sciendo

received: 10 March 2023
accepted: 1 July 2023

pages: 101-114

Methodology of an interpretive structural map construction for social commerce success

Hazel Pijo Aethyl Aguilar Mitzie Ann Catarongan
Janet Orioque Nadine May Atibing
Charldy Wenceslao Samantha Shane Evangelista
Joerabell Lourdes Aro Fatima Maturan
Kafferine Yamagishi Lanndon Ocampo

Lanndon Ocampo
Cebu Technological University, Philippines
ORCID 0000-0002-5050-7606
Corresponding author:
e-mail: lanndonocampo@gmail.com

Hazel Pijo
Palompon Institute of Technology, Philippines
ORCID 0009-0001-6701-8198

Aethyl Aguilar
Palompon Institute of Technology, Philippines
ORCID 0000-0001-8108-6747

Mitzie Ann Catarongan
Palompon Institute of Technology, Philippines
ORCID 0000-0001-8398-3118

Janet Orioque
Palompon Institute of Technology, Philippines
ORCID 0000-0002-4352-5021

Nadine May Atibing
Cebu Technological University, Philippines
ORCID 0000-0002-6131-472X

Charldy Wenceslao
Cebu Technological University, Philippines
ORCID 0009-0003-7056-6915

Samantha Shane Evangelista
Cebu Technological University, Philippines
ORCID 0000-0003-2162-7200

Joerabell Lourdes Aro
Cebu Technological University, Philippines
ORCID 0000-0002-9955-4315

Fatima Maturan
Cebu Technological University, Philippines
ORCID 0000-0003-2217-3482

Kafferine Yamagishi
Cebu Technological University, Philippines
ORCID 0000-0002-0775-6156

ABSTRACT

The factors influencing consumer purchase decisions in electronic commerce platforms and the interrelationships of each element are prevalent in the domain literature. However, a comprehensive analysis of the complex interrelationships among the success factors remains unexplored, especially in a social commerce context. To address the gap, this work evaluates the relationship structure and determines the critical factors using interpretive structural modelling (ISM). On the other hand, the Matrice d'Impacts Croisés Multiplication Appliquée á un Classement (MICMAC) is introduced to analyse the interaction of the factors and recognise the most relevant among them. In demonstrating the ISM-MICMAC analysis, this work performed a case study evaluating 13 factors of social commerce success for food products derived from a previous study. The findings of this work suggest that timeliness, data privacy policy, and Internet connectivity drive most other factors. Thus, focusing the resources on augmenting these factors consequently improves other factors. These findings suggest that sellers must streamline their overall service chain to maintain timeliness in their transactions, safeguard consumers' data privacy, and uphold consumer communication efficiency to maximise Internet connectivity. These insights provide useful information to help decision-makers in the food industry allocate resources and encourage more consumers for social commerce. Several managerial insights were discussed.

KEY WORDS

consumer purchase, social commerce, food products, COVID-19

10.2478/emj-2023-0023

Introduction

The global crisis shaped by the COVID-19 pandemic shook the world, restricting people's mobility and activities when the government actively imposed border controls to help lessen the virus transmission (Tong et al., 2021; Din et al., 2022). Economic activities, such as business operations, social gatherings, and educational learning, were disrupted by the call for strict adherence to health protocols in combating the pandemic (Ocampo & Yamagishi, 2020; Benton et al., 2021). Shopping is non-exempt to those perturbed activities where consumer preferences have switched

Pijo, H., Aguilar, A., Catarongan, M. A., Orioque, J., Atibing, N. M., Wenceslao, Ch., Evangelista, S. S., Aro, J. L., Maturan, F., Yamagishi, K., & Ocampo, L. (2023). Methodology of an interpretive structural map construction for social commerce success. *Engineering Management in Production and Services, 15*(3), 101-114. doi: 10.2478/emj-2023-0023

abruptly from offline (i.e., going to malls or physical shops) to online purchases (Kulkarni & Barge, 2020). To safely meet people's consumption requirements, especially for food products, the population of buyers and sellers shifted to using electronic commerce (e-commerce) platforms (Sheth, 2020; Lin et al., 2021). To this end, e-commerce, which pertains to the buying and selling activity of various goods on online platforms (Kwilinski et al., 2019), has since become prominent in the market with the advent of COVID-19 (Guo et al., 2021; Dixon, 2022). With this trend, an overflowing number of consumers was noticed on various online platforms, consequently driving e-commerce to evolve into a customer-oriented social commerce (Nacar & Ozdemir, 2022; Kim, 2020). Social commerce is leading the future of e-commerce (Attar et al., 2021).

Social commerce is a type of commerce mediated by social networking sites (e.g., Facebook, Instagram, and Twitter) and involves the convergence of online and offline environments (Yacob et al., 2021). More consumers use social networking sites to learn about marketing, selling, comparing, curating, buying, and sharing goods and services in online and offline marketplaces and communities (Zhou et al., 2013). Thus, social commerce increases quickly in various emerging markets and developing economies because of the changes in the information and communication technology (ICT) landscape (Arceño et al., 2022). Despite the prominence of food-selling platforms, there are many challenges faced by micro, small, and medium enterprises (MSMEs) when it comes to seamlessness in social commerce (Savrul, 2014), such as food enterprise competitiveness (Kukharuk & Gavrysh, 2019), rapid business model iteration, and the overwhelming flow advantage of giant enterprises (Chen et al., 2021). Meanwhile, many social commerce enterprises are also experiencing issues during their rapid expansion, such as unbalanced development and resource allocation (Chen et al., 2021). These issues significantly affect the competitiveness and adaptability of social commerce enterprises, making the whole industry relatively unstable.

To address these problems and improve the survivability of enterprises, it is imperative to understand the success factors affecting consumer purchase decisions on social commerce platforms (i.e., food reliability, product quality, safety, and convenience) (Hong et al., 2021; Prasetyo et al., 2021). While many studies have been made to understand the influence of these success factors on the buyer's decision to buy food online, limited attention is given to these priority factors, which are generally analysed in isolation, particularly in narrowing the context of social commerce. Such an approach does not fully address the inherent complex interrelationships of these factors, which may result in counterintuitive insights. Nevertheless, Arceño et al. (2022) reported an attempt to evaluate the factors affecting consumer purchase intention to purchase food products on Facebook platforms using a Decision-Making Trial and Evaluation Laboratory (DEMATEL). On the other hand, Guerrero et al. (2023) examined the barriers (i.e., which can be framed as factors) of online shopping in the Philippines, both from buyers' and sellers' perspectives, using interpretive structural modelling. Both attempts stem from their review of many empirical studies suggesting the causal relationships among these factors. Despite their reports, the context of social commerce, which combines offline and online environments, is left unattended. Hence, evaluating the interrelationships among factors that affect consumers' decision to purchase food products and subsequently deriving the resulting priority factors are an exciting agenda that requires investigation in a social commerce environment.

Thus, this work examines the complex interrelationships among the success factors of social commerce success and builds a structural map that effectively portrays their inherent transitivity, thereby offering rich information for practitioners. Due to its efficacy demonstrated in vast applications, the interpretive structural modelling (ISM) approach is adopted as the overarching methodology to gain insights into the complexity of the relationships among success factors, effectively advancing the insights of Arceño et al. (2022) for a social commerce context. The ISM is an established methodological framework for developing hierarchical and contextual relationships among the elements of a system. It is a "systematic application of some elementary notions of graph theory in such a way that theoretical, conceptual, and computational leverage is exploited to efficiently construct a directed graph, or network representation, of the complex pattern of a contextual relationship among a set of elements" (Malone, 1975). It offers a visual systems model derived from an unstructured mental model of complex relationships among elements in a system. On the other hand, a cross-impact matrix multiplication applied to classification, originally known as the Matrice d'Impacts Croisés Multiplication Appliquée á un Classement (MICMAC), is introduced to analyse the interaction

of success factors and recognise the most relevant ones. The efficacy of the ISM-MICMAC has led to its adoption in various applications, including, but not limited to, the analysis of lean six sigma barriers (Vinodh & Asokan, 2018), evaluation of manufacturing implementation factors (Sonar et al., 2020), assessment of the obstacles to implementing big data analytics (Dehkhodaei et al., 2023), examining buying behaviour of millennials for secondhand clothing (Medalla et al., 2020), evaluating the factors of research productivity (Ocampo et al., 2022), analysis of the challenges for adopting the Internet of Things (Janssen et al., 2019), and modelling the challenges of university technology transfer (Quiñones et al., 2020). Compared to the DEMATEL used by Arceño et al. (2022) in a similar study of e-commerce platforms, the ISM-MICMAC analysis offers at least two specific advantages: (1) it relaxes the contextual relationships among factors, rather than strict causal relationships, and (2) it builds a more organised hierarchical structure of the factors, portraying an effective representation of their relationships that can be better understood by decision-makers and practitioners. Thus, a comprehensive evaluation of the social commerce success factors by integrating ISM-MICMAC analysis informs practical insights that will help food MSMEs advance their social commerce models.

The remainder of this paper is structured as follows. Section 2 discusses the role of social commerce in online food delivery (OFD) systems and the factors influencing consumer purchase decisions in social commerce, while Section 3 presents the preliminary concepts of the ISM-MICMAC analysis. Section 4 outlines the application of the ISM-MICMAC analysis in structuring the success factors of adopting social commerce. Section 5 offers some managerial implications of the findings, while Section 6 ends with some concluding remarks and directions for future work.

1. Literature review

1.1. Role of social commerce in food delivery systems

Online food delivery (OFD) systems have recently become a global trend. The worldwide revenue of the OFD market is expected to be USD 1465.6 billion by 2027 (Dixon, 2022). Convenience is one of the main reasons consumers buy food online (Chai & Yat, 2019). During the global COVID-19 pandemic, the advantages of OFD have become more evident as it enhanced the accessibility of ready-made meals while enabling food providers to continue their operations (Li et al., 2020). Thus, the online food industry has cultivated various ways to elevate its services to cater to the increasing demand and remain competitive in the market, such as offering hefty discounts and developing effective promotional campaigns (Li et al., 2020). Accordingly, OFD has shifted from Restaurant-to-Consumer delivery to Platform-to-Consumer delivery, wherein the order is made through the food establishment's online platform or third-party platforms (Pal et al., 2022). These third-party platforms vary from country to country. For instance, in China, Meituan is the leading food delivery app (Culture Yard, 2022), while Just Eat Takeaway dominates the United Kingdom's food delivery market (Startups of London, 2022). The Philippines' OFD industry has been dominated by Grab and Food Panda (Statista Research Department, 2023). Thus, it is evident that the OFD industry has shown enhanced proactivity in expanding into new markets and shaping consumer eating habits. Due to the increasing demand, the role of social media in augmenting the OFD industry through advertisement and promotional campaigns has gained recognition in the current literature (Bhattacharyya & Bose, 2020). Moreover, there is an increasing trend in utilising social media platforms as a medium for food providers and consumers to engage in OFD services (Attar et al., 2021).

In recent years, social commerce has led the future of e-commerce (Attar et al., 2022). Nacar and Ozdemir (2022) emphasised that adopting social media in commercial transactions has notably transformed the traditional product value creation, marketing, branding, and production and purchasing activities of various businesses. Furthermore, social commerce allows seamless communication between sellers and buyers as a result of the communication-effective and user-centred designs enforced by social media platforms (Huang & Benyoucef, 2013); thus, making it convenient for both parties to conduct buy and sell transactions (Liao et al., 2021). Recent reports reveal that social media influenced purchases for 74 % of customers, with customers comparing prices and promotions (Beer, 2018). Thus, marketers have recently started leveraging social networking sites to promote their products and facilitate commercial transactions through the channel, effectively boost-

ing social commerce (Bhattacharyya & Bose, 2020). Accordingly, Facebook is the most widely used social networking site among individuals and businesses (Bhattacharyya & Bose, 2020). Facebook has been used by more than 86 % of US marketers for advertising in 2019. Due to its popularity in practice, academic research has started showing interest in understanding the role of Facebook, particularly in user consumption decisions. For instance, Bhattacharyya and Bose (2020) analysed the influence of Facebook interactions (e.g., likes, comments) on the purchase behaviours of consumers on a linked e-commerce site, while Al-Adwan and Kokash (2019) explored the driving forces of Facebook social commerce. On the other hand, Abuhashesh et al. (2021) investigated the effect of culture on consumer attitudes toward Facebook advertising. Meanwhile, the social media platform added various functions that allowed customers to comment on and rate their products and services (Nacar & Ozdemir, 2022). For instance, the Marketplace feature of Facebook, a function added in January 2018, has created a communication channel for buyers and sellers to interact with each other (Redfearn, 2019). Due to the straightforward and practical function of social media platforms, MSMEs have used these platforms to establish their business in terms of managing customer relationships and online presence (Handayani & Lindianigrum, 2011; He & Harris, 2020).

1.2. Factors influencing consumer purchase decisions in social commerce

The development and availability of online food purchasing through social media and social commerce combined with the busy schedule demand more expansive research for better understanding (Saad, 2021). Thus, various studies have ventured into determining the factors that influence consumer purchase decisions in social commerce. For instance, Cho and Sagynov (2015) determined such factors as product information, price, perceived product or service quality, usefulness, and convenience, including service quality offered by the seller. Using factor and regression analysis and structural equation modelling, it was found in their empirical analysis that perceived usefulness, perceived ease of use and trust had a significant effect on the behavioural intention to shop online. Another study (Moslehpour et al., 2021) showed that social media marketing, trust, and brand image affect the consumers' purchase intention. But among these factors, entertainment and word-of-mouth bring the most significant effect on a consumer's purchase intention. Hence, trust and brand image mediate the relationship between social media marketing and purchase intention. Trust and brand image can significantly amplify the influence of each variable on the consumer's purchase intention. Thereby, each factor significantly affects one another. Francioni et al. (2022) emphasised the differences in purchasing food online based on gender. In general, perceived healthiness, quarantine procedures, perceived hygiene, perceived ease of app use and attitude significantly influence continuance intention. Furthermore, it was also revealed that perceived healthiness, quarantine procedures, and perceived hygiene mainly influence male consumers' continuance intention.

Conversely, female customers' intention to purchase online is predicted by perceived healthiness and attitude, with respondents representing young customers aged 18–29. Another work by Shankar et al. (2022) using a qualitative and exploratory approach concluded the factors important to consumers in ordering food online through social media. Results showed that delivery time, service quality, price and condition of food delivered are the first factors that directly affect the success of online food delivery. Moreover, delivery tracking service and the attitude of a delivery person are found to constitute the second factor and are considered indirect factors. On the other hand, Faraoni et al. (2019) explored the antecedents of loyalty among consumers in e-commerce. They found that one of the critical factors affecting consumers' trust in the sellers is how the sellers handle the information provided during the transaction.

In particular, some of the frequent factors documented in the empirical studies of various scholars regarding these factors are the service quality, delivery time, electronic word of mouth (eWOM), pricing and condition of the food provided, brand familiarity, and the attitude of delivery people (Jiang et al., 2021; Hong et al., 2021; Prasetyo et al., 2021). Discussions of these research findings mentioned that the identified factors are considered crucial in food social commerce, especially in influencing the buying preference of food consumers online. Moreover, social interactions through eWOM emanate the prestige of the product and brand (Lim et al., 2022; Liu, 2021). Keeping abreast in strategising marketing is necessary to attract more customers (Kim et al., 2015; Lim et al., 2022). This affects people's cognisance of their self-performance (Bone, 1995), including some affective elements broadly known to be highly efficient to

both businesses and customers. As a result, uplifting and implementing strategies relating to the emotional factors associated with service quality must be designed by organisations to constantly build a strong connection with their customers (Qiu et al., 2019). Furthermore, the domain literature highlights some significant links between service quality, food quality, customer satisfaction, and perceived value in the context of customer satisfaction with virtual food ordering services and stresses the importance of quality in both service and food as it relates to customer satisfaction (Uzir et al., 2021). In addition, customer value positively influences buying intention (Su et al., 2019). Arceño et al. (2022) attempted to holistically evaluate these factors, contextualised in Facebook e-commerce platforms and found the criticality of reliability, food product quality and safety, and convenience. While these interrelationships are highlighted in the literature, evaluating social commerce success factors in light of these interrelationships remains a gap. Since social commerce platforms became prominent when buying activities were limited to online and no-contact interactions, MSMEs need to advance their initiatives to get a competitive edge when the stringent restrictions return to normal operations.

2. Preliminary concepts of interpretive structural modelling and MICMAC analysis

The significance of interpretive structural modelling lies in developing a map of complex relationships among many elements to construct a directed graph or network representation. It graphically identifies the relationships among elements to better understand their relationship structures. The foundations of the ISM were formulated by Harary et al. (1965). Meanwhile, the philosophical basis for a better understanding of ISM was presented by Warfield (1973). The ISM is a context-free technique best utilised when the gathered data is susceptible to human subjectivity. The mathematical basis of the ISM can be found in Harary et al. (1965) and is not discussed here for brevity. The foundation of the approach lies in utilising the expertise of people having knowledge in the desired field and then breaking down a complex system into several subsystems and establishing a multilevel structural model. The following are the steps taken throughout the study.

Step 1. Identify the system elements for analysis. These elements must be homogeneous with respect to the concept under investigation (e.g., factors of consumer purchase decisions). This process can be accomplished through various means, including but not limited to reviewing literature in the domain, conducting surveys, facilitating focus group discussions, or employing a combination of these methods. Since this work builds upon the factors identified by Arceño et al. (2022), 13 social commerce success factors were considered under evaluation.

Step 2. Construct a structural self-interaction matrix (SSIM) for each expert when a small group of domain experts is individually tasked to establish the structural model. Alternatively, when a group reaches a consensus through a group decision-making process, a single SSIM is generated to represent the collective decision. These experts are asked to evaluate the contextual relationship between the two elements. Four notations are used to describe the relation between a pair of elements:

- V for the relation from i to j but not in both directions;
- A for the relation from j to i but not in both directions;
- X for the relation from i to j and from j to i (i.e., both directions);
- O for the no relation that exists between i to j.

Step 3. Transform the SSIM into a binary matrix representation using the following relation R:

- V implies that $i\mathrm{R}j = 1$ and $j\mathrm{R}i = 0$;
- A implies that $i\mathrm{R}j = 0$ and $j\mathrm{R}i = 1$;
- X implies that $i\mathrm{R}j = 1$ and $j\mathrm{R}i = 1$;
- O implies that $i\mathrm{R}j = 0$ and $j\mathrm{R}i = 0$.

Step 4. Generate an initial reachability matrix $R = \left(r_{ij}\right)_{m\times m}$ for each SSIM using Equation (1).

$$R = A + I \tag{1}$$

where $A = \left(a_{ij}\right)_{m\times m}$ is an adjacency matrix where $a_{ij} = \begin{cases} 1 & \text{if} \quad i\mathrm{R}j = 1 \\ 0 & \text{if} \quad i\mathrm{R}j = 0 \end{cases}$; and I is an identity matrix with a size $m \times m$.

Step 5. Obtain an aggregate initial reachability matrix. When expert decision-makers individually generate an SSIM, the aggregation of the resulting initial reachability matrices is carried out via the majority rule (Sushil, 2018). A majority rule is a decision-making principle that chooses alternatives supported by a majority, which means they have more than half of the total votes. Consider an

aggregate reachability matrix $\tilde{R} = (\tilde{r}_{ij})_{m\times m}$. Thus, $\tilde{r}_{ij} = 1$ if the majority of experts favour the existence of the contextual relationship from element i to element j. Otherwise, $\tilde{r}_{ij} = 0$. Implementing the majority decision rule is necessary as it allows the aggregation of expert views, and when applied, it indicates that the number of supporters for a proposal outweighs its opponents. A more stringent requirement could be established, demanding that at least two-thirds of the experts declare $r_{ij} = 1$ (Sushil, 2018). In the event of the expert group reaching a consensus, this step is omitted.

Step 6. Produce the final reachability matrix $R^* = (r_{ij}^*)_{m\times m}$ by checking transitive links or relationships. It satisfies that if $\tilde{r}_{ij} = 1$ and $\tilde{r}_{ik} = 1$, then $r_{ik}^* = 1$, for elements i, j, and k. Warshall's algorithm is widely employed for enumerating transitive links, i.e., generating the transitive closure of a directed graph (Warshall, 1962).

Step 7. Determine the reachability set R_i and antecedent set A_i $(\forall i, j)$ from R^*. The reachability set R_i is defined as

$$R_i = \{i, j: r_{ij}^* = 1, j = 1, \dots, i-1, i+1, \dots, m\}. \quad (2)$$

On the other hand,

$$A_i = \{i, j: r_{ij}^* = 1, i = 1, \dots, j-1, j+1, \dots, m\}. \quad (3)$$

The intersection I_i set is defined as

$$I_i = R_i \cap A_i \quad (4)$$

The driving power D_i is simply the cardinality of R_i, denoted by $D_i = |R_i|$. The dependence power P_i, on the other hand, is defined as $P_i = |A_i|$.

Step 8. Perform level partitioning. Organising the elements into a hierarchical structure with κ levels offers valuable and practical insights into these elements. In this step, Algorithm 1 outlines the iterations of the partitioning rules.

Algorithm 1. Level partitioning

1. Start.
2. For each i, evaluate R_i and I_i.
3. If $R_i = I_i$, assign i to Level 1.
4. For each j, $j \in \{1, \dots, n\} \setminus i$, evaluate R_i and I_i.
5. If $R_i = I_i$, assign j to Level 2.
6. Repeat Step 3 and Step 4 for all remaining elements until all elements are assigned to $1, \dots, \kappa$ levels.
7. End

Step 9. Create the directed graph by excluding the transitive links. In the digraph, the elements are represented as vertices, and the contextual relationships are depicted as edges. If $r_{ij}^* = 1$, then a directed edge emanates from element i to element j. The construction of the interpretive structural model involves integrating the level partitions established in Step 8.

Step 10. Examine the driving power and the dependence power. As an extension of the ISM, the *Matrice d'Impacts Croisés Multiplication Appliquée á un Classement* (MICMAC) analyses the elements' driving power and dependence power. By constructing a $D_i \times P_i$ map, they are classified into four clusters:

- Elements with high driving power and weak dependence power depict independent elements.
- Elements with strong driving and dependence power depict linkage elements.
- Elements having strong dependence power and weak driving power depict dependent elements.
- Elements having weak driving and weak dependence power depict autonomous elements.

3. APPLICATION OF ISM-MICMAC ANALYSIS

The following are the steps in modelling the relationships of the factors that influence buying preferences of food consumers in social commerce platforms using the ISM-MICMAC analysis.

Step 1. List the factors of social commerce success.

The list of factors in this study is lifted from the factors identified by Arceño et al. (2022) through a focus group discussion with 15 participants. During COVID-19 lockdowns in the Philippines, communities are involved in buying and selling through Facebook social commerce platforms, such as virtual marketplaces and Facebook groups. Each participant is a member of at least one Facebook group for online buying and selling. Presented in Table 1 is the list of identified factors with a brief description and corresponding codes.

Step 2. Construct the individual structural self-interaction matrices.

The same set of participants were asked to judge the relationship among the factors influencing consumers to buy food products through social commerce platforms. They were briefed about the

Tab. 1. Social commerce success factors from Arceño et al. (2022)

Code	Factors	Description
F1	Food product presentation	The degree to which the product is posted online in terms of appearance and description
F2	eWOM	The number of positive comments from customers to the posted product online, including shares and likes
F3	Cost	The unit cost of the product, including delivery costs
F4	Reliability	The degree of the customer's perception of the integrity, reliability, responsiveness, trust, and perceived risk of the seller
F5	Return/refund policy	The seller's perceived willingness to accommodate product returns due to defects and non-conformity with the promised specifications
F6	Timeliness	The perceived degree of seller's reliability in terms of food product delivery time
F7	Consumer relation	The seller's perceived degree of receptiveness and engagement in answering customer queries
F8	Food product quality and safety	The degree of conformity of the food product in relation to taste, content, and safety
F9	Internet connectivity	The speed of the Internet connectivity of the customer in purchasing the food product online
F10	Convenience	The degree of ease of use in ordering the food product
F11	Social influence	The level at which the presence or action of others modifies an individual's attitude, beliefs, or behaviour
F12	Data privacy policy	The degree of confidentiality of the personal information of the customer
F13	Public health concern	The degree to which public health and safety protocols are observed in food preparation and delivery

Tab. 2. A sample structural self-interaction matrix

Factors	F13	F12	F11	F10	F9	F8	F7	F6	F5	F4	F3	F2
F1	O	O	V	O	O	A	V	X	O	V	X	V
F2	A	A	X	A	X	X	X	X	X	A	X	
F3	X	X	A	A	A	X	X	X	X	X		
F4	X	X	X	X	X	X	X	X	X			
F5	O	X	X	X	X	O	X	O				
F6	O	O	V	O	A	O	V					
F7	A	A	V	V	A	A						
F8	X	O	A	O	O							
F9	O	O	A	X								
F10	O	O	V									
F11	A	A										
F12	O											

study and the corresponding questionnaire, which was drafted in the context of the ISM. The questionnaire was distributed to the experts, and questions regarding the questionnaire were immediately addressed. A corresponding SSIM was constructed for each participant wherein the identified relationship is rated either V, A, X, or O, discussed in Step 2 of Section 3. A sample of an SSIM is presented in Table 2.

Step 3. Convert the structural self-interaction matrices into initial reachability matrices.

An initial reachability matrix was constructed for each SSIM, as in Step 3 of Section 2. A sample is shown in Table 3.

Step 4. Aggregate the initial reachability matrices.

In this study, each participant is assigned an equal weight which implies that the judgments of all participants are equally significant. The aggregation of the initial reachability matrices assumes the following. The aggregate initial reachability matrix is denoted as $\tilde{R} = \left(\tilde{r}_{ij}\right)_{m\times m}$ and constructed using the

Tab. 3. Initial reachability matrix sample

Factors	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
F1	1	1	1	1	0	1	1	0	0	0	1	0	0
F2	0	1	1	0	1	1	1	1	1	0	1	0	0
F3	1	1	1	1	1	1	1	1	0	0	0	1	1
F4	0	1	1	1	1	1	1	1	1	1	1	1	1
F5	0	1	1	1	1	0	1	0	1	1	1	1	0
F6	1	1	1	1	0	1	1	0	0	0	1	0	0
F7	0	1	1	1	1	0	1	0	0	1	1	0	0
F8	1	1	1	1	0	0	1	1	0	0	0	0	1
F9	0	1	1	1	1	1	1	0	1	1	0	0	0
F10	0	1	1	1	1	0	0	0	1	1	1	0	0
F11	0	1	1	1	1	0	0	1	1	0	1	0	0
F12	0	1	1	1	1	0	1	0	0	0	1	1	0
F13	0	1	1	1	0	0	1	1	0	0	1	0	1

Tab. 4. Aggregate initial reachability matrix

Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
F1	1	1	0	0	0	0	1	0	0	0	1	0	0
F2	0	1	0	1	0	0	1	0	0	0	1	0	0
F3	0	0	1	0	0	0	0	0	0	0	0	0	0
F4	0	0	0	1	1	0	1	1	0	1	1	0	1
F5	0	0	0	1	1	0	1	0	0	0	0	0	0
F6	0	1	0	1	0	1	1	0	0	1	0	0	0
F7	0	0	0	0	0	0	1	0	0	0	1	0	0
F8	1	0	1	1	0	0	0	1	0	0	0	0	1
F9	0	0	0	0	0	0	1	0	1	1	0	0	0
F10	0	0	0	0	0	0	0	0	0	1	1	0	0
F11	0	0	0	0	0	0	1	1	0	0	1	0	0
F12	0	1	0	1	0	0	1	0	0	0	0	1	0
F13	0	0	0	1	0	0	0	1	0	0	1	0	1

Tab. 5. Final reachability matrix

Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
F1	1	1	1*	1*	1*	0	1	1*	0	1*	1	0	1*
F2	1*	1	1*	1	1*	0	1	1*	0	1*	1	0	1*
F3	0	0	1	0	0	0	0	0	0	0	0	0	0
F4	1*	1*	1*	1	1	0	1	1	0	1	1	0	1
F5	1*	1*	1*	1	1	0	1	1*	0	1*	1*	0	1*
F6	1*	1	1*	1	1*	1	1	1*	0	1	1*	0	1*
F7	1*	1*	1*	1*	1*	0	1	1*	0	1*	1	0	1*
F8	1	1*	1	1	1*	0	1*	1	0	1*	1*	0	1
F9	1*	1*	1*	1*	1*	0	1	1*	1	1	1*	0	1*
F10	1*	1*	1*	1*	1*	0	1*	1*	0	1	1	0	1*
F11	1*	1*	1*	1*	1*	0	1	1	0	1*	1	0	1*
F12	1*	1	1*	1	1*	0	1	1*	0	1*	1*	1	1*
F13	1*	1*	1*	1	1*	0	1*	1	0	1*	1	0	1

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supermajority rule (i.e., 75% of all participants), which is set to filter out weak relationships. Let r_{ij}^k be the resulting judgment elicited by the kth participant on the contextual relationship emanating from the ith factor to the jth factor. If $\sum_{k=1}^{K} r_{ij}^k \geq 0.75K$, then $\tilde{r}_{ij} = 1$. Otherwise, $\tilde{r}_{ij} = 0$. Table 4 features the aggregate initial reachability matrix.

Step 5. Obtain the final reachability matrix.

Using Step 6 of Section 3 and Warshall's algorithm, the final reachability matrix $R^* = \left(r_{ij}^*\right)_{m\times m}$ is obtained. Table 5 presents the final reachability matrix wherein "1*" indicates a transitive relationship.

Step 6. Construct level partitions and draw the final interpretive structural map.

Using Algorithm 1 discussed in Section 3 to determine the level of each factor in the hierarchy and the aggregate initial reachability matrix, the final interpretive structural map was constructed, as presented in Table 4 (Fig. 1).

Step 7. Perform the MICMAC analysis.

The MICMAC analysis is employed by calculating the driving power D_i and dependence power P_i. The graphical representation of D_i and P_i of factor i $(\forall i = 1, \ldots, m)$, as discussed in Step 10 of Section 3, is presented in Fig. 2.

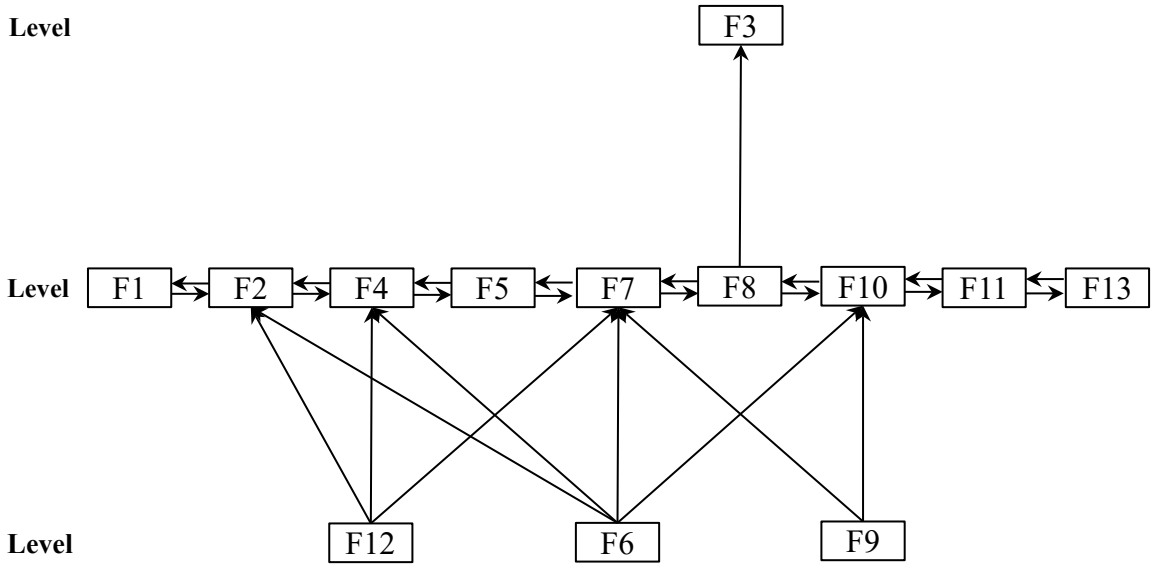

Fig. 1. Interpretive structural model of contextual relationships

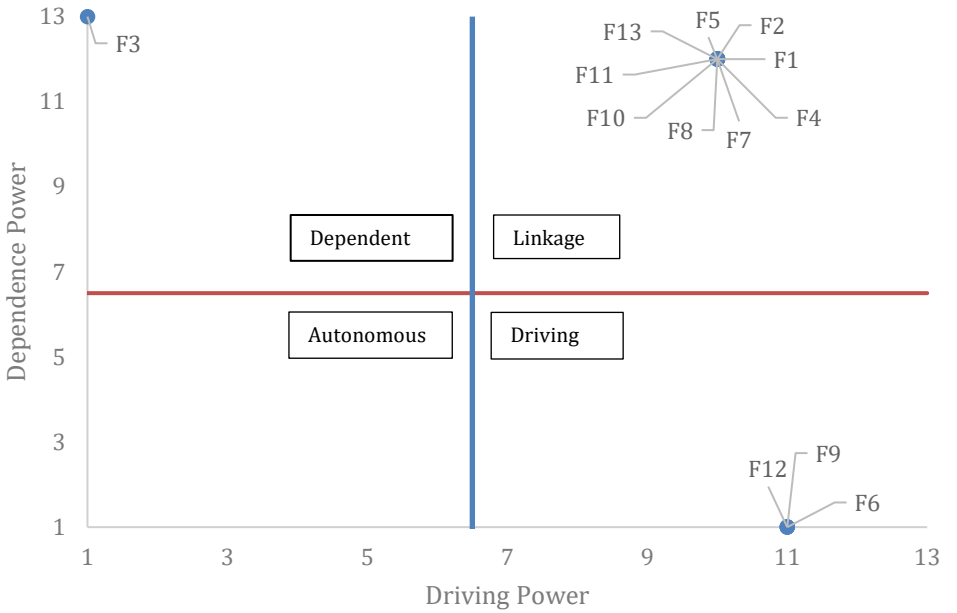

Fig. 2. MICMAC analysis map

4. Results and managerial implications

The factors that impact the purchase behaviours of online consumers in e-commerce platforms have been thoroughly explored in the literature. However, significant gaps remain in the context of food social commerce, which requires the integration of both online and offline environments, investigating the agenda of determining the factors that drive consumers to purchase food and exploring the interrelationships among these factors. To address these gaps, this work (1) conducted an FGD to determine the critical factors that define purchase behaviour in the context of food social commerce and (2) employed the ISM-MICMAC analysis to define the holistic relationships among the factors that affect the intention of the consumers to purchase food via social commerce. The methodology follows the procedure inherent in ISM-MICMAC analysis under group decision-making. First, 15 structural self-interaction matrices were constructed and transformed into initial reachability matrices. The initial reachability matrices were aggregated via a supermajority rule, and then the final reachability matrix defined the transitive or indirect relationships among the identified factors. The interpretive structural model of the contextual relationships was constructed using the aggregate initial reachability matrix and levels of each factor as defined using Algorithm 1. Finally, the MICMAC analysis is carried out wherein the factors are categorised depending on their driving and dependence powers.

As shown in the interpretive structural model (Fig. 1), the factors that impact consumers' buying intention in food social commerce are arranged in three levels in a hierarchical structure. Those at the lower level of the hierarchy drive the factors at the upper levels. Cost is the only factor under Level 1. Food product presentation, eWOM, reliability, return/policy, consumer relation, food product quality, safety, convenience, social influence, and public health concerns made up the driving factors in Level 2. Moreover, timeliness, Internet connectivity, and data privacy policy are the main driving factors that appeared at Level 3. These findings imply that timeliness, Internet connectivity, and data privacy policy drive most of the other factors and focusing the resources on augmenting these factors consequently improves other factors. Further analysis was performed using the MICMAC analysis. Implementing MICMAC reveals nine factors that belong to the linkage cluster: food product presentation, eWOM reliability, return/refund policy, consumer relation, food product quality and safety, convenience, social influence, and public health concern. All factors in the linkage cluster have a strong driving power of ten and a strong dependence power of twelve, as presented in Fig. 2. These factors are unstable, and any decision taken in response to them will affect others and feedback on themselves.

On the other hand, the three driving factors, i.e., timeliness (F6), Internet connectivity (F9), and data privacy policy (F12), dominate consumer decisions to buy food products on social commerce. The driving factors, such as data privacy policy, Internet connectivity, and timeliness, are identified as having independent characteristics. These factors have high driving power but low dependence power. Thus, these are substantial driving factors and may be treated as crucial among all driving factors, considering that they are the most important causative agents influencing consumers' decisions in purchasing food via social commerce platforms. Timeliness, with a driving power of eleven and a dependence power of one, directly involves four driving factors (i.e., eWOM, reliability, consumer relation, and convenience). On the other hand, Internet connectivity having a driving power of eleven and a dependence power of one directly affects two driving factors (i.e., consumer relationship and convenience). Furthermore, the data privacy policy, with a driving power of eleven and a dependence power of one, affects three driving factors (i.e., eWOM, reliability, and consumer relation). These findings are inconsistent with those of Arceño et al. (2022), who highlighted reliability, food product quality and safety, and convenience in e-commerce. These inconsistencies may be viewed from the differences between e-commerce and social commerce, where the latter emphasises the presence of social media platforms that require Internet connectivity and data privacy. Since most consumers have social media accounts, particularly in the case of Facebook as a dominant social media networking site, the timeliness of delivering the order food products entices them to avail social commerce. Given these insights, stakeholders and decision-makers should focus on this cluster, as driving factors have a significant influence over other factors influencing consumer decisions to buy food products in social commerce.

The findings of the ISM-MICMAC analysis offer invaluable insights for MSMEs, which are dominant in the food product market on social commerce. In this section, "driving" factors are emphasised since

they are considered the main contributing factors affecting the consumer's decision to purchase food online. High consideration of these driving factors would increase sales of MSMEs. Investments in these driving factors would yield an efficient allocation of organisational resources. One of the main factors influencing consumers' decision to buy food products on social commerce is timeliness, which is the capability of the sellers to prepare and deliver the food on time. This result is consistent with the findings of Jiang et al. (2021), wherein they highlighted the critical role of timeliness in satisfying consumers in food e-commerce. Thus, sellers in social commerce should focus their resources on developing initiatives that improve timeliness. These initiatives can include improving the overall service chain from ordering raw materials (e.g., selecting suppliers who deliver goods timely) to processing food (e.g., efficient scheduling of the cooks) until providing the food to the consumers. Sellers may enhance their transport capacity (e.g., make sure that riders are always available, traffic considerations) or create partnerships with reliable food delivery services that highlight promptness and have an excellent reputation for fast delivery. Moreover, timeliness can be improved by being attentive on social platforms to respond rapidly to customers' requests and inquiries.

Another key factor that sellers in food social commerce should give attention to is the policy on data privacy. In any online transaction, personal information is given by the consumer to the seller, and protecting this information would increase consumer confidence, trust, and loyalty in social commerce platforms, as pointed out by Faraoni et al. (2019). During the food ordering and delivery process, consumer details (e.g., contact information, address, and social media profiles) should be protected to avoid data leaks and possible identity theft, fraud, or unauthorised access to individuals' personal lives. Moreover, posting product reviews or screenshots as proof of consumer legitimacy should be avoided without their consent. To augment data privacy and for consumers to feel safe in providing information, sellers should collect only the data that is necessary for the transaction, partner with trusted payment processors that have complied with the security standards and develop an incident response plan for remedial measures in case of such events as data leaks. Meanwhile, the Internet connectivity of consumers as they purchase online is also relevant. Slow Internet performance becomes concerning when it inconveniences consumers during the purchase transaction, resulting in discontinued purchases. Not only the consumers but also the sellers encounter issues during their business operations due to poor Internet connection. However, this problem is out of the scope of the sellers' control. Hence, the only way to disregard slow Internet as a hindrance to purchasing is for the sellers to reduce information search. If sufficient information is provided in the social media post for the product to be sold, additional tasks for information search of the sellers may not be necessary. Such information may include product features, attributes, specifications, warranty and services, price, location meet-up, and payment information. By providing this information, trivial tasks for the sellers that require an Internet connection, such as replying to customer queries on the social media platform, will be eliminated. Furthermore, additional contact information of the seller, such as phone number and business email, may be included in the social media post. Buyers may use this contact information when they cannot access the social media platform due to slow Internet connectivity.

Conclusion and future works

Factors that need to be considered in the social commerce of food products play an essential role in digital entrepreneurship, innovation, and product quality and safety. Due to its significant impact on socio-economic development, current literature has examined how certain factors influence consumers' decisions in purchasing food on social commerce. A substantial list of the factors that drive consumers' decisions to purchase food in e-commerce has been established.

However, the domain literature has not addressed the possible relationships between the identified driving factors of consumers' decisions to purchase food in social commerce context. While empirical evidence reported that the identified driving factors influence consumers' decision to purchase food in social commerce, it is important to consider that these driving factors can impact other driving factors due to their loosely defined boundaries, which is crucial in developing insights for decision making for MSMEs to upgrade their food product quality and safety as well as to reach numerous consumers, increase in sales and profits, and thus, improvement of socio-economic development can gradually be felt in a particular community.

This work adopts a list of 13 relevant driving factors from a previously reported study. The ISM and MICMAC analyses were utilised to determine the possible relationships between driving factors due to the subjectivity of the identified driving factors and the notion that evaluating the interrelationships reflects an expert judgment. The ISM portrays a clear overview of the complex relationships of the driving factors of social commerce success in a manner that establishes a hierarchical structure in determining those factors that are more significant in purchasing food in social commerce. The ISM-MICMAC analysis reveals that most driving factors are categorised as linkage variables that MSMEs must oversee in their food product presentation, quality, safety, and digital marketing strategies in social commerce. As these driving factors have high dependence and driving powers, compromising one driver in this category changes the overall structure of the network of driving factors of consumers' decision to purchase food on social commerce. Furthermore, three driving factors (i.e., timeliness, Internet connectivity, and data privacy policy) identified as independent variables are also crucial since addressing these driving factors would also address other driving factors. Conversely, the cost factor is recognised as the dependent variable, while no autonomous factor has been identified. The results of this work contribute meaningfully to the literature as it provides significant insights that would help better understand the factors influencing the consumers' decision to purchase food on social commerce. These results would aid MSMEs, especially the local online sellers, in maintaining timeliness in their transactions by streamlining the overall service chain, safeguarding consumers' private data by keeping only the minimal required information to process the transaction, and upholding efficiency in consumer communication to maximise Internet connectivity, especially in localities with slow Internet performance.

Nevertheless, this work contains some limitations. Few experts eliciting judgments in the ISM-MICMAC analysis can be considered as the basis for future studies. Since the consumers are all from the Philippines, their judgments may not reflect other consumers across other countries with different cultures, different exposure levels to social commerce, and various consumption attitudes. Moreover, the interrelationships put forward in this study can be considered conceptual, reflecting the knowledge and experience of experts. However, an empirical analysis that tests how actual data support such relationships may be an interesting agenda for future work. With this, statistical modelling (i.e., factor analysis and structural equation modelling) may be adopted to validate the relationships between the driving factors discussed in this work. Also, the decisions of consumers to purchase food on social commerce might be influenced by intergenerational variances. It would be valuable for future research to explore the contrasting behaviours of younger consumers and their older counterparts in social commerce. Lastly, a parallel analysis that would espouse fuzzy cognitive mapping in examining how an increase in one factor increases other factors is an important future agenda to aid in the allocation decisions of sellers.

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