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## User engagement in social network platforms: what key strategic factors determine online consumer purchase behaviour?

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### ABSTRACT

Social network platforms as ubiquitous media in our today lives are the venue of many everyday activities including purchasing products and services. This study set out to explore key strategic factors of online consumer purchase behavior in social network platforms. ISM methodology is used for comparing the variables that are extracted from the Delphi technique and confirmed by the experts. To collect the data, a questionnaire was developed and distributed among a limited sample of experts in microeconomics, social networks marketing and consumer purchase behavior to compare twelve factors. The findings revealed that 'Consumer engagement', 'Consumer's value perception' and 'Perceived risk' are placed at the level I. Thus, they would be positioned at the top of the ISM model. Meanwhile, findings show that 'Trust', 'Social influence', 'Social support' and 'Value co-creation' are the most important strategic variables of research. Thereafter, all linkage variables are strategic variables. This, in terms of MICMAC analysis, means such variables are significant and are worth the investment in the future based on the cross-impact analysis. The results of this study can be used for platform businesses to deepen the user engagement level and to lead the customers to purchase decision. Also future researchers can use the findings of this research to propose new models of user engagement in social network platforms or to investigate the relationship among the identified factors.

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Consumer purchase behavior; social network platforms; value co-creation; consumer engagement; user engagement; audience engagement; consumer's value perception; microeconomics; ISM-MICMAC approach

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## 1. Introduction

As of January 2020, around 3.8 billion people actively engaging in social network platforms worldwide, reaching a penetration level of about 49% (Sreejesh et al., 2020). Most of customers receive their required information from internet and accordingly contents of social network platforms and affected by social media content, especially in the early stages of the shopping process (Agnihotri, 2020). By increasing use of smartphones, social network platforms have become the ubiquitous media that most of people use in everyday activities from personal, business, entertainment, etc. While they provide effective and instant communication for personal, business, entertainment purposes, at the same time create a very effective point of access to customer for businesses (Khajeheian et al., 2018). In the United States, more than \$22 billion in consumers' purchases was influenced by social network platforms in 2019. The sum is expected to reach more than \$84 billion in 2024 (Vithayathil et al., 2020). It has been reported that over 90 percent of brands use at least one social network platform for advertising, and companies are proactive in using social media tactics and strategies to elevate the consumption of their brand (Sreejesh et al., 2020). Due to such deep rate of penetration, it has been said that we are living in a platformization era (Dal Zotto & Omid, 2020).

Beside effectiveness in communication, use of social network platforms is also encouraging for businesses in sake of their power of engagement and relationship with customers (Park et al., 2021; Shen et al., 2020). Users are enabled to create user generated content (Moghadamzadeh et al., 2020) and share them in social platforms to play a role in the market by connecting with other customers and create a customer-to-customer market. They can also enjoy from other customers' experiences such as user reviews and feedback (Xu et al., 2020). customers can also join the web communities (Khajeheian & Kolli, 2020) and play a role in perception of the given product or service.

On the other hand, social platforms create many advantages for marketers and companies. First, instant access to the customers in real-time is a specific opportunity to use excitements and feeling of customers. Creating a community of users also generates network power for platforms (Reillier & Reillier, 2017). In addition, data has become significantly a valuable asset and the big data that generated from social networks can be used for smart and effective marketing campaigns (Nemati & Khajeheian, 2018). By consistent connection with social networks customers have changed from passive recipients of marketing messages to active users which engage with other users and learn about the product or service and evaluate the marketing message (Saboo et al., 2016). Considering such evolution in user engagement, companies also developed their marketing and advertising campaigns in a way that they can involve with customers and create a user experience (Vithayathil et al., 2020; Ebrahimi et al., 2021). The special characteristics of social network platforms and the unique opportunities they provide for the consumers and marketers, has made the study of consumer purchase behavior more complex (Arenas-Gaitán et al., 2019).

A specific challenge of study of user engagement and social media platforms, is complexity of levels in both. Engagement in social platforms has many different forms and levels. While consumption of content could be known as engagement in

traditional media, in the digital social platforms with an abundance of affordances, users engage in different levels. For example Iglesias et al. (2013) recognized Involvement, engagement and participation as three different levels of users engagement. In fact, when we use social media platforms, we have much more possibilities. We can only read, listen or watch a content and go away, or we can go deeper and use different features and possibilities to connect with the other users in regard with a specific content or involve in a community or participate in the content. For this reason, engagement in social networks platforms is a complicated and multi-level phenomenon and accordingly, consumer purchase behaviour as one of the engagement indices can be identified as one of the levels of engagement.

On the other side, social network platforms are in different categories too. One classification is marketplace platforms, social media platforms and integrated platforms (ref.) another includes transaction-based, integrated, crowdsourcing, innovation platforms (ref.) such diversity of platforms reflects different missions that each platform follows to accomplish and various types of favourable activities within each platform. Falahatpisheh and Khajeheian (2020) showed that affordances in social platforms create a specific ground of action and distinguish any platform from the others. Due to such variety, online consumer purchase behaviour can be different in each type of platform too. While the phrase mostly implies on the marketplaces, but in any platform, there is a certain type of use behaviour that can be interpreted as consumer purchase behaviour. For example, in social media, consumer purchasing behaviour can be seen as content consumption (involvement), commenting, linking and sharing (engagement) and content generation (participation), and ultimately, based on the business model of social media, purchasing subscription (or any other revenue model that the given platform seeks such as pay per value).

Nevertheless, any type of platform we consider, and especially in the current fast-paced online retailing environment, it has become challenging to capture buyers' attention and break through the marketing clutter to affect their online shopping intentions (Irshad et al., 2020). Consumer purchase behavior has been a black box that marketers always try to better understand (Janavi, Soleimani, Gholampour, Friedrichsen, & Ebrahimi et al., 2020). Understanding this phenomenon is always an important challenge for marketers since it is affected by several factors. Previous studies based on various theories including the theory of consumption values (Wu et al., 2018), technology acceptance model (Fu et al., 2018; Moradi Abadi et al., 2017) and WOM theory (Wang & Herrando, 2019) have examined the factors affecting online consumer purchase behavior on social networks. However, abundance of social network platforms that can be used for online marketing and business have created a new level of complexity. the question is not how to engage customers with social network platforms anymore, but is that what factors can encourage them with a specific social network platform and effect on the online shopping. Audience engagement has become a specific trend in understanding the role of involving users (Khajeheian & Ebrahimi, 2021). Based on above, understanding the key factors that affect and determine online customer purchase behavior on social network platforms is critical for companies and marketers and enable them to communicate more effectively with customers. This is what the present study aims to research. Thus, the research problem

is to identify the factors affecting online consumer purchase behavior in social networks and then to identify the strategic factors.

## 2. Literature review

A large and growing body of literature has investigated the impact of social networks on consumer behavior in recent years. Social networks influence consumer behavior from the stage of information acquisition to the post-purchase behavior (Vinerean et al., 2013). The growth in contemporary social network literature has yielded a rich but yet fragmented, picture of what the concept of social network platforms is and raised the question of how its role should be defined (Agnihotri, 2020). A still-emerging theme in recent years is how digital media and social platform environments impact the consumer behavior (Stephen, 2016). Previous researches have examined the factors affecting online consumer behavior. By reviewing the literature, twelve main factors affecting online consumer behavior were identified, and relevant explanations and research related to each factor will be provided in this section.

### 2.1. Consumer Engagement

The concept of engagement has been studied as a subject in the field of organizational psychology, and recently in the field of consumer behavior (Dwivedi, 2015). Consumer online engagement represents the participation and interaction of individuals within the social network environment, by use of affordances (Falahatpisheh & Khajeheian, 2020) such as reacting to content by liking, sharing, and commenting (Dabbous & Barakat, 2020).

Previous studies have confirmed the value of customer engagement for companies through its impact on online consumer purchase behavior on social networks. For example, Kumar et al. (2010) proposed four components of a customer's engagement value (CEV) with a company, including customer lifetime value (the customer's purchase behavior). Santini et al. (2020) also used a meta-analytic model among 97 studies to investigate customer engagement in social platforms and confirmed the positive effect of customer engagement on behavioral intention. Prentice, Han, Hua, & Hu et al. (2019) confirmed the positive effect of customer engagement on purchase intention. Results of a study conducted by Hollebeek et al. (2014) have also shown that consumer brand engagement in social networks has a positive impact on brand usage intention.

### 2.2. Trust

Trust is a determining factor in leading users toward transactions within social media platforms. a large number of people use these social platforms to read others' opinions and feedback about the products and services offered by different retailers (Irshad et al., 2020; Haghghi & Montazer, 2015)). In a broad sense, trust is the belief that others will respond in expectable and predictable ways (Sembada & Koay, 2019). In marketing literature, trust has been treated as a key component in the

development of marketing relationships (Yoon, 2002) and Lack of trust is frequently cited as a reason for not purchasing from online merchants (Kang & Johnson, 2013).

Previous studies have emphasized the effect of trust on online consumer behavioral tendencies on social platforms. For example, the influence of trust perception on the intention to use online shopping has been confirmed in a study conducted by Xu-Priour et al. (2014). According to the results of a study conducted by Irshad et al. (2020), the positive impact of trust on the online purchase intentions of consumers was confirmed. Also, Kang and Johnson (2013) indicated the positive impact of the perceived trustworthiness of social networks on intentions to engage in social media platforms. Also, the positive impact of trust on an intention to purchase on social platforms was shown in a study conducted by Hajli (2014b).

### **2.3. Social media word of mouth**

Word of mouth (WOM) plays a key role in communications and marketing strategy (Gonda et al., 2020). With the advent of the Internet and social media, the traditional word of mouth has expanded into new electronic channels including social networking sites, user groups, bulletin boards, discussion review sites, forums, and blogs (Mishra & Satish, 2016). word of mouth information is intended to help consumers fully understand a product or service before consuming it and may also shape service expectations (Wang & Yu, 2017). This new eWOM has become a vital factor in marketing efforts and has influenced various stages of the consumer shopping decision process (Mishra & Satish, 2016).

The positive impact of social media word of mouth on purchase intention has been confirmed in previous studies (Park et al., 2021; Wang & Herrando, 2019; Yusuf et al., 2018). Also, the positive relationship between E-WOM (likes, Friends 'likes, comments, and shares) and the purchasing decision has been confirmed in the study conducted by Mekawie and Hany (2019).

### **2.4. Social influence**

Social influence arises from consumers' motives to be in conflict with others or to be in unity with them (Wood & Hayes, 2012). Deutsch and Gerard (1955) suggested that interpersonal influences are of two types: normative and informational. They defined informational influence as the tendency to accept other people's information and consider that information to be true. In contrast, they defined normative influence as the tendency to follow the expectations of other people (Shen et al., 2010).

The positive impact of normative social influence and informational social influence on social shopping intention has been confirmed in a study conducted by Fu et al. (2020). Also, the study conducted by Kuan et al. (2014) investigated the effect of 'buy' information and the normative effect of 'like' information on purchase intention and concluded that negative and positive 'buy' information has an asymmetric impact on intention and attitude, while 'like' information has a positive impact on intention.

Also, the research conducted by Jiménez-Castillo and Sánchez-Fernández (2019) confirmed the positive impact of digital influencers on the intention to purchase recommended brands.

### **2.5. Value perception**

Consumer perceived value (CPV) is an important concept in the field of marketing (Huang et al., 2019) and in predicting purchase behavior (Chang & Tseng, 2013). Perceived value is the consumer's overall evaluation of the utility of a service or product, determined by a consumer's perception of what is given and received (Hsiao & Chen, 2016).

The positive impact of perceived value on purchase intention has been confirmed in the research conducted by Wang et al. (2018). Also, the results of a study carried out by Anderson et al. (2014) confirmed the positive impact of utilitarian values on the purchase intention of consumers who use Retail Facebook Pages. The research conducted by Lin et al. (2020) also confirmed the positive impact of emotional value and functional value on purchase intention.

### **2.6. Perceived risk**

Risk is a consumer's perception of uncertainty and the adverse consequences of performing an activity (Chang & Tseng, 2013; Gustavsen & Hegnes, 2020). Perceived risk is a crucial aspect of the consumer behavior (Tseng & Wang, 2016). When consumers understand higher risks, they are less likely to buy the product (Chang & Tseng, 2013).

Previous research has also demonstrated the negative impact of perceived risk on purchase intention. For example, research conducted by Tuu and Olsen (2012) confirmed the negative effect of risk on purchase intention and the negative moderating role of risk in satisfaction and purchase intention. Also, the results of a study conducted by Cui et al. (2019) showed that perceived risk directly affects consumers' purchase intentions on social media platforms. Also, a study conducted by Aghekyan-Simonian et al. (2012) confirmed the negative impact of financial/time risk and product risk on purchase intention.

### **2.7. Perceived usefulness**

The perceived usefulness of a medium has been postulated as a central element in the technology use (Davis, 1989). Perceived usefulness is such that a person believes that using a certain technology enhances her/his job performance (Caffaro et al., 2020).

The positive impact of perceived usefulness on users' online shopping intention for movie tickets has been confirmed in a study conducted by Fu et al. (2018). Also, Amoako-Gyampah (2007) confirmed the positive impact of perceived usefulness on behavioral intention. The study conducted by Agag and El-Masry (2016) also confirmed the positive impact of perceived usefulness on an intention to purchase travel online.



## **2.8. Perceived information quality**

Information quality refers to the accuracy, relevance, understanding, and usefulness of provided information (Fu et al., 2020) by social network sites. High-quality information allows consumers to make better decisions efficiently and helps to reduce the levels of consumers' perceived risk related to privacy concerns (Kim et al., 2020).

Useful and reliable information can improve the perception and decision-making of members of virtual communities (Gao et al., 2017). Past research (Gao et al., 2017; Kim et al., 2020) has confirmed the positive impact of information quality on customer satisfaction. The positive impact of perceived information quality on the consumer's social shopping intention has been also confirmed in the research conducted by Fu et al. (2020). Also, a study by Filieri et al. (2018) confirmed the positive impact of information helpfulness on purchase intentions.

## **2.9. Social support**

Social support is an individual's experience of being helped by, being responded to, and being cared for by people in that individual's social group (Liang et al., 2011). Individuals may join SNSs and online communities as there is social support, both emotional and informational (Hajli, 2014a).

Past research has confirmed the positive impact of social support on relationship quality (Hajli, 2014a) and social commerce intention (Hajli, 2014a; Liang et al., 2011). In addition, Bai et al. (2015) have confirmed the positive impact of social support on users' purchasing behaviors in social commerce.

## **2.10. Value co-creation (Relational value, economic value, enjoyment value)**

Value co-creation represents the collaboration amongst a range of firms and their stakeholders (i.e., actors) in developing successful innovations, designing and developing products, and identifying new business opportunities (Babu et al., 2020). Value co-creation theory further emphasizes that enterprises should co-create value with consumers through the interaction (Zhang & Meng, 2021).

In a study conducted by Choi et al. (2016), the impact of value co-creation encounters on purchase intentions was confirmed. Also, the research carried out by Kunja and Acharyulu (2018) confirmed the positive impact of value co-creation on consumer behavior in social networking sites. See-To and Ho (2014) also emphasizes the positive relationship between the level of value co-creation process and social network platforms user's purchase intention on the product.

## **2.11. Service innovation**

Firms utilize social media platforms to improve their innovation processes benefitting from social networks and user-generated content that reflect the preferences of customers (Muninger et al., 2019; Mirbargkar et al., 2020). Social platforms allow quite useful and novel ways of collaborating and interacting in the innovation process (Testa et al., 2020; Bouzari et al., 2020).



Based on the results of a study by Fuchs et al. (2010), customers who are empowered to select the products to be marketed show stronger demand for the underlying products. Similar results were also obtained in the study by M. J. Kim et al. (2020) as it showed that tourists' behavioral intention innovation diffusion positively and indirectly influences virtual reality. Also, a study conducted by Agag and El-Masry (2016) confirmed the positive and indirect effects of perceived relative advantages and compatibility on the intention to purchase travel online.

### **2.12. Knowledge sharing**

Knowledge sharing is a deliberate act that makes knowledge reusable by others through the knowledge transfer (Scuotto et al., 2020). On SNSs, users become actively involved in social interactions by generating and sharing information like videos, photos, and insights about the events (Zhang et al., 2021).

According to the results of a study conducted by Albert et al. (2014), increasing the frequency of firm participation in consumer communities positively and directly affect purchasing intention. The research carried out by Ghahtarani et al. (2020) has confirmed the positive effect of Information/knowledge sharing behavior on the purchase intention of users in social business. A study conducted by Tran (2020) also confirmed the positive effect of online reviews on consumer purchase intention in different social models. The research carried out by Xu et al. (2021) also confirmed the positive effect of information disclosure on consumer purchase behavior. In the next part, the methodology of research is presented.

## **3. Methodology**

### **3.1. Interpretive structural modelling**

Interpretive structural modelling (ISM), proposed by Warfield (1974), is used to make a complex system into a visualized hierarchical structure (Ebrahimi et al., 2020). ISM is an interactive learning process in which a set of directly related and dissimilar elements are integrated into a comprehensive systematic model and widely used in different perspectives of management (Khan et al., 2020). It is a method of analyzing and solving complex problems to manage decision-making, such as social network marketing and consumer purchase behavior.

In research of complex problems, strategic thinking (Dhir & Dhir, 2020), organizational management (Singh & Kant, 2008; Talib et al., 2011), tourism industry (Sadeh & Garkaz, 2019; Hamidi et al., 2019), social networks analysis (Ebrahimi et al., 2020; Khajeheian & Kolli, 2020), marketing (Lee et al., 2015; Soni & Kodali, 2016; Sindhu, 2022), consumer purchase (Xiao, 2018; Khan et al., 2020) and system operations (Lee et al., 2015), there are often multi-dimensional factors that should be considered at different levels. When the factors on the connective level become more complicated, it becomes more difficult to determine specific relevance. On the other hand, ISM can aim at these complex and level-connected problems to determine how to search for their relevance and determine which factors should be put into consideration (Chang et al., 2013; Lee et al., 2015; Majumdar & Sinha, 2019).

It is a systematic method that can analyze interrelationship properties by examining different factors of a complex system (Ebrahimi et al., 2020). It can transform poorly articulated or unclear models into well-defined and visible ones (Yang & Lin, 2020).

ISM helps to impose direction and order on the complexity of relationships among a system's elements (Sage, 1977; Attri et al., 2013). It is interpretive as the group judgment decides how and whether the variables are related. It is a modelling method because the overall structure and specific relationships are portrayed in a graphical model. It is structural because based on the relation, an overall structure is extracted from the complex set of variables. (Singh & Kant, 2008).

Different steps involved in the ISM technique include: (Singh & Kant, 2008; Pfohl et al., 2011; Talib et al., 2011; Soni & Kodali, 2016; Gan et al., 2018; Sadeh & Garkaz, 2019; Azevedo et al., 2019; Agrawal, 2019; Dhir & Dhir, 2020; Ebrahimi et al., 2020; Sindhu, 2022):

1. Identifying elements that are relevant to the problem or issues. This could be done by survey;
2. Establishing a contextual relationship between elements concerning which pairs of elements would be evaluated;
3. Developing a structural self-interaction matrix (SSIM) of elements that indicates a pair-wise relationship between the system elements;
4. Developing a reachability matrix from the SSIM, and examining it for transitivity – transitivity of the contextual relation is a basic assumption in ISM that states that if element A is related to B and B is related to C, then A is related to C;
5. Partitioning of the reachability matrix into different levels;
6. Drawing a directed graph (digraph) and removing the transitive links, based on the above relationships in the reachability matrix;
7. Converting the resultant digraph into an ISM-based model by replacing element nodes with the statements; and
8. Reviewing the model to investigate conceptual inconsistency and make necessary modifications.

### **3.2. Sampling**

The statistical population of this research in the field of qualitative and ISM consists of experts with experience in the fields of microeconomics, social networks marketing and consumer purchase behavior. The number of samples in the ISM section consists of 22 experts.

To check the validity of the measurement tool, content validity was used and a questionnaire (Appendix A) was provided to experts to confirm the accuracy of the questions. The purposeful sampling of the present study in the ISM section is a purposeful judgmental sampling and 22 experts have answered the questions that a limited number of people have the appropriate information to answer the study questions and finally 22 experts answered questions. The experts were people who

had at least 10 years of work experience or marketing research related to social network marketing and consumer purchase behavior.

In the research sample, 54.5% and 45.5% of the respondents were men and women, respectively. The highest number of respondents (54.5%) was in the age groups of 35-45 years, 46.4% of the respondents held master levels suggesting that most respondents have high levels of education. Most of the respondents were the owner of businesses on Instagram and their main expertise area was marketing.

Sampling continued until the theoretical saturation stage. To determine the reliability of the measuring instrument, the Inter-class correlation (ICC) coefficient value was confirmed in terms of consistency (Solatianaghizi et al., 2017; Ebrahimi et al., 2020; Bouzari et al., 2021; Fekete-Farkas et al., 2021; Salamzadeh et al., 2021). Experts were asked to rate the questionnaire based on the 'average measure of every factor' and these scores were used to calculate the ICC coefficient. Meanwhile, the absolute agreement coefficient value was confirmed in 95% confidence intervals as well.

In the first step, to interview with experts, by sending a message on social media, some successful and well-known online business owners in Iran (on Instagram and Facebook) were asked to specify a time to interview if they were willing to cooperate. Finally, 22 online business owners announced their desire to participate in the interview and fill out a structured questionnaire. Also, since this research was conducted during the Covid-19 pandemic, all interviews were conducted via skype. The questionnaire was also divided into three sections. The first section included the demographic characteristics of the respondents who were asked to introduce themselves at the beginning of the interview and answer descriptive questions. In the second section, the way of filling out the questionnaire was explained with an example.

In fact, to avoid any errors and beef up transparency, the work procedure and the way of filling out the questionnaire in the interview were first fully explained to the respondent experts. The third section also included a matrix of relationships between variables. The interviewer asked a question about the pairwise comparison of both factors separately from the interviewee. For example, what is the relationship between F1 and F2? The interviewee selected one of the symbols V, A, X, and O based on the table.

V: F1 variable *i* leads to F2 variable *j*

A: F2 variable *j* leads to F1 variable *i*

X: Both variables *i* and *j* lead to each other

O: Both variables *i* and *j* are unrelated

#### 4. Data analysis

A case study is presented here to examine the practicality of the proposed evaluation framework. A group of experts in social network marketing was formed to define the key factors in modelling consumer purchase behavior. With an above-mentioned review of the literature and consultation of the group based on the Delphi technique, twelve factors were determined. A list of twelve constructs was identified (Table 1).

**Table 1.** Identified factors based on Delphi technique, experts' ideas and literature review.

Number	Factors	Key References
F1	Consumer engagement	(Kumar et al., 2010; Hollebeek et al., 2014; Prentice et al., 2019; Santini et al., 2020)
F2	Trust	(Kang & Johnson, 2013; Hajli, 2014b; Xu-Priour et al., 2014; Sembada & Koay, 2019; Irshad et al., 2020)
F3	Social media WOM	(Yusuf et al., 2018; Mekawie & Hany, 2019; Wang & Herrando, 2019; Park et al., 2021)
F4	Social influence	(Kuan et al., 2014; Hu et al., 2019; Jiménez-Castillo & Sánchez-Fernández, 2019; Fu et al., 2020)
F5	Consumer's value perception	(Anderson et al., 2014; Hajli, 2014b; Alalwan, 2018; Wu et al., 2018; Irshad et al., 2020; Lin et al., 2020)
F6	Perceived risk	(Aghekyan-Simonian et al., 2012; Tuu & Olsen, 2012; Kim & Lennon, 2013; Cui et al., 2019)
F7	Perceived usefulness	(Amoako-Gyampah, 2007; Agag & El-Masry, 2016; Fu et al., 2018; Ventre & Kolbe, 2020)
F8	Perceived information quality	(Gao et al., 2017; Filieri et al., 2018; Fu et al., 2020; Kim et al., 2020)
F9	Social support	(Liang et al., 2011; Hajli, 2014a; Bai et al., 2015)
F10	Value co-creation	(See-To & Ho, 2014; Choi et al., 2016; Kunja & Acharyulu, 2018; Khajeheian & Ebrahimi, 2021)
F11	Knowledge sharing	(Albert et al., 2014; Ghahtarani et al., 2020; Tran, 2020; Xu et al., 2020)
F12	Service innovation	(Fuchs et al., 2010; Agag & El-Masry, 2016; Kim et al., 2020)

Source: Author' Research.

Following steps of the Delphi technique based on previous studies (Brooks, 1979; Dewangan et al., 2015; Mehta et al., 2014; Kamble & Raut, 2019) were:

- Identifying the group of experts.
- Determining the willingness of individuals to serve on the group.
- Gathering individual inputs on a specific issue and then compiling them into basic statements.
- Analyzing data from the group.
- Compiling information on a new questionnaire and sending it to each panel member for review.  
Analyzing the new input and returning to the panel members the distribution of the responses.
- Asking each member to study the data and evaluate his/her position based on the responses from the group.
- Analyzing the input, and sharing the minority supporting statements with the panel.

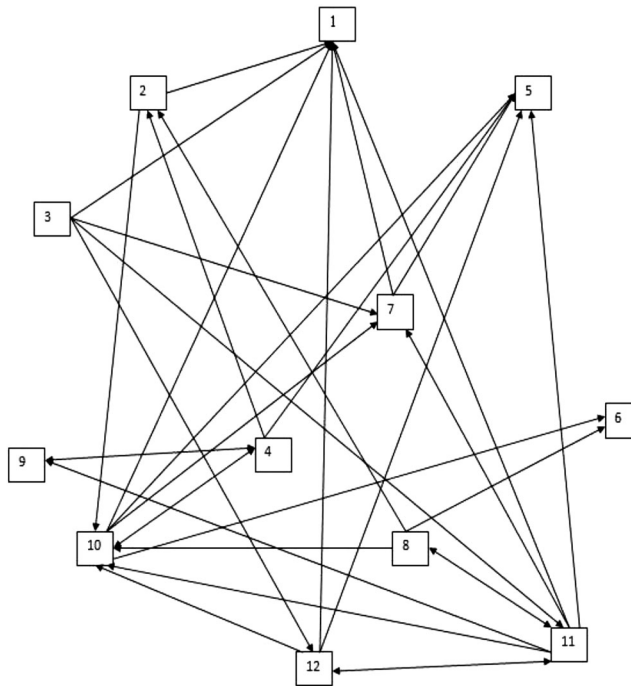
#### **4.1. Building adjacency matrix or SSIM**

The contextual relationships among the 12 factors are constructed in an Adjacency Matrix based on the feedback from 22 experts (Table 2). In fact, to apply the ISM technique, the contextual relationship between the factors should be developed based on the judgment experts' suggestions (Sadeh & Garkaz, 2019). We obtained the contextual relationships between the 12 factors mentioned by experts in the structured interviews, which is a less biased method. Most direct-effect relationships were found between F10 (Value co-creation) and other factors. The least direct-effect

**Table 2.** Structural self-interaction matrix.

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

Source: Author' Research.

**Figure 1.** Digraph based on SSIM.

Source: Author' Research.

relationships were between F6 (Perceived risk), F8 (Perceived information quality), F9 (Social support), and other factors. A digraph based on SSIM is shown in [Figure 1](#).

#### 4.2. Initial reachability matrix

In this step, the SSIM was converted into a binary matrix, called the initial reachability matrix ([Table 3](#)) by replacing V, A, X, and O by 1 and 0, depending on the position, according to several authors (Faisal, 2010; Chang et al., 2013; Azevedo et al., 2019; Ebrahimi et al., 2020). Hence, the reachability matrix should be formed based

**Table 3.** Initial reachability matrix.

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

Source: Author' Research.

on SSIM. To this end, the format of the SSIM should be transformed into the format of a reachability matrix by converting symbols into binary digits (ones or zeros) (Sadeh & Garkaz, 2019). In fact, SSIM is developed by assigning codes for finalized relation between every 'i and j' set of variables (Sindhu, 2022).

Four types of relationships that could exist between any two variables (i and j) are denoted by using the following 4 symbols:

- If the (i, j) entry in the SSIM is V then the (i, j) entry in the initial reachability matrix becomes 1 and the (j, i) entry becomes 0.
- If the (i, j) entry in the SSIM is A, then the (i, j) entry in the initial reachability matrix becomes 0 and the (j, i) entry becomes 1.
- If the (i, j) entry in the SSIM is X then the (i, j) entry in the initial reachability matrix becomes 1 and the (j, i) entry becomes 1.
- If the (i, j) entry in the SSIM is O, then the (i, j) entry in the initial reachability matrix becomes 0 and the (j, i) entry also becomes 0.

#### 4.3. Developing a reachability matrix to the final reachability matrix

With the aid of the computation tool MATLAB (Appendix B) to conduct the power iteration analysis, the transitivity rules have been checked. Some cells of the initial reachability matrix were filled by inference. As a result, the final reachability matrix is based on entries from the pairwise comparisons and some inferred entries. The transitivity concept is used to make this inference and fill the gaps. Any entry 1\*represent incorporating the transitivity. According to Shen et al. (2016), the final RM can be generated using the following equation 1:

$$R_f = R_j^K = R_j^{K+1}, K > 1 \quad \text{Equation 1:}$$

where  $R_f$  is the final Reachability Matrix, and  $R_i$  is the initial Reachability Matrix.

The transitivity principle is based on the following: if a variable 'I' is related to 'j' and 'j' is related to 'k', then transitivity implies that variable 'I' is related to 'k' (Warfield, 1974; Gan et al., 2018; Ebrahimi et al., 2020). After the application

**Table 4.** Final reachability matrix.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Driving power
F1	1*	0	0	0	0	0	0	0	0	0	0	0	1
F2	1	1*	0	1*	1*	1*	1*	0	1*	1	0	0	8
F3	1	1*	1*	1*	1*	1*	1	1*	1*	1*	1	1	12
F4	1*	1	0	1*	1	1*	1*	0	1	1	0	0	8
F5	0	0	0	0	1*	0	0	0	0	0	0	0	1
F6	0	0	0	0	0	1*	0	0	0	0	0	0	1
F7	1	0	0	0	1	0	1*	0	0	0	0	0	3
F8	1*	1	0	1*	1*	1	1*	1*	1*	1	1	1*	11
F9	1*	1*	0	1	1*	1*	1*	0	1*	1*	0	0	8
F10	1	1*	0	1	1	1	1	0	1*	1*	0	0	8
F11	1	1*	0	1*	1	1*	1	1	1	1	1*	1	11
F12	1	1*	0	1*	1	1*	1*	1*	1*	1	1	1*	11
Dependence power	10	8	1	8	10	9	9	4	8	8	4	4	

Note: During the checking of transitivity\* indicates the values which are changed from "0" to "1" and shown with 1\*, power = k = 4.

Source: Author' Research.

of the transitivity principle, the final reachability matrix was obtained with a power of  $k=4$  (Table 4). The final reachability matrix makes it possible to identify the reachability and antecedent sets for each of the variables. The driving power for each of the variables corresponds to the total number of variables (including itself) which it may affect. The dependence of a variable is the total number of variables (including itself) that may affect it. These driving powers and dependencies are used below in the MICMAC analysis or cross-impact analysis (Azevedo et al., 2019).

#### 4.4. Level partitions

The reachability set consists of the element itself and the other elements that it may help achieve, while the antecedent set consists of the element itself and the other elements that may help in achieving it. Thereafter, the intersection of these sets is derived for all factors. The factors for which the reachability and intersection sets are the same occupy the top level in the ISM hierarchy (see Appendix C: level partitions program with MATLAB). The top-level element in the hierarchy would not help achieve any other element above its own level (Singh & Kant, 2008; Dalvi-Esfahani et al., 2017; Digalwar et al., 2020). Once the top-level element is identified, it is separated from the other elements. Then, the same process is repeated to find out the elements in the next level. This process is continued until the level of each element is found (Table 5). The tables show five levels for the ISM model. F1, F5 and F6 are top-level elements in the ISM model of this research.

#### 4.5. ISM model and MICMAC analysis

Through level partitioning factors, we build the diagram of the final ISM model, which is presented in Figure 2. In Table 5, it can be seen that 'Consumer engagement', 'Consumer's value perception' and 'Perceived risk' are at Level I. Thus, they would be positioned at the top of the ISM model. In Figure 1, it is possible to



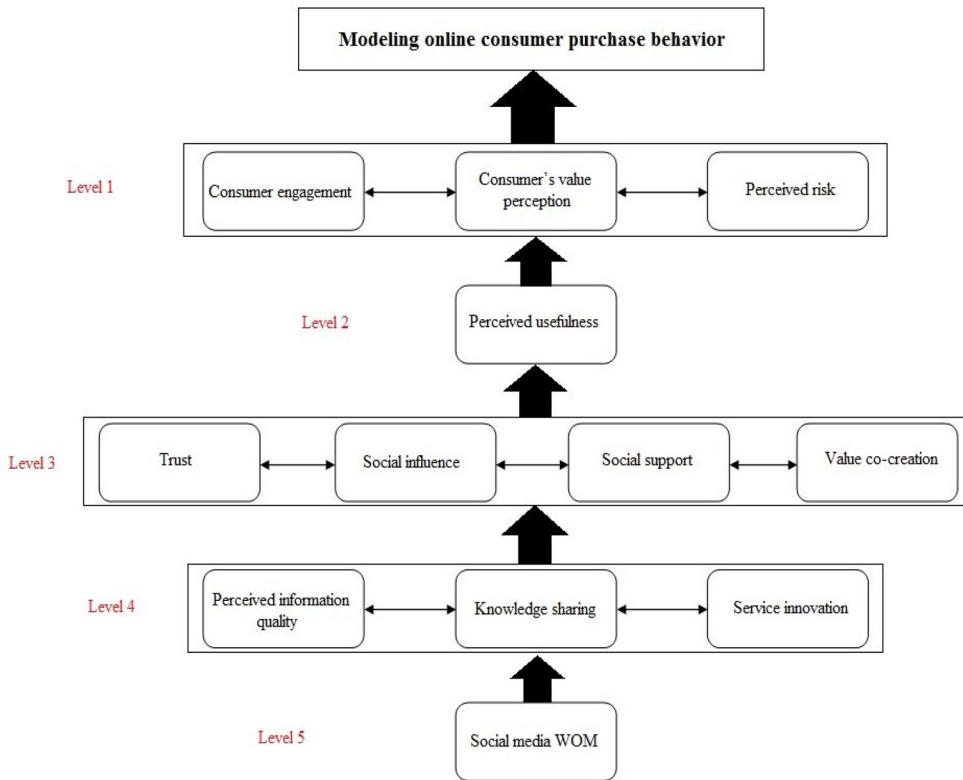
**Table 5.** Level partitioning factors.

First iteration				
Factors	Reachability set	Antecedent set	Intersection set	Level
F1	1	1,2,3,4,7,8,9,10,11,12	1	1
F2	1,2,4,5,6,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F3	1,2,3,4,5,6,7,8,9,10,11,12	3	3	
F4	1,2,4,5,6,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F5	5	2,3,4,5,7,8,9,10,11,12	5	1
F6	6	2,3,4,6,8,9,10,11,12	6	1
F7	1,5,7	2,3,4,7,8,9,10,11,12	7	
F8	1,2,4,5,6,7,8,9,10,11,12	3,8,11,12	8,11,12	
F9	1,2,4,5,6,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F10	1,2,4,5,6,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F11	1,2,4,5,6,7,8,9,10,11,12	3,8,11,12	8,11,12	
F12	1,2,4,5,6,7,8,9,10,11,12	3,8,11,12	8,11,12	
Second Iteration				
F2	2,4,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F3	2,3,4,7,8,9,10,11,12	3	3	
F4	2,4,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F7	7	2,3,4,7,8,9,10,11,12	7	2
F8	2,4,7,8,9,10,11,12	3,8,11,12	8,11,12	
F9	2,4,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F10	2,4,7,9,10	2,3,4,8,9,10,11,12	2,4,9,10	
F11	2,4,7,8,9,10,11,12	3,8,11,12	8,11,12	
F12	2,4,7,8,9,10,11,12	3,8,11,12	8,11,12	
Third Iteration				
F2	2,4,9,10	2,3,4,8,9,10,11,12	2,4,9,10	3
F3	2,3,4,8,9,10,11,12	3	3	
F4	2,4,9,10	2,3,4,8,9,10,11,12	2,4,9,10	3
F8	2,4,8,9,10,11,12	3,8,11,12	8,11,12	
F9	2,4,9,10	2,3,4,8,9,10,11,12	2,4,9,10	3
F10	2,4,9,10	2,3,4,8,9,10,11,12	2,4,9,10	3
F11	2,4,8,9,10,11,12	3,8,11,12	8,11,12	
F12	2,4,8,9,10,11,12	3,8,11,12	8,11,12	
Fourth Iteration				
F3	3,8,11,12	3	3	
F8	8,11,12	3,8,11,12	8,11,12	4
F11	8,11,12	3,8,11,12	8,11,12	4
F12	8,11,12	3,8,11,12	8,11,12	4
Fifth Iteration				
F3	3	3	3	5

Source: Author' Research.

identify the research variables, the relationships among them, and also the hierarchical level to which each variable belongs. We see in [Figure 1](#) that the linkage factors are at the base of our model, which means that they are the main driver to achieve the other variables that are part of our study.

Matrices d'Impacts Croises Multiplication Appliqué a un Classement (MICMAC) technique is utilized to study how impacts are distributed 'through reaction loops and paths for developing hierarchies for members of a set of elements' (Wang et al., 2008; Gan et al., 2018). MICMAC analysis aims to examine the factors' dependence and driving power (Warfield, 1974; Gan et al., 2018; Dhir & Dhir, 2020). Meanwhile, MICMAC helps in understanding the scope of variables and identifying the key strategic variables in the system (Ebrahimi et al., 2020; Khan et al., 2020). All Factors have been classified, according to their dependence and driving powers ([Table 4](#)), into four categories as autonomous factors, dependent factors, linkage factors, and independent factors. [Figure 3](#) shows 'Trust', 'Social influence', 'Social support' and



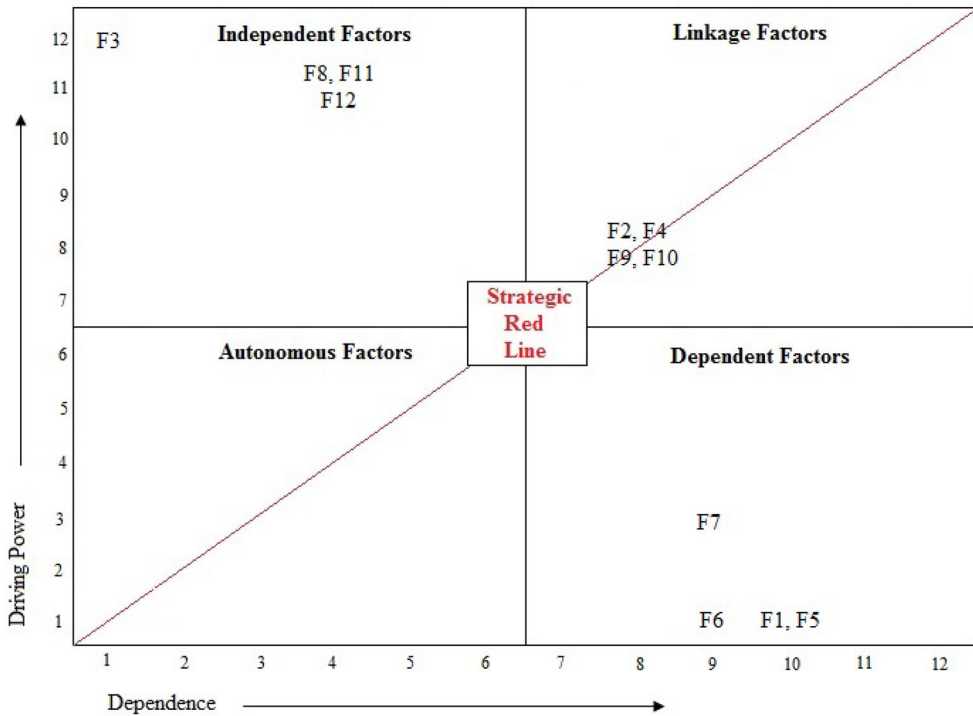
**Figure 2.** ISM model.  
Source: Author' Research.

'Value co-creation' are the most important strategic variables of research (nearest factor to the strategic line).

- Segment I Autonomous: in this segment factors have less dependence and driving powers. In this study, under this segment, there is no autonomous factor.
- Segment II Dependent: in this segment enablers have a strong dependence on power but a weak driving power. this study has three dependents, which are, Consumer engagement(F1), Consumer's value perception(F5), Perceived risk(F6) and Perceived usefulness (F7).
- Segment III Linkage: in this segment enablers have a strong dependence and driving power. In this segment, this study has four factors that are linked, i.e., F2, F4, F9, and F10.
- Segment IV Driver or independent: enablers in this segment have very little dependence but more driving power. In this segment, under this segment, there are four independent factors i.e., F3, F8, F11 and F12.

## 5. Discussion

The present study set out to identify the key strategic factors of online consumer purchase behavior in social network platforms. The results of this research emphasize the



**Figure 3.** MICMAC analysis.

Source: Author' Research.

role of 'Consumer engagement', 'Consumer's value perception' and 'Perceived risk' at the top of the ISM model for successful modelling of online consumer purchase behavior. Both negative and positive active consumer engagements strongly influenced the behavior and attitudes of those who observe the created content (Schamari & Schaefer, 2015). Companies are progressively trying to engage consumers because it leads to significant marketing consequences (Pezzuti et al., 2021) such as online consumer purchase behavior.

Previous studies (Hollebeek et al., 2014; Kumar et al., 2010; Prentice et al., 2019; Santini et al., 2020) have confirmed the impact of consumer engagement on online consumer purchase behavior. Based on the results of this study, consumers' value perception is another important factor in determining online consumer shopping behavior.

Value perception has been recognized as the most important factor that influences shoppers' online shopping decisions (Wu et al., 2018). Past studies have emphasized the importance of consumer value perception in online consumer purchase behavior. For example, research conducted by Lin et al. (2020) confirmed the positive effect of functional value and emotional value on purchase intention. Also, the positive effect of saving time, which is one of the components of utilitarian values, on the purchase intention was confirmed in the research conducted by Anderson et al. (2014). Also, Alalwan (2018) revealed in his research that hedonic motivation has a vital role in predicting customers' reactions and perceptions towards social media ads. Also, the research carried out by Irshad et al. (2020) confirmed the positive effect of remuneration motivation and social motivation on online purchase intentions.

Another important variable in online consumer purchase behavior is perceived risk. Previous studies (Aghekyan-Simonian et al., 2012; Cui et al., 2019; Kim & Lennon, 2013; Kimery & McCord, 2002; Tuu & Olsen, 2012) confirm the negative impact of perceived risk on online consumer purchase behavior. Perceived risk is a major barrier to purchase intentions in the online shopping environment (Aghekyan-Simonian et al., 2012).

When consumers perceive higher risks, it is less likely that they will buy the product (E.-C. Chang & Tseng, 2013). Consumers perceive a higher level of risk in online shopping (Forsythe et al., 2006). Some of the consumer risks in the online environment include product risk, financial risk, time risk (Aghekyan-Simonian et al., 2012; Forsythe et al., 2006), psychological and physical risks (Cui et al., 2019), equipment/function risk, and social risk (Tseng & Wang, 2016) that affect online consumer purchase behavior. Meanwhile, Perceived usefulness was another dependent variable in the ISM model. In other words, one's perception of the usefulness of social networks for purchasing can affect his or her purchase behavior. The positive effect of perceived usefulness on online consumer behavioral tendencies has been confirmed in previous studies (Agag & El-Masry, 2016; Amoako-Gyampah, 2007; Fu et al., 2018).

The findings also show that social support is one of the most important strategic variables of research. Thereafter, all linkage variables (such as F2, F4, F9 and F10) are strategic variables. Strategic, in terms of MicMac analysis, means that such variables are significant and are worth the investment in the future based on the cross-impact analysis. These results support the selection of the variables, that are deliberately confirmed by experts in the field. The recognized strategic variables, called linkage factors, have equal driving power and dependence power to explain the modelling of online consumer purchase behavior. Level Partitioning showed that linkage variables impact significantly on dependent factors and consequently on online consumer purchase behavior. In fact, four dependent variables, have the highest dependence power and lowest driving power and therefore, are significantly influenced by other variables of the model. It can be said that these variables are goal variables and determine online consumer purchase behavior.

Online social support, which may help social network users is often intangible, including emotional and informational supports (Liang et al., 2011). In social media platforms, the user who receives shared information considers others as being helpful and caring when providing a useful product or life information. After receiving such information, the user will be willing to acquire or share valuable shopping information with others. Trust and friendship among users can be increased by frequently sharing supportive information, which may further enhance the intention to do commercial activities (Bai et al., 2015).

From the consumer behaviour perspective, purchasers are more influenced by information received from other consumers than information provided by suppliers. Thus, the information and emotional support that the online consumer receives from people on social media are crucial to marketers. Previous studies have also confirmed the positive impact of social support on relationship quality (commitment, satisfaction, and trust) (Cui et al., 2019; Hajli, 2014a), willingness to social business (Liang et al., 2011), customer satisfaction (Zhu et al., 2016) and online consumer purchase

behavior (Bai et al., 2015, Oláh et al., 2018). Since social support was identified as the strategic variable in the present study, marketing managers should provide a favorable supportive environment to establish optimal consumer interactions on social networks. It is also essential to provide useful and complete information about the company and the product on the virtual pages of social networks. More investment in social support will result in more effective marketing activities.

Hence, trust is another strategic variable and it is related to social support and consumer purchase behavior. It is essential to provide an atmosphere of trust between online consumers and sellers. Because of the psychologically distant and unregulated nature of online communications, consumers who find that trust-building is too complex usually opt to withdraw from buying online goods (Sembada & Koay, 2019). Thus, social platform marketers need to further strengthen the trust of online consumers. Previous studies (Hajli, 2014b; Irshad et al., 2020; Xu-Priour et al., 2014) have confirmed the positive impact of trust on online consumer purchase behavior.

Social influence is another strategic variable that has been introduced in the online consumer behavior model. In fact, people are affected by others' opinions when purchasing products and services through social networks. The effect of social influence on the consumer's online purchase intention has been confirmed in previous studies (Fu et al., 2020; Kuan et al., 2014).

One of the most strategic variables and concept is value co-creation. Co-creation opportunities represent strategic options for suppliers to create increased brand meaning for customers. Suppliers can develop successful co-creation initiatives based on customers' encounters. They can utilize these encounters for educating their customers on how to engage in co-creation behaviours (Payne et al., 2009).

The positive effect of value co-creation on shopping intention has been confirmed in previous studies (Kunja & Acharyulu, 2018). The research by See-To and Ho (2014) also emphasizes the theoretical justifications of the effect of value co-creation on purchase intention. The research studies conducted by Choi et al. (2016) and Salem et al. (2019) also confirmed that characteristics of the value co-creation encounter affected purchase intention, brand value, and customer value.

In terms of independent variables, Knowledge sharing constitutes the most vital part of social activities taking place in virtual communities (Chen & Kuo, 2017). Past studies (Albert et al., 2014; Ghahtarani et al., 2020; Tran, 2020) have confirmed the impact of knowledge sharing on consumer purchase behavior.

Service innovation in social networks is another independent variable in the online consumer behavior model. Using the technological potential of social networks can provide new services to online consumers. Service innovations are attractive to online consumers and will affect their purchase behavior. The positive impact of service innovations on online consumer purchase behavior has been confirmed in previous studies (Agag & El-Masry, 2016; Fuchs et al., 2010; Kim et al., 2020).

Social media word of mouth is another independent factor with the most driving power and less dependence in the online consumer behavior model. word of mouth over social media is a type of communication that is known as an important influential source of information on social media platforms (Park et al., 2021). Previous

studies (Mekawie & Hany, 2019; Yusuf et al., 2018) have confirmed the impact of social media word of mouth on online consumer purchase behavior.

Perceived information quality is another independent variable identified in the online consumer behavior model. In fact, online consumer perceptions of the quality of the information provided by sellers on social platforms can influence online consumer purchase behavior. Past studies (Filiari et al., 2018; Gao et al., 2017; Kim et al., 2020) have confirmed the positive impact of perceived information quality on online consumer behavioral tendencies.

The model of the present study showed how online consumer behavior in e-commerce can change under the influence of strategic variables. However, the present model has been formed qualitatively and in the opinion of field experts, and the need for quantitative model testing and case studies is felt. In fact, the present model provides a theoretical view of online consumer purchase behavior that can be the basis for practical development in the future. The research model can be implemented and implemented in the field of online businesses. It is a quantitative research and model simulation using a machine learning dataset. Certainly, quantitative implementation of the model in the future can complement the current research and better show the effect of variables such as perceived risk.

## 6. Conclusion

With the emergence of social network platforms on mobile phones as ubiquitous media, online purchasing became a trend in e-commerce. Retailing social media platforms present a new experience for customers to thoroughly review and compare their favorable goods and services with the other offers and to benefit from the feedback of other users. Also, they benefit from the online communities to share and receive the purchasing experience of others (Khajeheian & Kolli, 2020) and therefore, to enjoy a rich purchasing experience. While traditional online retailing websites were merely Cognition web, social network platforms are based on co-creation approach (Fuchs, 2017) and user engagement is the key to keeping the customers loyal. For this reason, social network platform owners need to identify and use the factors that facilitate engagement. This research was conducted to serve this aim by identifying and ranking these factors and recognizing the strategic ones.

### 6.1. Theoretical and Practical Implications

The findings of this research provide insights for boosting the engagement of online customers and affecting their purchase behaviour. The contribution of this research is two-folded. In the first place, the innovative application of ISM with MICMAC is a methodological contribution with several advantages compared with other multi-criteria decision-making methods. This combination can be used in other research studies that seek to identify strategic factors in other related managerial studies. Level partitioning of factors can provide a comprehensive view for managerial decision-making. Also, ISM programming with MATLAB provides a basis for model development in the future with the help of machine learning methods.

The second contribution of this research is the modelling of the factors that impact the decision-making of online customers in social networks. It shows that word of mouth is theoretically the main driver for customer purchase in online social network platforms, although this variable ranked at the lowest level of the model. Four strategic variables of trust, social influence, social support and value co-creation are placed at the middle level of the model and the main interface for the proposed model efficiency. Managers need to pay the highest level of attention to these strategic factors.

One of the theoretical implications of this research is to recognize the importance of the key factors such as value perception, user engagement and service innovation in forming the social network platforms' users. Today, the social network platforms are totally accepted and penetrated and therefore we do not need to conform whether they impact on the online consumer purchase behaviour; but we need to identify the factors that determine purchase behaviour to show how to convert their surfing and usage to purchase action. In this regard, user engagement (can be perceived and call as audience engagement and customer engagement too) and its mechanics and dynamics are the key to involve users to social network platforms and not only lead them to purchasing behaviour, but also any other involvement activities such as participation in value production and exchange.

Service innovation is recognized as another strategic factor in the model of consumer purchase behavior in social network platforms. to succeed in an enterprise social platform, companies are supposed to determine users' motivation to actively engage in the generation and sharing process of their knowledge (Chen & Kuo, 2017). Effective knowledge sharing strategy might positively impact innovative performance (Scuotto et al., 2020). Social media marketers should utilize the technological facilities available in the social platforms and provide innovations to serve online consumers. The quality of the e-service offering can meet customers' new demands, increase customer loyalty, provide additional product value, and increase customers' purchase intentions (Xu et al., 2017). This confirms the findings of Falahatpisheh and Khajeheian (2020) that affordances of social network platforms provide service innovation in IT products and garner more intensive user engagement. Other factors such as trust, social media worth of mouth, social influence, perceived information quality, and perceived usefulness are among the important factors influencing online consumer behavior.

Dependent variables play the highest role in the proposed online consumer purchase behavior model. Consumer engagement influences consumer purchase behavior. Also, perceived risk is an important factor in reducing consumer online consumer purchase tendencies. This reflects that marketers should focus on reducing the perceived risk of online consumers. Online consumers' perception of the total value received at the time of purchase on social media is recognized as another important factor that influences purchase behavior. This finding reflects that the marketers need to focus on the value proposition to the customer and inform the customers of the different aspects of the proposed value. Finally, social support is another key variable that plays an important role in influencing online consumer behavior. With increasing consumers' perception of informational and emotional support on social media platforms, the consumer's purchase intention will also increase.



Therefore, creating a supportive environment for useful online consumer interactions is an important necessity for businesses operating on social networks.

### **6.2. Findings and novelty of research**

The findings of this research stress the importance of strategic factors that must be considered by the owners, managers and marketers of retailing social network platforms to engage the customers and lead them to online purchase behaviour. user engagement is the keyword in the success of social networks and media brands (Khajeheian & Ebrahimi, 2021; Crespo et al., 2020) and results in co-creation activities that benefit the platform and various stakeholders including other users and customers. When it comes to e-commerce, co-creation activities include reviews, feedback, likes, comments and sharing the content on other social media accounts and affecting other customers. The findings of this research deepen our understanding of the online purchase behavior of customers in retailing social network platforms. In addition, the proposed model can be tested on online social platforms as a practical solution.

### **6.3. Limitations and Future Research Directions**

In the generalization of the findings of this exploratory research, some limitations must be carefully mentioned. One research limitation is related to the nature of the qualitative ISM method; for example, ISM does not calculate the weight of variables and we cannot prioritize factors based on their weights. Moreover, we have no option to show sensitivity analysis in the ISM method. Hence, future researchers can continue this research using one of the multi-criteria decision-making methods (MCDM) such as AHP, ANP, DEMATLE or Fuzzy methods to get the best results to prioritize factors and focus on sensitivity analysis. Furthermore, we suggest that future researchers add new variables from extended literature or interview with experts or practitioners to show more layers of the level partitioning model.

Notwithstanding these limitations, the study suggests that future researchers test the 'importance' and 'performance' of the proposed variables as a case study in marketing companies through innovative and new methods such as the IPMA matrix. Also, the strategic variables of the research can be quantitatively analyzed in the form of NCA analysis, which is one of the advanced methods in the field of resource allocation for businesses. We also suggest that future researchers examine the model presented through machine learning as a case study in online businesses in order to predict and simulate market and consumer behavior. Also, the study of affordances that affect the level of user engagement and increase the possibility of online shopping is another suggestion for future research.

### **Disclosure statement**

No potential conflict of interest was reported by the authors.

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## Appendix A: ISSM Questionnaire

This questionnaire is intended to support the research regarding the study An ISM-MICMAC approach to identify key strategic factors in online consumer purchase behavior: The role of knowledge sharing and service innovation. To attain this objective we design an expert questionnaire. we appreciate it if you could fill in the next questionnaire. It takes only a few minutes.

### A1. Respondents' characterization

- Gender: \_\_\_\_\_
- Age: \_\_\_\_\_
- Education: \_\_\_\_\_
- Expertise area: \_\_\_\_\_
- Job of the respondent: \_\_\_\_\_

A2. The following table intends to register the perception of professionals and academics about An ISM-MICMAC approach to identify key strategic factors in online consumer purchase behavior: The role of knowledge sharing and service innovation. Please, fill in the table considering the following symbols:

- V: F1 variable I leads to F2 variable j  
 A: F2 variable j leads to F1 variable i  
 X: Both variables i and j lead to each other  
 O: Both variables i and j are unrelated

	j = F12	F11	F10	F9	F8	F7	F6	F5	F4	F3	F2	F1
i = F1												
F2												
F3												
F4												
F5												
F6												
F7												
F8												
F9												
F10												
F11												
F12												

Thanks for your responsiveness and collaboration

## Appendix B: power iteration analysis program with MATLAB

```
function [ T i ] = ISMpower(x)
    [n, ~]=size(x);
    x = eye(n)+x;

    x(x~=0)=1;
    F = cell(n);

    F{1}=x;
    D = x;

    for i = 2:n
        D = D*o;
```

```

    D(D~=0)=1;
    F{i}=D;
    if F{i} == F{i-1}
        break
    end
end;

T = zeros(n);

for j = 1:i
    T = F{j}+T;
end
T = T + eye(n);
T(T~=0)=1;

end

```

### Appendix C: Level partitioning program with MATLAB

```

function level = ISMLevels(x)

[n,~]=size(x);
xx= 1:n;
counter = 1;
level = {};

while isequal(x,[]) == 0

    [n,~]=size(x);

    [r, s, ~] = find(x);
    enter = {n};
    exit = {n};
    same = {n};
    c = [];
    for i = 1:n
        enter{i}=r(s==i);
        exit{i}=s(r==i);
        same{i}=intersect(enter{i},exit{i});

        if isequal(exit{i},same{i}) == true
            c = [c i];
        end
    end

    end

    x(:,c)= [];
    x(c,:)= [];
    level{counter}=xx(c);
    counter = counter + 1;
    xx(c)= [];

end

```