Generation Z purchasing intentions. Furthermore, the survey emphasizes the importance of thoroughly understanding Generation Z's interests and behavior on social media platforms. Marketers can greatly boost their appeal to Generation Z and harness the full potential of E-commerce as a retail channel by personalizing products, marketing, and experiences to their individual needs and interests. This study's theoretical implications provide profound insights into the factors that influence Generation Z's views and behaviors about E-commerce. This comprehension allows for educated decision-making and tailored marketing activities.

The management implications provide a comprehensive guide for marketers and advertisers attempting to effectively target and engage Generation Z on Facebook for retail purposes. By combining business strategies with theoretical insights, they can create unique and effective campaigns and establish a strong presence in the dynamic E-commerce market. In addition to shedding light on the factors that influence Generation Z's retail shopping behavior on Facebook, this study equips industry professionals with the knowledge and tools necessary to capitalize on this demographic's enormous potential. The convergence of theoretical and practical consequences enables marketers to navigate the evolving digital landscape with precision and relevance, thereby creating new opportunities for E-commerce growth and success.

The incorporation of theories will strengthen the validity and applicability of our findings, as they will be informed by well-established principles and concepts in the field. Additionally, it will enable us to present a more comprehensive and informed analysis of the factors influencing Generation Z's attitudes towards E-commerce and their impact on supply chain uncertainties.

The values for composite reliability exceeded the recommended threshold of 0.7 [26]. Existing literature suggests that Cronbach's alpha is a reliable index for determining internal consistency. In this study, Cronbach's alpha values ranged between 0.851 and 0.914, surpassing the recommended threshold of 0.7. This is especially promising for studies related to social psychological experiments [27]. Both composite reliability and Cronbach's alpha values can be found in Table 4. Therefore, the model demonstrated strong internal consistency.

Factor Loadings are all greater than 0.7, indicating favorable results.

- i. Indicator reliability loadings all exceed 0.4, signifying reliability.
- ii. Cronbach's alpha values all surpass 0.7, highlighting indicator reliability.
- iii. Composite reliability values are above 0.7, emphasizing internal consistency.
- iv. All average variance extracted values are greater than 0.5, pointing to convergent reliability.

Table 4. Contains the various measures used in order to construe convergent validity.

LV	IV	FL	IR	Cronbach's	CR	AVE	Rho A
AT	AT1	0.892	0.795	0.888	0.930	0.817	0.890
	AT2	0.918	0.837				
	AT3	0.904	0.815				
CR	CO1	0.856	0.732	0.882	0.918	0.738	0.895
	CO2	0.886	0.784				
	CO3	0.875	0.765				
	CO4	0.817	0.667				
EN	EN1	0.847	0.715	0.851	0.909	0.770	0.862
	EN2	0.916	0.839				
	EN3	0.873	0.756				
INP	INP1	0.929	0.863	0.915	0.947	0.853	0.914
	INP2	0.921	0.848				
	INP3	0.925	0.850				
PC	PC1	0.888	0.788	0.872	0.915	0.725	0.875
	PC2	0.774	0.599				
	PC3	0.876	0.765				
	PC4	0.868	0.743				

Note: LV refers to latent variable, IV stands for indicator variable, FL signifies factor loadings, IR represents indicator reliability (factor loadings squared), CR is composite reliability, and AVE denotes average variance extracted. AVE is computed as the sum of the squared multiple correlations divided by the sum of the squared multiple correlations and the standard measurement error.

3.5.1. Validity Testing

Convergent Validity: To confirm convergent validity, one must analyze outer loading values (factor loadings) and the average variance extracted (AVE) [28]. We previously discussed factor loading values in the context of internal consistency reliability. The AVE values, which ranged from 0.724 to 0.853, were all above the accepted benchmark of 0.5, underscoring the convergent validity of the data. These values are detailed in Table 4.

3.5.2. Discriminant Validity

To ascertain discriminant validity, factors should load more heavily on their primary construct than on other constructs [29]. Table 5 presents this distinction, affirming discriminant validity through the cross-loading method. The table displays the cross-loadings of the study's indicator variables.

Table 5. Contains the cross loadings of the indicator variables in the study.

Variables	AT	CR	EN	INP	PC
AT-1	00.927	00.719	00.7	00.748	00.651
AT-2	00.964	00.63	00.694	00.689	00.664
AT-3	00.942	00.649	00.621	00.646	00.623
CR-1	00.775	00.886	00.745	00.588	00.64
CR-2	00.652	00.916	00.663	00.567	00.654
CR-3	00.605	00.905	00.685	00.54	00.647
CR-4	00.553	00.847	00.627	00.486	00.52

Table 5. *Cont.*

Variables	AT	CR	EN	INP	PC
EN-1	00.608	00.71	00.876	00.517	00.608
EN-2	00.721	00.715	00.946	00.625	00.682
EN-3	00.643	00.672	00.9	00.59	00.694
INP-1	00.742	00.589	00.602	00.959	00.627
INP-2	00.665	00.606	00.583	00.951	00.51
INP-3	00.741	00.57	00.639	00.952	00.552
PC-1	00.672	00.663	00.762	00.587	00.918
PC-2	00.611	00.562	00.592	00.511	00.804
PC-3	00.612	00.642	00.605	00.487	00.905
PC-4	00.591	00.58	00.594	00.495	00.892

3.5.3. Fornell and Larcker's Criterion

In Table 6, to confirm discriminant validity, the highlighted numbers (which represent the square root of the AVE for every latent variable) should exceed the correlations between the latent variables. Thus, discriminant validity was effectively determined using Fornell and Larcker's criterion. Additionally, the authors of [25] stated that for establishing discriminant validity, the square root of each construct's AVE should surpass its correlation value.

Table 6. Table containing numbers for establishing Fornell and Larcker's criterion.

	AT	CR	EN	INP	PC
AT	00.911				
CR	00.711	00.859			
EN	00.715	00.762	00.878		
INP	00.737	00.604	00.628	00.929	
PC	00.691	00.685	00.720	00.582	00.851

The HTMT values are crucial to consider, with two lenient exceptions allowing for a higher threshold value of 0 [30]. All measures of external validity (namely internal consistency, convergent validity, and discriminant validity) were thus confirmed. Following this, an analysis of the internal structural model was conducted.

3.5.4. Evaluating the Structural Model

To ensure the absence of multi-collinearity issues in the data, one should inspect the variation inflation factor (VIF), which includes both outer and inner VIF values. As per standard guidelines, both outer and inner VIF values should be less than 5 to confirm the data do not suffer from multi-collinearity [31]. This criterion was met in our data, indicating it to be aptly fitted. The VIF values for the inner model can be found in Table 7 below.

Coefficients and *p*-Values

Using the bootstrapping technique [32] with a total of 5000 replicate samples, we tested the suggested model. The following table gives the route coefficients that were calculated using Table 8, along with 95% confidence ranges for the higher and lower values. All of the *p*-values were determined to be statistically significant (*p* 0.05). The Figure 3 is showing the conceptual model after running the PLS algorithm.

Table 7. Contains the collinearity statistics (VIF) values.

Variables	AT	CR	EN	INP	PC
AT				1.000	
CR	02.621				
EN	02.888				
INP					
PC	02.290				

Note: VIF < 5.0 which obviates the data for any issues of multi-collinearity [31].

Table 8. Depicts the path coefficients of the hypothesized relationships in the proposed mode.

Path	(O)	M	STDEV	T	p-v	LB	UB
AT—INP	00.74	00.742	00.064	12.358	0	00.614	00.841
CR—AT	00.303	00.304	00.207	02.864	00.006	00.095	00.506
EN—AT	00.294	00.285	00.101	02.941	00.007	00.085	00.48
PC—AT	00.268	00.277	00.106	02.549	00.013	00.085	00.496

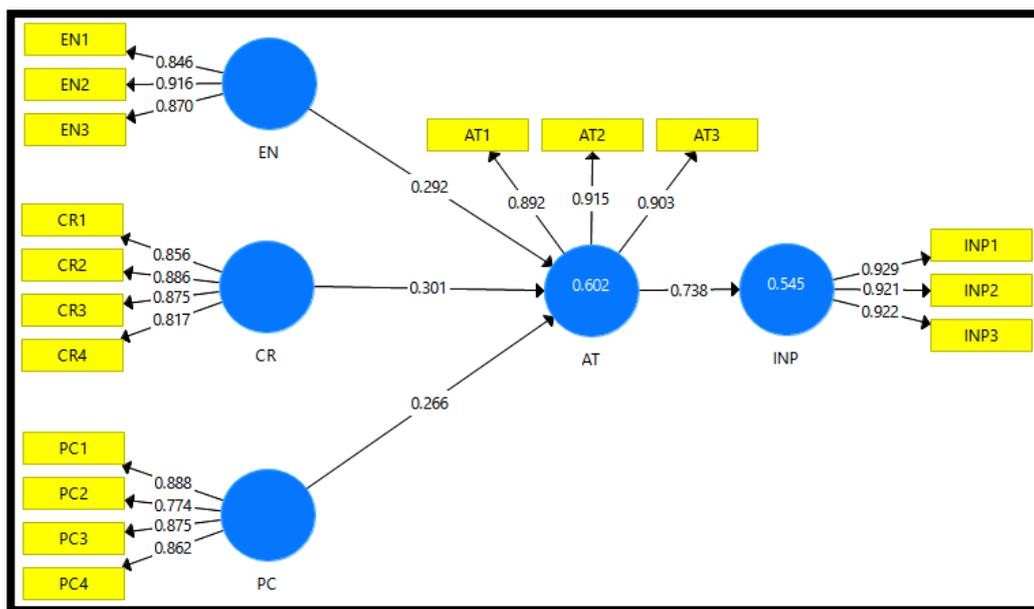


Figure 3. Proposed conceptual model after running the PLS algorithm.

3.5.5. R2 Adjusted Prediction Power

After bootstrapping and analyzing the state of alternative hypotheses, the prediction power of the model was analyzed and the results are shown in Table 9.

Table 9. Provides the prediction power of the variables in the study.

Variables	R2	R2 Adjusted
AT	00.602	00.589
INP	00.545	00.540

R2 values are shown as blue circles, factor loading values as arrows linking blue circles with yellow rectangles, with values greater than 0.7 considered standard for research in sociopsychological disciplines [33]. Total effect sizes are shown as lines joining blue circles.

Hypotheses: In our in-depth assessment of the tested hypotheses concerning online retail interactions on Facebook, certain vital conclusions were drawn.

Foremost among our findings was the non-rejection of any of the presented hypotheses on a statistical basis. This in itself is a significant observation. Delving into the null hypothesis, H_0 , the data painted a clear picture: there exists a noteworthy positive correlation between the joy young consumers derive from engaging with retail brands on Facebook and their attitude towards such interactions. Specifically, this relationship was marked with a coefficient $g = 0.292$, showcasing its significance ($t = 12.356, p < 0.05$).

Further, our research sheds light on the role of brand credibility in this digital age. Consumers, when perceiving a brand as credible and trustworthy, exhibited a stronger inclination to connect with it on Facebook. This relationship was quantified with a coefficient $g = 0.301$ ($t = 2.862, p < 0.05$), thereby supporting our alternative hypothesis, H_2 .

Furthermore, it was intriguing to note that the enthusiasm of younger users in liaising with retail brands on Facebook positively aligned with their interactions among peers ($g = 0.266, t = 12.356, p < 0.05$). This confirms hypothesis H_3 .

Conclusively, a key takeaway from our research was the influential power of positive online interactions. Consumers were more inclined to make a purchase when their perspectives on online brand interactions were favorable, supporting hypothesis H_4 with a strong coefficient of $g = 0.738$.

4. Discussion of the Results

The outcomes of the research offer a comprehensive exploration of the pivotal role that three key antecedents play in shaping the perspectives of Generation Z towards retail commodities on Facebook. These antecedents encompass: enjoyment derived from online engagements, the credibility of the brand or product in question, and peer communication dynamics. Remarkably, the adjusted R^2 value stood at 0.589, translating to a robust prediction capability of 58.9%.

Delving into the individual influence of these antecedents, it was evident that credibility took the lead in its sway over perceived attitudes. It was closely trailed by enjoyment and, subsequently, by peer communication. Their corresponding g -coefficients stood at 0.292, 0.301, and 0.266, respectively, underscoring their importance.

These observations resonate well with previously conducted studies. For instance, research indexed as [34] underscored how the degree of enjoyment derived while contemplating a Facebook-based retail purchase significantly bolstered the chances of Generation Z finalizing such transactions. In tandem with our findings, the authors of [35] concluded that younger consumers tend to harbor a more receptive stance towards online retail acquisitions. Furthermore, our results provide empirical weight to the findings of [36], emphasizing the pivotal role trust plays in guiding online purchase trajectories.

Additionally, our research unveiled intriguing generational differences. Generation Z, when juxtaposed against their older counterparts, devote substantially more time immersing themselves in digital dialogues with their peers. This heightened engagement does not merely serve as a social tool but notably molds their perceptions of retail products. More importantly, it strongly influences their propensity to secure these products via Facebook. In numerical terms, the attitudes exhibited by Generation Z had an impressive 54% (adjusted $R^2 = 0.540$) prediction potential concerning their likelihood to clinch retail acquisitions on the platform.

In synthesizing the key takeaways, this research underscores the paramountcy of accounting for factors such as enjoyment, credibility, and peer interaction dynamics when predicting the perceptions and purchasing tendencies of Generation Z concerning Facebook-based retail offerings. The amalgamation of these antecedents provides a formidable predictive model.

For stakeholders, especially marketers and retail strategists, these revelations are invaluable. They not only elucidate the intricate web of factors that guide Generation Z's online shopping behaviors but also offer a roadmap for tailored engagements. In an era

where digital interfaces, such as Facebook, are increasingly serving as retail touchpoints, harnessing insights into the purchasing psyche of a digitally native demographic such as Generation Z is both a challenge and an opportunity. This research, in its depth and breadth, offers a foundational framework for capitalizing on the latter.

There are numerous potential bias issues in the context of F-commerce research that researchers should be aware of and handle effectively to ensure the validity and reliability of their findings. Some of the most common sources of bias in F-commerce research

To mitigate these potential biases, researchers can employ various strategies, such as

1. Implementing random or stratified sampling methods to ensure a representative sample.
2. Providing incentives to encourage participation and minimize non-response bias.
3. Using anonymous surveys to reduce social desirability bias.
4. Using multiple data sources or triangulation to validate findings.
5. Clearly defining the research questions and objectives to focus on specific aspects of F-commerce without unnecessary biases.
6. Conducting sensitivity analyses to assess the impact of potential biases on the study's results.

4.1. Implications

This study's findings reveal a profound understanding of how Generation Z perceives and engages with E-commerce, particularly retail shopping on Facebook. The model used in the study not only highlights their current attitudes, but it also accurately predicts their purchasing intentions. To truly grasp the breadth and depth of these findings, it is necessary to investigate their implications in two distinct dimensions. For starters, from an academic standpoint, these findings provide a rich tapestry for scholars, researchers, and market analysts. These findings can be used by academics and scholars to fine-tune curricula, ensuring that they remain relevant and provide insights into the evolving digital marketplace. For researchers, this opens up new avenues for further research, such as delving deeper into Generation Z sub-segments or investigating other influential platforms. Market analysts, on the other hand, can use these data to improve their predictions and better understand market dynamics, particularly as they relate to the E-commerce behaviors of younger generations. The second dimension is concerned with the practical application of these insights, particularly for those who are actively involved in the E-commerce arena, whether as marketers, suppliers, or digital advertisers. Marketers can use this information to create more effective and targeted campaigns, ensuring their messaging on platforms such as Facebook resonates with Generation Z. Recognizing this generation's preferences, suppliers can optimize their logistics by utilizing tools such as real-time tracking or integrating more deeply with platforms preferred by this generation. Meanwhile, digital advertisers have a well-defined strategy. They can design more compelling advertisements, interactive campaigns, and even collaborative events on platforms such as Facebook with knowledge of what drives and motivates Generation Z's E-commerce behaviors, ensuring they capture the attention and purchasing power of this tech-savvy generation.

4.2. Consequences for Scholars, Researchers, and Market Strategists

The study's conceptual model effectively forecasted the purchasing intentions of Generation Z in the realm of E-commerce, underscoring their affinity for tech-centric platforms. The research provides insights into the factors, such as enjoyment, credibility, and peer interaction, which mold Generation Z's attitude towards E-commerce [37].

For academics, this suggests the potential for introducing specialized curriculum segments that delve into how platforms such as Facebook effectively resonate with and sway Generation Z. Social science professionals and psychologists might also consider probing further into other factors that could bolster the predictive strength of the presented model. Market analysts can harness these insights to craft products more aligned with Generation Z's distinct preferences. The results underscore the pivotal role Facebook

plays for Generation Z as a crucial avenue for both engagement and retail purchasing. With this knowledge, marketers can refine their online retail campaigns, tapping into Generation Z's proclivity for online shopping. In essence, this study enriches the prevailing academic discourse on E-commerce within the Generation Z demographic. It broadens our comprehension of their online purchasing habits and the impact of influential social media platforms.

4.3. Consequences for Brand Strategists, Suppliers, and Digital Advertising Professionals

The results of this study offer substantial insights for marketers. Recognizing the importance of interactive communication, marketers can now engage Generation Z more effectively through dynamic Facebook advertising strategies tailored to this demographic. For suppliers, leveraging features such as the global positioning system for product delivery and showcasing warehouse locations on Facebook can be potent tools to influence the purchasing decisions of Generation Z. However, perhaps the most significant impact is on the realm of digital marketing and advertising. Advertisers are presented with the opportunity to craft tailored products, along with creating dedicated Facebook fan pages for various brands. These measures not only expand the outreach to Generation Z but also resonate with them, nudging them towards subsequent purchases.

4.3.1. Theoretical Implications

In the context of F-commerce and Generation Z retail shopping behavior, theoretical implications refer to the broader theoretical insights and contributions that the research contributes to the existing body of knowledge in relevant domains. The following are some of the study's significant theoretical implications:

Increasing Understanding of Generation Z Attitudes: The study's investigation of attitude antecedents such as enjoyment, credibility, and peer communication provides theoretical insights into the elements that influence Generation Z's attitudes towards F-commerce. This knowledge adds to the body of knowledge on consumer behavior and attitude formation, particularly among the younger generation.

Integrating Attitude and Purchase Intentions: The study contributes to attitude-behavior theories by finding a substantial association between attitude and purchase intentions in the setting of F-commerce. This discovery adds to our understanding of how attitudes about online shopping translate into actual purchase decisions, with important theoretical implications for marketing and consumer psychology.

Extending Supply Chain Uncertainty Research: The study's identification of uncertainty in F-commerce supply networks [38], as well as recommended solutions for controlling these uncertainties, contributes to supply chain management theories. The incorporation of symmetrical and asymmetrical modeling strategies to overcome uncertainties can broaden theoretical understanding of supply chain management in the context of modern online retail practices.

Contextualizing F-Commerce in the Middle East: This study adds to the increasing body of research on F-commerce in varied cultural and economic contexts by focusing on Generation Z's interaction with F-commerce in the Middle East. The findings can help to inform cross-cultural marketing theories [39] as well as provide light on the specific elements driving customer behavior in the Middle East.

The study's usage of big data with the PLS-SEM methodology can contribute to theoretical discussions on merging diverse research approaches. The research presents theoretical implications for future studies attempting to utilize both data-driven insights and established statistical methodologies by demonstrating the combination of big data analysis with a commonly used structural equation modeling method.

Recognizing the Importance of Social Commerce: The study's examination of Generation Z's F-commerce participation emphasizes the importance of social commerce in modern retail practices. This discovery has theoretical implications for ideas of e-commerce, online marketing, and the impact of social media on consumer behavior.

The study's unique focus on Generation Z as the target demographic reveals their individual qualities and interests, contributing to generational studies and marketing theories [40]. Understanding Generation Z attitudes and behaviors in the context of F-commerce might help inform customized marketing efforts for this specific demographic.

Overall, the theoretical implications of this study provide useful insights into a variety of domains, including consumer behavior, supply chain management, marketing, and cross-cultural studies [41]. The findings of the study contribute to the refinement and extension of current theoretical frameworks, making it an important addition to the academic literature on F-commerce and Generation Z in the Middle East.

4.3.2. Management Implications

Management implications of F-commerce and Generation Z retail shopping behavior can provide significant insights and advice to businesses, marketers, and supply chain managers trying to capitalize on this rising trend. Some of the important management implications based on the research findings and analyses are as follows:

1. **Emphasizing the Role of Attitude:** Managers should recognize the considerable influence of attitude on Generation Z's F-commerce purchase intentions. To increase sales and engagement, they should aim on fostering a good attitude about F-commerce among Generation Z consumers. To develop trust and credibility [41], strategies could include personalized content, engaging experiences, and open communication.
2. **Managers may capitalize on the relevance of fun and peer communication in Generation Z's F-commerce experiences by leveraging enjoyment and peer communication.** Businesses may improve the overall browsing experience and raise buy intentions among this generation by generating amusing and engaging content and fostering social interactions.
3. **Enhancing Credibility and Trust:** Given the widespread skepticism regarding online platforms, managers should prioritize the development of credibility and trust in their F-commerce activities. Transparency, customer evaluations, and testimonials can all help to build confidence among Generation Z customers and encourage them to make retail purchases on Facebook.
4. **Tailoring Products and Experiences:** Understanding Generation Z's social media tastes and behavior is critical for successful F-commerce operations. Managers should personalize items, advertisements, and shopping experiences to this demographic's individual demands and interests, improving the attraction of F-commerce offers.
5. **Optimizing Supply Chain Management:** Managers should execute supply chain changes to achieve outstanding operational performance based on the identification of uncertainties in the supply chain related to F-commerce [42,43]. To satisfy the demands of F-commerce transactions efficiently, proactive methods such as flexible inventory management, responsive logistics, and effective order fulfilment can be implemented [20].
6. **Managers should use big data and analytics to obtain important insights into Generation Z's shopping behaviors and preferences on F-commerce platforms [44].** Client data analysis may help firms make data-driven decisions, improve marketing strategies, and personalize services to specific client categories.
7. **Increasing Social Media Presence:** Businesses must recognize the importance of social media platforms, notably Facebook, in engaging Generation Z consumers [45]. Companies can communicate with their target audience more effectively by extending their social media presence and investing in social commerce capabilities [46,47].
8. **Continuous Monitoring and Adaptation:** As the landscape of F-commerce and Generation Z preferences evolves at a rapid pace, managers should employ a continuous monitoring strategy. Businesses may remain competitive by regularly reviewing consumer feedback [48], following market trends, and remaining up to current on platform features [49].

Businesses should strategically position themselves in the F-commerce market and effectively respond to the expectations and preferences of Generation Z consumers in the Middle East and abroad by considering these management implications.

5. Conclusions and Limitations

The presented model was found to effectively forecast the purchasing intentions of Generation Z towards retail products on Facebook. This study is distinctive in its comprehensive inclusion and experimental validation of all variables. Results illustrated that the attitude, influenced by enjoyment, credibility, and peer communication, greatly determined the intention to procure retail items through Facebook. E-commerce's potential to elevate retail sales and profits, especially when targeting young consumers on social media, was evident. However, the research has its limitations. Primarily, focusing only on Generation Z might limit the generalizability of the results, as an educated demographic may exhibit socially desirable responses. While the model's predictive strength is commendable, adding more variables could enhance it. Secondly, the study zeroed in exclusively on Facebook, leaving room for future investigations into platforms such as Instagram, Snapchat, and YouTube. Lastly, the research measured only the intent of Generation Z to buy through Facebook. Subsequent studies could delve deeper into real purchase behaviors across a broader and diverse audience.

Author Contributions: Conceptualization, M.A.M. and S.B.K.; Methodology, M.A. and S.B.K.; Validation, M.A.; Formal analysis, M.A.; Investigation, M.A.M.; Data curation, S.B.K.; Writing—original draft, M.A.M. and S.B.K.; Writing—review & editing, M.A.; Project administration, M.A.M.; Funding acquisition, M.A.M. All authors have read and agreed to the published version of the manuscript.

Funding: Researchers Supporting Project number (RSP2023R446), King Saud University, Riyadh, Saudi Arabia.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Researchers Supporting Project (RSP2023R446), King Saud University, Riyadh, Saudi Arabia.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Bacon, L.D. Using LISREL and PLS to measure customer satisfaction. In Proceedings of the Seventh Annual Sawtooth Software Conference, La Jolla, CA, USA, 2–5 February 1999; pp. 2–5.
2. Teens, Social Media & Technology Overview 2015. Available online: <http://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015/> (accessed on 7 August 2023).
3. Cheah, I.; Phau, I. Attitudes towards environmentally friendly products: The influence of ecoliteracy, interpersonal influence and value orientation. *Mark. Intell. Plan.* **2011**, *29*, 452–472. [[CrossRef](#)]
4. Saab, S., Jr.; Fu, Y.; Ray, A.; Hauser, M. A dynamically stabilized recurrent neural network. *Neural Process. Lett.* **2022**, *54*, 1195–1209. [[CrossRef](#)]
5. Bagozzi, R.P. Attitudes, intentions, and behavior: A test of some key hypotheses. *J. Personal. Soc. Psychol.* **1981**, *41*, 607. [[CrossRef](#)]
6. Bagozzi, R.P.; Yi, Y. On the evaluation of structural equation models. *J. Acad. Mark. Sci.* **1988**, *16*, 74–94. [[CrossRef](#)]
7. Barclay, D.; Higgins, C.; Thompson, R. The partial least squares (PLS) approach to casual modeling: Personal computer adoption and use as an illustration. *Technol. Stud.* **1995**, *2*, 285–309.
8. Chen, H.; Papazafeiropoulou, A.; Chen, T.K.; Duan, Y.; Liu, H.W. Exploring the commercial value of social networks: Enhancing consumers' brand experience through Facebook pages. *J. Enterp. Inf. Manag.* **2014**, *27*, 576–598. [[CrossRef](#)]
9. Childers, T.L.; Carr, C.L.; Peck, J.; Carson, S. Hedonic and utilitarian motivations for online retail shopping behavior. *J. Retail.* **2001**, *77*, 511–535. [[CrossRef](#)]
10. Churchill, G.A., Jr.; Moschis, G.P. Television and interpersonal influences on adolescent consumer learning. *J. Consum. Res.* **1979**, *6*, 23–35. [[CrossRef](#)]
11. Arikumar, K.S.; Deepak Kumar, A.; Gadekallu, T.R.; Prathiba, S.B.; Tamilarasi, K. Real-Time 3D Object Detection and Classification in Autonomous Driving Environment Using 3D LiDAR and Camera Sensors. *Electronics* **2022**, *11*, 4203. [[CrossRef](#)]

12. DelVecchio, D. Moving beyond fit: The role of brand portfolio characteristics in consumer evaluations of brand reliability. *J. Prod. Brand Manag.* **2000**, *9*, 457–471. [[CrossRef](#)]
13. Di Pietro, L.; Pantano, E. An empirical investigation of social network influence on consumer purchasing decision: The case of Facebook. *J. Direct Data Digit. Mark. Pract.* **2012**, *14*, 18–29. [[CrossRef](#)]
14. Ellison, N.B.; Steinfield, C.; Lampe, C. The benefits of Facebook “friends:” Social capital and college students’ use of online social network sites. *J. Comput. Mediat. Commun.* **2007**, *12*, 1143–1168. [[CrossRef](#)]
15. Colliander, J.; Dahlén, M. Following the fashionable friend: The power of social media: Weighing publicity effectiveness of blogs versus online magazines. *J. Advert. Res.* **2011**, *51*, 313–320. [[CrossRef](#)]
16. Fan, M.; Ammah, V.; Dakhan, S.A.; Liu, R.; Mingle, M.N.; Pu, Z. Critical Factors of Reacquainting Consumer Trust in E-Commerce. *J. Asian Financ. Econ. Bus.* **2021**, *8*, 561–573.
17. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [[CrossRef](#)]
18. Feipeng, G.; Qibei, L. The research and implementation of supply chain resource integration platform on textile industry. In Proceedings of the 2010 International Forum on Information Technology and Applications, Kunming, China, 16–18 July 2010.
19. Ho, G.T.S.; Tang, Y.M.; Lam, H.Y.; Tang, V. A blockchain-based decision support system for E-commerce order prediction. In Proceedings of the 2023 International Conference on Artificial Intelligence in Information and Communication (ICAIIIC), Bali, Indonesia, 20–23 February 2023.
20. Wanganoo, L.; Prasad Panda, B.; Tripathi, R.; Kumar Shukla, V. Harnessing smart integration: Blockchain-enabled B2C reverse supply chain. In Proceedings of the 2021 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), Dubai, United Arab Emirate, 17–18 March 2021.
21. Gefen, D.; Straub, D.; Boudreau, M.C. Structural equation modeling and regression: Guidelines for research practice. *Commun. Assoc. Inf. Syst.* **2000**, *4*, 7. [[CrossRef](#)]
22. Gironde, J.T.; Korgaonkar, P.K. Understanding consumers’ social networking site usage. *J. Mark. Manag.* **2014**, *30*, 571–605. [[CrossRef](#)]
23. Gold, A.H.; Malhotra, A.; Segars, A.H. Knowledge management: An organizational capabilities perspective. *J. Manag. Inf. Syst.* **2001**, *18*, 185–214. [[CrossRef](#)]
24. Hair, J.F., Jr.; Sarstedt, M.; Hopkins, L.; Kuppelwieser, V.G. Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *Eur. Bus. Rev.* **2014**, *26*, 106–121. [[CrossRef](#)]
25. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: New York, NY, USA, 2016.
26. Hair, J.F.; Sarstedt, M.; Pieper, T.M.; Ringle, C.M. The use of partial least squares structural equation modeling in strategic management research: A review of past practices and recommendations for future applications. *Long Range Plan.* **2012**, *45*, 320–340. [[CrossRef](#)]
27. Henseler, J.; Ringle, C.M.; Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [[CrossRef](#)]
28. Hew, J.J.; Lee, V.H.; Ooi, K.B.; Lin, B. Mobile social commerce: The booster for brand loyalty? *Comput. Hum. Behav.* **2016**, *59*, 142–154. [[CrossRef](#)]
29. Hulland, J. Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strateg. Manag. J.* **1999**, *20*, 195–204. [[CrossRef](#)]
30. Hwang, H.; Malhotra, N.K.; Kim, Y.; Tomiuk, M.A.; Hong, S. A comparative study on parameter recovery of three approaches to structural equation modeling. *J. Mark. Res.* **2010**, *47*, 699–712. [[CrossRef](#)]
31. Kaiser, F.G.; Schultz, P.W.; Berenguer, J.; Corral-Verdugo, V.; Tankha, G. Extending planned environmentalism: Anticipated guilt and embarrassment across cultures. *Eur. Psychol.* **2008**, *13*, 288–297. [[CrossRef](#)]
32. Li, W.; Qalati, S.A.; Khan, M.A.S.; Kwabena, G.Y.; Erusalkina, D.; Anwar, F. Value co-creation and growth of social enterprises in developing countries: Moderating role of environmental dynamics. *Entrep. Res. J.* **2020**, *12*, 501–528. [[CrossRef](#)]
33. Liao, Y.W.; Wang, Y.S.; Yeh, C.H. Exploring the relationship between intentional and behavioral loyalty in the context of e-tailing. *Internet Res.* **2014**, *24*, 668–686. [[CrossRef](#)]
34. Liat, C.B.; Wuan, Y.S.; Nilai, P. Factors Influencing Consumers’ Online Purchase Intention: A Study among University Students in Malaysia. *Int. J. Lib. Arts Soc. Sci.* **2014**, *2*, 121–133.
35. Liebana-Cabanillas, F.; Alonso-Dos-Santos, M. Factors that determine the adoption of Facebook commerce: The moderating effect of age. *J. Eng. Technol. Manag.* **2017**, *44*, 1–18. [[CrossRef](#)]
36. Lin, H.; Fan, W.; Chau, P.Y. Determinants of users’ continuance of social net-working sites: A self-regulation perspective. *Inf. Manag.* **2014**, *51*, 595–603. [[CrossRef](#)]
37. Saab, S., Jr.; Saab, K.; Phoha, S.; Zhu, M.; Ray, A. A multivariate adaptive gradient algorithm with reduced tuning efforts. *Neural Netw.* **2022**, *152*, 499–509. [[CrossRef](#)] [[PubMed](#)]
38. Al-Abbas, M.; Saab, S.S. Gender Inequity in Engineering Higher Education: A Case Study of an American University in a Middle Eastern Country. In Proceedings of the 2022 10th International Conference on Information and Education Technology (ICIET), Matsue, Japan, 9–11 April 2022; pp. 345–354.

39. Bin, Y.; Jun, H. An analysis on green supply chain management in E-commerce under the economic globalization. In Proceedings of the 2009 International Conference on Business Intelligence and Financial Engineering, Beijing, China, 24–26 July 2009.
40. Lu, Z.P. Exploration for regional B2C E-commerce mode based on supply chain management. In Proceedings of the 2009 International Conference on E-Business and Information System Security, Wuhan, China, 23–24 May 2009.
41. Qin, B.; Fang, H. Analysis on the bottlenecks in automobile industry—Based on the database method of the whole automobile industry supply chain. In Proceedings of the 2021 International Conference on E-Commerce and E-Management (ICECEM), Dalian, China, 24–26 September 2021.
42. Wisetsri, W.; Syam, E.; Alanya-Beltran, J.; Kulkarni, G.R.; Vardhan Reddy, R.K.; Alam Sheikh, M.F. Assessing and comparing the role of machine learning (ML) and supply chain management (SCM) towards enhancing E-commerce. In Proceedings of the 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 28–29 April 2022.
43. Xu, P. Structuring a new mode of enterprise operation management by supply chain management. In Proceedings of the 2011 International Conference on Management and Service Science, Bangkok, Thailand, 7–9 May 2011.
44. Xu, Q.; Liu, Z. Dual-channel supply chain coordination model based on seasonal compensation. In Proceedings of the 2012 International Conference on Management Science & Engineering 19th Annual Conference Proceedings, Dallas, TX, USA, 20–22 September 2012.
45. Yang, L.; Li, B.; Lan, W. Tourism supply chain cooperative trust dominated by travel agency in China. In Proceedings of the 2009 International Conference on Management of E-Commerce and e-Government, Nanchang, China, 24–26 October 2009.
46. Yu, X.; Wei, L. Inventory management in e-commerce supply chain with lateral transshipment and quick response. In Proceedings of the 2018 5th International Conference on Industrial Engineering and Applications (ICIEA), Singapore, 26–28 April 2018.
47. Zhang, W.; Wang, L. Research on the impact of supply chain relationship on enterprise innovation under the background of digital economy. In Proceedings of the 2021 International Conference on E-Commerce and E-Management (ICECEM), Dalian, China, 24–26 September 2021.
48. Wibowo, W.; Purwa, T.; Ulama, B.S.S.; Wilantari, R.N. Investigating the effects of several interventions on supply chain behavior: Evidence from West Nusa Tenggara Province, Indonesia. *Uncertain Supply Chain Manag.* **2022**, *10*, 601–624. [[CrossRef](#)]
49. Rani, S.; Babbar, H.; Srivastava, G.; Gadekallu, T.R.; Dhiman, G. Security Framework for Internet of Things based Software Defined Networks using Blockchain. *IEEE Internet Things J.* **2022**, *10*, 6074–6081. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.