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Original Research

Foreign Entrepreneur Success in China: The Role of Entrepreneurial Cognition in Opportunity Recognition

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Abstract

There is a huge opportunity for foreign entrepreneurs to enter the Chinese market. They have noted that the market is difficult to enter and complex to navigate. This study contributes towards filling this gap by identifying the critical success factors for foreigners in China, basing on entrepreneurial cognition and opportunity recognition theories. 128 entrepreneurs in China were surveyed through semi-structured interviews. Their responses were collated and analyzed using graph theoretic matrix approach to identify and rank the factors with the most influence on their business success. The factors with the greatest influence on the success of foreign entrepreneurs are government policies and funding. Government policies towards innovation through financing for technology companies and the demographic make-up of the consumer population provide the greatest opportunities for foreigners. By understanding the most crucial success factors and the role of cognition in opportunity recognition, entrepreneurs and managers can derive meaningful insights into strategic choices regarding doing business in China. This study addresses a grossly under-researched topic of global entrepreneurs in China. Not only is there a large number of foreigners living in China, but they also find great difficulty in adjusting to the cultural scene and this affects business outcomes. Furthermore, GTMA is a highly scientific method that the authors show is valuable in social science research, particularly entrepreneurship research

Keywords: China, International entrepreneur, cognition, opportunity recognition.

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Introduction

China's entrepreneurship scene is one of the largest and most profitable in the world. Together, both Chinese and foreign entrepreneurs contribute over 60% of the country's GDP, are responsible for 80% of urban development and contribute 50% of fiscal revenues and taxes (He, Lu, & Qian, 2019; Huang, Liu, & Li, 2016). They can foster sustained economic growth through innovation (Qian, 2017) and currently tech entrepreneurs alone account for 41.49% of the total GDP (Shan, Jia, Zheng, & Xu, 2018). The Chinese government is well aware of the efficacy of entrepreneurship such that several macro-level strategies have been implemented to support and encourage entrepreneurship at every level.

There were approximately 556 262 foreign enterprises in China as of 2018, which accounts for 14.2% of the total number of entrepreneurs in China (B. I. Park & Xiao, 2021). While they are only a small portion of the total market, foreign entrepreneurs have advantages in capital technology, large profits and brand recognition that makes them a special group that the Chinese government hopes to attract more of through incentives and preferential taxes (Xu, Pan, Wu, & Yim, 2006). According to the Ministry of Commerce the investments for foreign invested enterprises (FIEs) rose steadily by an average 13% annually and were valued at 10 billion USD in Shanghai alone (K. Li, Zhang, Wang, Jiang, & Zhang, 2021). A study done by McKinsey in 2020 found that FIEs have the highest profit margins in the country at 2200 USD per employee (Bick, Chang, Wang, & Yu, 2020). Being a foreign entrepreneur is highly lucrative in what is one of the most prominent markets in the world. In 2018 alone, there were 60 553 new foreign enterprises registered with a cumulative 134.97 billion USD invested (MofCom, 2018).

Unfortunately, the market is just as difficult to enter as it is attractive. Extensive literature spanning over 25 years maps out the difficulties that entrepreneurs in China have faced, particularly, foreign entrepreneurs (Lee, 2003). These include complex and inconsistently applied laws, national isolation that has created a closed business and social ecosystem, unique cultural context, language deficiencies and rigorous competition from domestic players and copycat products, conflicts in managerial and cultural integration, lack of access to network resources or "guanxi" and multi-layered distribution channels, liability of foreignness, and corruption in public services (Y. Chang & Hu, 2020; Karakaya & Stahl, 1989; Lee, 2003; Min & Chen, 2003; Niu, Dong, & Chen, 2012; W. Zhang & Zhai, 2016; Zhou, 2012).

According to entrepreneurial cognition theory a unique outlook held by an entrepreneur allows them to objectively evaluate their personal strengths and advantages that are relevant to their business, which is invaluable in international entrepreneurship (Pellegrini & Ciappei, 2015). This means that the ability of a foreign entrepreneur to navigate a unique environment, learn from experiences and make good strategic decisions largely depends on their knowledge-cognition perspective. It also means that entrepreneurial cognition has a direct impact on firm strategies, opportunity identification through information processing and therefore directly affects entrepreneurial successes (L. Yang, 2015).

Despite the large number of foreign enterprises in China (MofCom, 2018), there is only little literature that focuses on foreign entrepreneurs specifically (Ahlstrom, Young, Nair, & Law, 2003; Gurău, Dana, & Katz-Volovelsky, 2020; Lightfoot & Almeida, 2007). Though many previous studies explain the policies and theories regarding the opportunities for foreign entrepreneurs in China (Ahlstrom & Ding, 2015; Anwar & Sun, 2015; Wu & Burge, 2018; Y. Zhang, Zhao, & Ge, 2016), there still exists a gap in the literature in understanding what is the nature of the different factors that foreign entrepreneurs have to face. To this end, the first contribution of this study will be to provide a clear picture of the dynamic environment that foreign entrepreneurs are facing in China's business ecosystem, from the perspective of the entrepreneurs.

There are studies that have mapped the difficulty that foreign entrepreneurs have in new markets (Dickson, Yao, & Hill, 2020; Hamizah, 2020; Liu, Al Asady, & Fu, 2020), but we found only one done in China. China is a very unique case study. Arribas, Hernández, and Vila (2013) stated that China is very different from other economies of similar size and status because it has a dynamic business environment which is still taking shape. It is quickly becoming a world leader, it's the second largest economy in the world and also a major player in global and regional economic blocks. The challenges that foreigners need to overcome here are not easily comparable to any other market. It is also a highly -sought after market and this therefore makes it an intriguing case. Furthermore, the economic, social and political development in different regions of the country is imbalanced. Location, therefore, is likely a decisive factor in the success of FIEs. (Luo & Lemański, 2016; Puslecki, Trapczynski, & Staszaków, 2016). This study will address current questions regarding the context for entrepreneurship on emerging economies that have a dynamic environment which is at a formative stage, more so for people who are not native to those countries.

The ability of entrepreneurs to identify the challenges and opportunities in China is largely influenced by their experience, background and a myriad of other personal factors (Si, Zhang, & Teng, 2021). Furthermore, the role of foreign entrepreneurs in China has been changing over the past few years on account of developing institutional frameworks, entrepreneurship policies and the regional differences in openness. There is also a gap identified by Ng and Fu (2018) that there is a need to understand how cultural differences affect entrepreneurship. Basing our investigation on entrepreneurial cognition theory, the second contribution of this study is to explore what factors affect the success of foreign entrepreneurs in China, whether if and how these factors are interrelated? This will be achieved through answering these questions: "What factors influence the opportunity recognition by foreign entrepreneurs" and "Are there any interdependencies amongst these factors?".

To answer these questions, we employ a qualitative exploratory research method to capture a more holistic view of the business environment that foreigners in China encounter which is more comprehensive than existing studies that focus on the singular point of view (Gurău et al., 2020; Lightfoot & Almeida, 2007). It would allow for the investigation of environmental dynamics both situational and action oriented (R. Mitchell, Randolph-Seng, & Mitchell, 2011) that are difficult to single out but largely influence the knowledge-cognition perspective of entrepreneurs. For this reason, the third contribution of this paper will be to test graph theory and matrix approach (GTMA) as a

suitable method for undertaking entrepreneurship research. It has successfully been used in other fields of social science including organizational management (Gurumurthy, Mazumdar, & Muthusubramanian, 2013), logistics and supply chain management (Agrawal, Singh, & Murtaza, 2016; Gupta & Singh, 2015) as well as management science (Harary, 1959). This method can account for the bi-directional inter-relationships amongst the main factors and examine to what extent each of them affects the business outcomes of entrepreneurial activities in a way that other methods cannot. The study will go on to outline a literature review of previous studies in section 2, define the variables based on a combination of priori research and consultation of experts in section 3, build and calculate the graph theoretic model in section 4 and discuss the results and research implications in section 5.

Literature Review

Foreign Entrepreneurship in China

Entrepreneurship is the creative process of monetizing problem-solving methods (Ahlstrom & Ding, 2015; Alvarez, Barney, & Anderson, 2013). The entrepreneur is therefore the one who changes a market or economic system through provision of an innovative product or business model often in response to a valuable economic opportunity (Devi, 2020). China's "mass entrepreneurship and innovation" policies are attractive to entrepreneurs and they offer lucrative opportunities for them. A foreigner is defined by the (CambridgeDictionary) as a person who comes from another country. In this context it describes people who hold nationalities outside of Chinese territories. With over 840 000 foreigners living in China (NBS, 2021), of which 9% are entrepreneurs or business owners, the study must stipulate the difference between small business owners and entrepreneurs.

The entrepreneurs, that are the focus of this study, have an entrepreneurial spirit, are innovative in creating new markets, new products, new organization structure and methods of production and service delivery (Ng & Fu, 2018; Urban, Van Vuuren, & Barreira, 2008). Entrepreneurial activity among foreigners has been on the rise in recent years across the country (Ashourizadeh, Li, & Wickstrøm, 2020) but they are clearly skewed between geographical regions. Eastern coastal regions are far more developed than the central and western regions. Eastern China has significantly better infrastructure, favorable implementation of national and provincial policies for regional entrepreneurship and therefore gives better opportunities (M. Li, He, & Zhao, 2020). Most foreigners live in Tier One cities across the country. However, there still are some discrepancies between these cities such as Shanghai in Eastern China, Guangzhou and Shenzhen in the South, Beijing in the North and Chengdu in the West. There is need to find the differences between the success of foreign entrepreneurs in the different economic zones of China.

Going further, what really defines success to an entrepreneur? Wach, Stephan, Marjan, and Wegge (2018) connote that unlike managers, entrepreneurs measure their performance against their goals. So instead of pegging success with survival, return on assets, number of employees and market share; entrepreneurs measure performance and success based on self-actualization (Benzing, Chu, & Kara, 2009), independence and

autonomy over firms (Stephan, Hart, & Drews, 2015), social contribution, personal fulfillment (E. St-Jean & Audet, 2012) and work-life balance (É. St-Jean & Duhamel, 2020). Their success can be grouped into business-oriented and personal-oriented. The former encompasses financial and also development of innovation capacity and enhanced status (Lukes & Stephan, 2012) while the latter entails relationships formed (Sydler, Haefliger, & Pruksa, 2014) and value of the impact of innovation on the community (Wach, Stephan, & Gorgievski, 2016). This paper espouses these as the successes which entrepreneurs in China will be aiming for.

Theories of Entrepreneurship

This study is based largely on Entrepreneurial Cognition and Opportunity Recognition Theory.

Entrepreneurship literature has recently devoted much attention to understanding how entrepreneurs think and why they make the choices they make. Significant attention has been given to understanding the thought structures and knowledge used by individuals to assess situations, take decisions and act on these to recognize opportunities and grow new (Ronald K. Mitchell, Smith, Seawright, & Morse, 2000; Ronald K. Mitchell et al., 2002; B. Randolph-Seng et al., 2015). Entrepreneurship cognition is the ability of an entrepreneur to identify and successfully act on opportunities in a dynamic environment in which others find it difficult to do so (Shepherd & Patzelt, 2018). Entrepreneurial behavior is influenced by these mental or cognitive processes. For this reason, a strand of literature that seeks to study entrepreneurship from this cognitive aspect has emerged to investigate the mechanism through which an individual obtains, processes and utilizes information.

In the entrepreneurial cognition handbook (J. R. Mitchell, Mitchell, & Randolph-Seng, 2014), it is described that entrepreneurs operate in uncertain market conditions and because of this they need to make use of both situation and action-oriented cognition. The former is the knowledge which is inseparable from the context in which it is learned and is largely connected to culture, home country and social background. The latter is the way in which the entrepreneur observes and reacts to objects and concepts. Together, these multi-level dynamics are processed by the entrepreneurs leading to the emergence of new enterprises and realization of new opportunities in a particular region and with special competitive advantage (Sanchez, Carballo, & Gutiérrez, 2011; Sarasvathy & Dew, 2011).

In the context of foreign entrepreneurship, individuals can make use of the special opportunities that arise in dynamic environments and attain significant profits. The cognition perspective is the degree to which the entrepreneur can make use of their personal knowledge and experience to identify what is relevant to their business. It explains global strategic choices of entrepreneurs in international entrepreneurship by showing the relationship between external environment and internal information (Pellegrini & Ciappei, 2015). This can be seen by entrepreneurs who operate in the same external environments but achieve different results (L. Yang, 2015). The social context shapes the strategic decisions of entrepreneurs (Sasseti, Marzi, Cavaliere, & Ciappei, 2018). Entrepreneurial cognition, therefore, has an effect on entrepreneurial success as it bridges the relationship between organizational strategy and market information

processing. Raza, Muffatto, and Saeed (2018) found that entrepreneurial cognition mediates the relationships between prevailing institutional environments and new venture creation by individuals. J. S. C. Randolph-Seng and Atinc (2020) describe how many studies on entrepreneurship have focused on individuals rather than the interactions amongst those individuals in a more contextualized sense. This study therefore hopes to contribute towards filling this gap by studying these interactions between the entrepreneurs and their environment in the context of an emerging economy.

Venkataraman (2019) connotes that the most important skill for an entrepreneur to have is the ability to identify opportunities. Urbano, Audretsch, Aparicio, and Noguera (2019) explain how existing regulative statutes and cultural norms of China affect foreigners doing business there. Embedded within this institutional framework is opportunity recognition theory (Phillips & Tracey, 2007). Foreign entrepreneurs must be able to recognize the opportunities that exist for them in line with provisions made by the institutions. Institutions will present the environment that foreigners must encounter. Formal institutions regulated by the State determine the prevailing state of entrepreneurship (North, 1991) in China. They determine the foreign entrepreneur's ability to operate, to obtain legal residence status and visas as well as which industries to enter. This means the formal institutions in China enable as well as constrain entrepreneurs. Social interactions and observation of culture and language are so important and are a determinant of the success or failure of a business in terms of productivity and formality (Lee, 2003).

Entrepreneurial Cognition- Opportunity recognition nexus

The relationship between the entrepreneurs internal thought processes and the external environment is indeed a cutting-edge strand of literature in recent years (York & Venkataraman, 2010; Zanella, Solano, Hallam, & Guda, 2019). It can clarify the strategic choices made by entrepreneurs in the same environment to take advantage of different opportunities and create different ventures. While (Ahlstrom & Ding) together with other relevant literature on foreign entrepreneurship in China have detailed the challenges and even opportunities for foreigners in China, almost no paper to the best of our knowledge has investigated how the cognition experience of entrepreneurs affects their outcomes. The unique circumstance that foreign entrepreneurs operate in a regulative grey area in China in which the government is a stakeholder makes for an intriguing case study because aspects that one individual may perceive as a challenge would equally be perceived as an opportunity by a different individual. Entrepreneurial cognition and opportunity recognition theories collide at a fascinating nexus in this case of a dynamic environment with wildly varied cultural and socio-economic differences within a single country. This study further seeks to look into the controversial performance measurement of FIEs that stems from foreign enterprises reportedly having larger profit margins despite having lower capacities than Chinese counterparts (Qi, Wu, Wang, & Wang, 2021; Xu et al., 2006). This study therefore follows the theoretical framework in Figure 1.

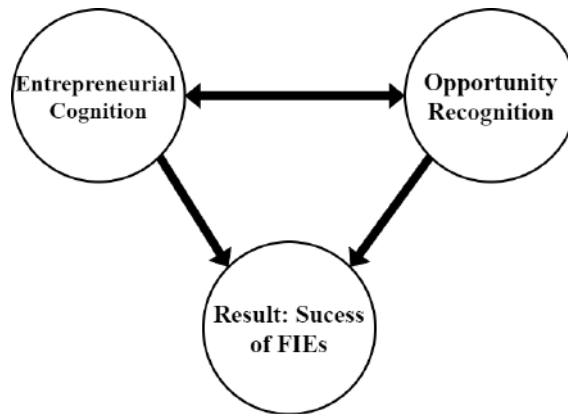


Fig1. Conceptual Diagram

Conceptual Development

Item generation

In order to understand the circumstance of foreign entrepreneurship in China, an initial review of studies on the market entry barriers (MEBs) of entrepreneurs in China was done to compile the prominent factors that affect the business environment for foreign entrepreneurs (Jayaraman, 2010; Niu et al., 2012; W. Zhang & Zhai, 2016). This study gathered findings from the literature survey on MEB's dating back from 1989-2020 (Fan & Zhang, 2017; Kloosterman, 2010; Lee, 2003; Niu et al., 2012; Raeesi, Dastranj, Mohammadi, & Rasouli, 2013; Steinz, Van Rijnsoever, & Nauta, 2016). The paper by Dickson et al. (2020) was used as a basis on the groupings of the items. A preliminary list of 30 items divided into 6 general categories (5 items for each).

Expert Review

Four experts who are senior academics in Entrepreneurship, Business Administration and Management studies and have experience working with foreign entrepreneurs at Chinese universities provided us with suggestions and feedback on the face validity of the 30 items. They were emailed the list of items along with the title of the manuscript and objectives of the study. Accounting for their feedback, we reworded some of the items, combined those that were ultimately the same and deleted 4 items. This resulted in a set of 20 items divided into 5 clusters namely Chinese Government Policy (GP), national Demographics (DG), Domestic Market Competition (MC), Local Business Relations (BR) and access to Funding (Fu).

Nomological Validity

Government Policy (GP)

Arguably, government policy is the most powerful shaping force of the business environment in China (Woetzel et al., 2014). Firstly, the Open-Door Policy (GP1) from 1979 saw China open up its borders to investment from other countries. This has since

led to the State decentralizing decision-making regarding trade, opening of special economic zones in strategic locations to facilitate it, loosened control on foreign exchange and replacement of administrative restrictions with tariffs and quotas (S. H. Park & Ungson, 2016; S. H. Park, Ungson, & Zhou, 2013). This has significantly transformed the nation to a market economy. Secondly, China is forex-controlled meaning companies must apply for foreign exchange certificate and review annually by supplying documents for all money coming in and out of China through business transactions (Ji-yun, 2002) (GP2). Although the circulation of foreign currency is prohibited, The Shanghai Pilot FTZ currently allows full convertibility of RMB, the beginning of the relaxation of this policy (Deloitte, 2017). Thirdly, in many 1st and 2nd tier cities, the State Tax Administration has introduced some attractive incentives for foreign entrepreneurs and startups (Hsu, Lee, Leon-Gonzalez 2018) that give preferential tax treatment and substantial tax holidays (GP3). In certain industries, such as high-new-tech-enterprises (HNTes) and cities in Guangdong and west China, they are offering a 2-year tax holiday followed by 3 years of 12.5% income tax versus the documented 25%. Therefore, entrepreneurs can easily bear the tax load after 5 years giving them enough time to get their businesses up and running (Deloitte, 2017). Finally, the last aspect of this is the regulatory transparency of policies regarding investment (GP4). Jayaraman (2010) describes the legal system as “loosely defined” allowing for many loopholes alongside red tape and misinformation. Entrepreneurs with a good network of Chinese colleagues will have less difficulty navigating simple tasks such as permits and approvals, however without these connections one will face grave difficulties navigating the red tape and run-around as well as may have no protection against theft of expertise and intellectual property (IP) (Tung & Cho, 2000).

Demographics (DG)

China's large population is a great opportunity for entrepreneurs but some of the specific demographic properties make it a complicated love story. China has a fast-growing wealthy middle class (DG1) as more rural workers move to urban areas for better paid jobs and native Chinese business people expand and have greater disposable income (S. H. Park & Ungson, 2016). These consumers have higher demands for quality and efficiency than ever before and their needs are dynamic. Chinese consumers spent CNY 34.8 trillion in 2018 alone (NBSC, 2019), a figure expected to rise to CNY 60 trillion by 2025; therefore their complex needs dictate how businesses will operate (Farrell, Gersch, & Stephenson, 2006). Chinese Mandarin is the standard language spoken in China (DG2). Although many young workers in big cities will be able to speak English, most of other business conversations with officials, sponsors and partners will be in Chinese (Cui & Kwon, 2014). Therefore, though not compulsory, foreign entrepreneurs who can communicate in Chinese to their counter parts are more likely to gain the trust of others (Chua, Ingram, & Morris, 2008). Innovation management (DG3) is very important for domestic and foreign entrepreneurs in China. Previously, it was primarily foreign firms that introduced new products from their countries into China through partnerships (Collinson & Liu, 2019) with local companies but now has shifted to companies independently innovating to create products unique and original to Chinese tastes. It is crucial that entrepreneurs settling in China study the market and have significant competitive products and services tailored for the market specifically. This gives rise to another aspect, the digitized society (DG4). Verot (2018) stated that Chinese

consumers chat, shop, order groceries, pay for services, watch television and even date online, meaning whatever business model entrepreneurs will choose, having an online infrastructure is invaluable.

Business Relations (BR)

The CEO of Nexcelia Solutions (Munganyi, 2020); an entrepreneur with a tech startup in Shanghai; said “In China business is more of a relationship than a transaction”. This is embedded in the 5000-year history of the country. People place great importance on networking and “social capital” because who you know can be gateway to better opportunities for your business. This social capital is often termed “Guanxi”(BR1). Yau, Lee, Chow, Sin, and Alan (2000) make it clear that cultivating long term profitable relationships is a worthwhile social investment. Guanxi can also be looked at from a long-term angle as “trust” (BR2). By conducting a series of transactions successfully over some time (Trimarchi, Liesch, & Tamaschke, 2010) , people will come to trust your expertise and you will be given opportunities based on recommendations and testimonials given on your behalf. Being outsiders, often from different races and cultures, foreign entrepreneurs will need to gain the trust of customers and suppliers alike and overcome the liability of foreignness (Ikegami, Maznevski, & Ota, 2017). Gaining trust, especially in Joint Venture and Partnership companies, may require foreign companies to share their technological know-how and IP with local firms which has given rise to the unfortunate copycat culture “Shanzhai” (BR3). Although the government is increasing measures in recent years with special committees to hear IP protection suits (Hennessy, 2012), there is still a significant threat in terms of counterfeit goods and theft of intellectual property for reproduction (Jiang & Shan, 2016). One of the most attractive aspects of China used to be the cheap labor cost. However, in recent years, it has lost its luster as a base for cheap manufacturing (D. T. Yang, Chen, & Monarch, 2010). In 2018 ,58.52% of the population was living in urban areas, earning a national average minimum wage of 74,318 yuan, almost double the 36,539 yuan earned in 2010 (NBSC, 2010, 2019). The increase in labor cost (BR4) is not conducive to competitiveness and the cost of operating is increasingly higher by the year as are the expert needs of firms (Wang, Kinnucan, & Duffy, 2019; Zheng, Zhao, & Li, 2019).

Market competition (MC)

In 2010 when China released its 12th FYP document, it stated it was no longer content with being “the worlds factory” and rather wanted to move to an innovation economy (Worldwide, 2010). This means many domestic companies (MC1) especially in the emerging industries of high-end technology compete fiercely. Foreign entrepreneurs in these industries will be disadvantaged in that they don’t have the vast supply network and government funding that these firms will have (Buysse & Essers, 2019) but will have to perform equally well if not better in order to stay in business. Froese, Sutherland, Lee, Liu, and Pan (2019) make it clear that state financed firms often have many legal and regulatory advantages over foreign entrepreneur firms. Some American and Europeans have expressed feeling “stonewalled” in China, that is being given unfair access to the market (MC2) as the government gears towards its “Made in China 2025” initiative and shows some form of preference for Chinese firms over foreign ones (V. K. Chang & Pieke, 2018). Another obstacle for the foreign entrepreneur who wishes to open a firm in

China, especially WFOE, is the limited access to the supply chain (MC3). The entrepreneur will need to begin networking and creating his own system of suppliers, customers, distributors and retailers (Buysse & Essers, 2019) which will require a lot of valuable time that competitors will be gaining. In this process one will need to invest in a well-connected human resource (MC4), either through “buying guanxi” by hiring already well-connected staff or spend a lot of time networking to meet and gain the friendship of officials and other business people (Yen & Abosag, 2016) in order to gain an edge in market and financial performance and can reduce the liability of foreignness (Ikegami et al., 2017).

Funding (Fu)

One of the biggest questions for entrepreneurs is where they will get money to start their businesses and this applies the same in China. Blachman (2018) describes how Chinese venture capitalists (VCs) are looking to invest in foreign bred startups that have highly advanced engineering and data science as well as hard technology skills (Fu1). Such companies that pass the bar will be given access to major players in China to collaborate with, making it an even more attractive to be funded by Chinese VCs. The private equity (PE) market in China is slightly less developed than that of American and European countries (Nazareno, Zhou, & You, 2019) (Fu2). Though also available to foreigner entrepreneurs Lerner and Schoar (2005) suggest that there is still ambiguity in the legal environment and as a result PE manager sometimes buy controlling stakes earlier on in the business leaving the actual entrepreneur with weaker decision-making authority (Kaplan & Stromberg, 2009). Another funding option is that of self-organized foreign entrepreneurs (Fu3) that is to say foreigners that will use their own funds sourced from personal savings, friends and family. However according to the interviews conducted with foreign entrepreneurs in China, self-financed entrepreneurs with less than 5 million RMB are limited and stand a risk of hemorrhaging cash and failing within 3-5 years (Ng & Fu, 2018), while most foreign startups need at least 5-7 years to settle down. Lastly due to a high interest in HNTes (Fu4) in China, in cities such as Shanghai, Shenzhen and Chengdu there are possibilities of getting startup capital (\$148,800) and 3 years rent free in designated technology zones (Bo, 2019). Business incubation programs are increasingly popular as well and offer many financial and other resources crucial for start-ups along with the support of the government and access to supply chains (Chandra & Fealey, 2009).

The factors presented here have intricate interrelationships amongst them and some depend on each other. This is shown in the following conceptual model can be drawn up in Figure 2.

The resultant cause and effect diagram of all these factors is illustrated in Figure 3.

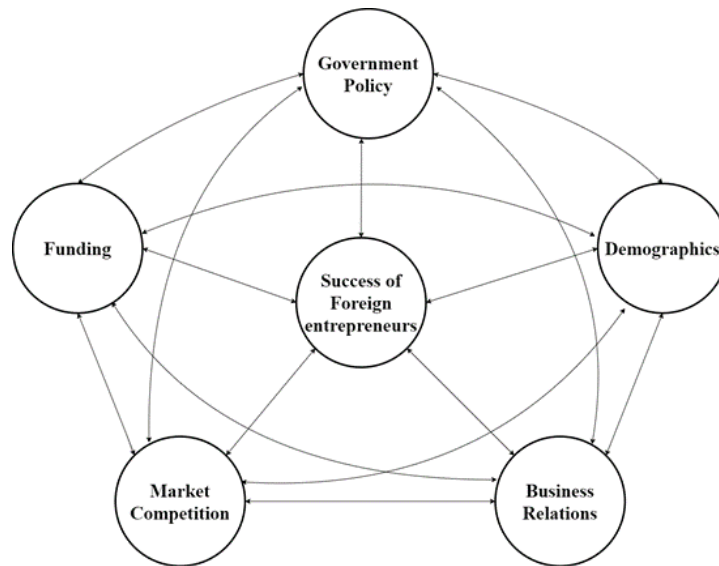


Figure 2. Cause and Effect Diagram

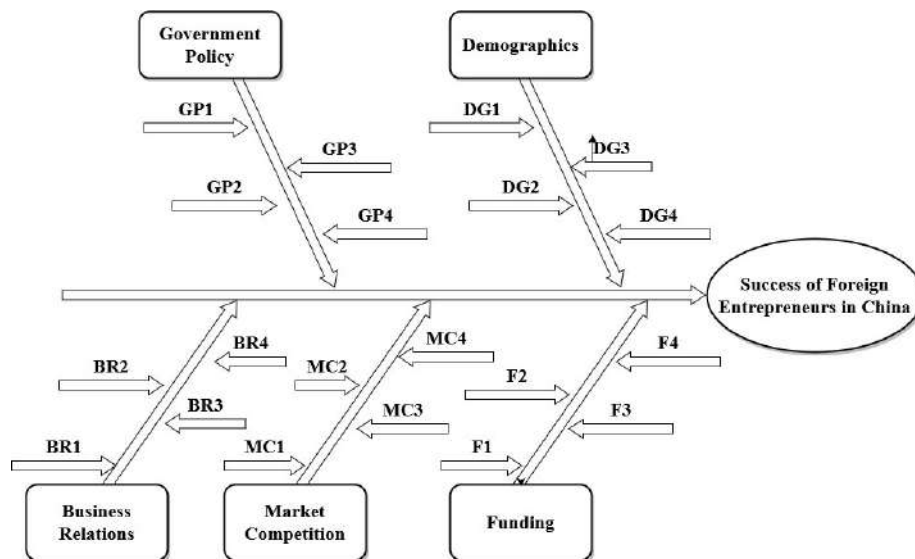


Figure 3. Behavioral digraph

While the literature and theories describe and explain the factors that affect foreign entrepreneurs in China, it still remains unclear to what extent these factors influence business environment in which the foreign entrepreneur and how they interact with one another. The following section explore the inter-relationships of the subfactors operating within the major factors as well as explore the nexus points of each of these factors with one another to determine the degree to which they impact the success of foreign entrepreneurs.

Research Design

The investigation made use of graph-theoretic matrix approach (GTMA) to examine interdependencies amongst the factors and determine the most critical ones. Characteristics of this technique are its ability to capture the interdependencies and hierarchical structure amongst variables from a considerably small sample size. This study specifically elected GTMA as the most appropriate method because collecting large amounts of data is notoriously difficult in China so it was better to collect a small amount of real data (Riege, 2003; Trimarchi et al., 2010). Furthermore, it allows for qualitative inductive research whereby it is possible to formulate conclusions based on the results of the data rather than analyzing data based on existing theories (Fang, Tung, Berg, & Nematshahi, 2017). Graph theory is a simple and formidable technique which is free from these limitations and has in fact proved its fortitude in every field of study (Muduli, Govindan, Barve, & Geng, 2013).

The most common representation of the graph is by means of diagrams in which vertices are represented as points and each edge as a line segment joining its end vertices. GTMA has 3 constituents i) diagram representation for visual analysis ii) matrix representation valuable for computer processing iii) permanent representation suitable for expressing the effect of each variable by a single number (Grover, Agrawal, & Khan, 2004). To get the permanent value of each variable the indexes of multi-nominals must be computed and subjected to comparison and classification by certain criterion in this case, importance, leading to an election of the best value. The concept of a permanent matrix and performance attributes index gives correct and complete evaluation of the data. It allows the selection of the most suitable option and evaluate the overall quality of the industry.

Following this, the permanent matrices of critical factors were drawn-up and used to analyze the intensity of each critical factor and rank them according to importance in influence and opportunity for foreigners hoping to do business in China and what they may face in entering the market. The authors made use of GTMA to examine interdependencies amongst the factor and draw out the most critical ones.

Data Collection

The items concluded on by the literature review and experts' review were used to formulate questions for semi-structured interview questions that were asked foreign entrepreneurs in China. A qualitative approach was chosen because the study aimed to understand the views and experiences of the respondents. For this reason, structured questions were sent to the respondents before the interview time and they were encouraged to prepare and conduct the interview as a narration (Fang et al., 2017). The researchers also made use of follow-up probing questions to better understand the respondents (Abubakar, Anasori, & Lasisi, 2019). All the interviews were conducted through a mix of video calls, telephone calls and face to face meetings according to accessibility and each lasted between 45 minutes to one hour. They were recorded and transcribed afterwards. The transcribed were combed for recurring items and key words which were noted down and slowly regrouped into same or similar clusters of words and phrases. These clusters were further refined and finally made into the individual variables,

where weightage was based on frequency and context in the interviews. Main questions focused on the principal objective of the study: challenges faced in doing business in China. Other questions also probed on the subthemes of the research: industry specific challenges and opportunities, the role of the Chinese government and business regulations as well as the state of local consumers and market competition.

Sampling

Responses were gathered from a total of 128 foreign entrepreneurs, from 42 countries, spread across 7 major regions of China and 13 industries. We employed a purposive snowball sampling technique according to the method used by (Karadal, Shneikat, Abubakar, & Bhatti, 2020). Established and experienced foreign entrepreneurs living and operating ventures in China were selected, starting with ones that the researchers had from personal contacts. These were asked to recommend future respondents from their social networks, personal contacts and industry acquaintances. From a total of 130 contacts we had, we received 128 valid responses. A 98% response rate for a snowball sample is considered to be valid (Karadal et al., 2020). These were urged to express their views and opinions on the topic. The entrepreneurs were distributed as shown in Table 1.

Table 1. Distribution of entrepreneurs that were sampled

| North China | North-East China | East China | South China | Central China | South-West China | North-west China |
|-----------------------------------|---------------------|---|--|--|--|-----------------------------|
| Tianjin Communication & IT (6) | Jilin Retail (3) | Shanghai Automobile (8), Foodstuff (12), EdTech (6), Personal care products (4) | Guangdong Home appliances (9), Apparel (5), Logistics (1) | Hubei Retail (2), Personal care products (2) | Chongqing Agriculture (1), Logistics (1) | Shaanxi- Agriculture (1) |
| Beijing EdTech (10) | | Jiangsu Textiles (14), Communication & IT (6) | Shenzhen- Electronics (5) | Henan- Electronics (4), Food stuff (2) | Sichuan- Foodstuff (2) | |
| | | Fujian Apparel (9) | | | | |
| | | Zhejiang Toys (4), Household appliances (4), Furniture (5) | | | | |

Model Construction and Calibration

From the conceptual model, 5 major factors with 4 subfactors each can be derived, namely Government Policy (GP), Demographics (DG), Market Competition (MC),

Business Relations (BR) and Funding (Fu), giving a total of 20 items. All the variables are outlined in Table 2.

Table 2: List of Variables

| Government Policy (GP) | Demographics (DG) | Business Relations (BR) | Market Competition (MC) | Funding (Fu) |
|------------------------------|----------------------------|-------------------------|---|-----------------------------------|
| GP1: Open Door Policy | DG1: Upcoming middle class | BR1: Guanxi | MC1: Domestic Competitors | Fu1: Venture Capital |
| GP2: Forex Policy | DG2: Language | BR2: Trust | MC2: Market Access Restriction | Fu2: Private Equity |
| GP3: Tax Obligations | DG3: Innovation Management | BR3: IPR | MC3: Access to supply networks | Fu3: Self Organized Entrepreneurs |
| GP4: Regulatory Transparency | DG4: Digitized Society | BR4: Rising labor costs | MC4: Human resource and Political connections | Fu4: Tech-Startups |

The behavioral diagram (also called the directed graph) is prepared to represent the behavioral factors critical to the success of foreign entrepreneurs in terms of nodes and edges. Nodes will stand for the major factors (C_i) while the edges will show their interactions (f_{ij}). Figure 3 illustrates the behavioral factors and interactions amongst the 5 major factors C_1 C_2 C_3 C_4 and C_5 .

Table 3: Relative importance of factor f_{ij}

| Class description | Relative importance of Attributes | |
|--|-----------------------------------|------------------------|
| | F_{ij} | $f_{ji} = 10 - F_{ij}$ |
| Both factors are equally important | 5 | 5 |
| One factor is slightly important | 6 | 4 |
| One factor is very important over the other | 7 | 3 |
| One factor is most important over the other | 8 | 2 |
| One factor is extremely important over the other | 9 | 1 |
| One factor is exceptionally important over the other | 10 | 0 |

Similarly, Figure 4 shows the corresponding nodes and edges for the subfactors of the major factor GP. The nodes denoted C^1_1 C^1_2 C^1_3 and C^1_4 represent the subfactors GP1, GP2, GP3 and GP4 while the edges f_{ij} indicated the interdependencies among the subfactors that affect the success of foreign entrepreneurs in China.

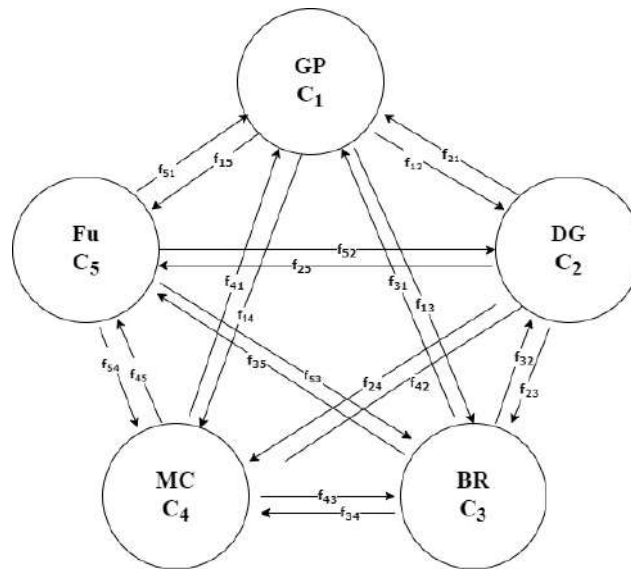


Fig 4: Behavioral digraph for one factor , Government Policy (GP)

Data Analysis

The above digraphs (Figure 3 and Figure 4) give a visual analysis of the relationships amongst the variables and are represented in equation 1 by a 5X5 matrix for the overall critical success factors (CSF) and 4X4 matrices represented in equations 2,3,4,5 and 6 for the sub-factors in each.

$$CSF = \begin{pmatrix} C_1 & f_{12} & f_{13} & f_{14} & f_{15} \\ f_{21} & C_2 & f_{23} & f_{24} & f_{25} \\ f_{31} & f_{32} & C_3 & f_{34} & f_{35} \\ f_{41} & f_{42} & f_{43} & C_4 & f_{45} \\ f_{51} & f_{52} & f_{53} & f_{54} & C_5 \end{pmatrix} \quad (1)$$

Where CSF is the Critical Success Factors index. C_i stands for the major factors (GP= C_1 , DG= C_2 , BR= C_3 , MC= C_4 , Fu= C_5) found on nodes of the digraphs and f_{ij} is the relative importance of the i th factor as compared to the j th which are shows as edges in the digraph.

$$\text{Permanent}(C_1) = \text{per}(\text{GP}) = \begin{pmatrix} C_1^1 & f_{12}^1 & f_{13}^1 & f_{14}^1 \\ f_{21}^1 & C_2^1 & f_{23}^1 & f_{24}^1 \\ f_{31}^1 & f_{32}^1 & C_3^1 & f_{34}^1 \\ f_{41}^1 & f_{42}^1 & f_{43}^1 & C_4^1 \end{pmatrix} \quad (2)$$

In equation 2 where $C_1^1, C_2^1, C_3^1, C_4^1$ stand for the subfactors GP1, GP2, GP3 and GP4.

$$\text{Permanent}(C_2) = \text{per}(\text{DG}) = \begin{pmatrix} C_2^2 & f_{12}^2 & f_{13}^2 & f_{14}^2 \\ f_{21}^2 & C_2^2 & f_{23}^2 & f_{24}^2 \\ f_{31}^2 & f_{32}^2 & C_3^2 & f_{34}^2 \\ f_{41}^2 & f_{42}^2 & f_{43}^2 & C_4^2 \end{pmatrix} \quad (3)$$

In equation 3 where $C_1^2, C_2^2, C_3^2, C_4^2$ stand for the subfactors DG1, DG2, DG3 and DG4.

$$\text{Permanent}(C_3) = \text{per}(\text{BR}) = \begin{pmatrix} C_1^3 & f_{12}^3 & f_{13}^3 & f_{14}^3 \\ f_{21}^3 & C_2^3 & f_{23}^3 & f_{24}^3 \\ f_{31}^3 & f_{32}^3 & C_3^3 & f_{34}^3 \\ f_{41}^3 & f_{42}^3 & f_{43}^3 & C_4^3 \end{pmatrix} \quad (4)$$

In equation 4 where $C_1^3, C_2^3, C_3^3, C_4^3$ stand for the subfactors BR1, BR2, BR3 and BR4.

$$\text{Permanent}(C_4) = \text{per}(\text{MC}) = \begin{pmatrix} C_1^4 & f_{12}^4 & f_{13}^4 & f_{14}^4 \\ f_{21}^4 & C_2^4 & f_{23}^4 & f_{24}^4 \\ f_{31}^4 & f_{32}^4 & C_3^4 & f_{34}^4 \\ f_{41}^4 & f_{42}^4 & f_{43}^4 & C_4^4 \end{pmatrix} \quad (5)$$

In equation 5 where $C_1^4, C_2^4, C_3^4, C_4^4$ stand for the subfactors MC1, MC2, MC3 and MC4.

$$\text{Permanent}(C_5) = \text{per}(\text{Fu}) = \begin{pmatrix} C_1^5 & f_{12}^5 & f_{13}^5 & f_{14}^5 \\ f_{21}^5 & C_2^5 & f_{23}^5 & f_{24}^5 \\ f_{31}^5 & f_{32}^5 & C_3^5 & f_{34}^5 \\ f_{41}^5 & f_{42}^5 & f_{43}^5 & C_4^5 \end{pmatrix} \quad (6)$$

In equation 6 where $C_1^5, C_2^5, C_3^5, C_4^5$ stand for the subfactors Fu1, Fu2, Fu3 and Fu4.

Permanent representation

The Jukart-Ryser formula used to mathematically explain the permanent function is illustrated in equation 7 as follows:

$$\left[\prod_{i=1}^5 C_i + \sum_i \sum_j \sum_k \sum_l f_{ij} f_{ji} f_{kl} f_{lk} + \sum_i \sum_j \sum_k \sum_l (f_{ij} f_{jk} f_{kl} f_{li} + f_{ij} f_{jl} f_{lk} f_{ki}) + \sum_i \sum_j \sum_k (f_{ij} f_{jk} f_{ki} + f_{ij} f_{ji} f_{ik} + f_{ij} f_{ji} f_{ik}) \right] \quad (7)$$

The permanent expression contains values of (n+1) grouping. Each factor has 4 subfactors, n=4, meaning there will be 5 groupings whose meaning is outlined as follows:

- The 1st group contains 1 term and represents the symbiotic relationships amongst the 5 major factors contributing to the success of foreign entrepreneurs in China, $C_1 C_2 C_3 C_4 C_5$.
- The 2nd grouping is absent because a self-loop does not exist in this model and was not depicted in the diagram
- The 3rd group has 2 terms and signifies two-factor interdependence (i.e., $f_{ij} f_{ji}$) together with the remaining drivers (i.e., 2 in this case)
- The 4th group has 3 terms of each and represents three-drivers interdependence (i.e., $f_{ij} f_{jk} f_{ki}$) together with the remaining drivers (i.e., 1 in this case)

- The 5th group has two subgroupings i) a set of 2 two factor interdependence (i.e., f_{ij}, f_{ji} and f_{lk}, f_{kl}) together with the remaining drivers (i.e., 0 in this case) ii) a set of 4 factor interdependencies (i.e. $f_{ij}, f_{jk}, f_{kl}, f_{ji}$ and $f_{li}, f_{ik}, f_{kj}, f_{il}$) and the remaining drivers which is also 0.

In light of this, using the resultant matrix and permanent value for Government policy is:

$$\text{Per (GP)} = \begin{pmatrix} 8 & 7 & 6 & 6 \\ 3 & 4 & 4 & 4 \\ 4 & 6 & 5 & 5 \\ 4 & 6 & 5 & 6 \end{pmatrix} \quad (2)$$

explained by:

$$= C_1^1 C_2^1 C_3^1 C_4^1 + (f_{12}^1 f_{21}^1 f_3^1 C_4^1 + f_{13}^1 f_{31}^1 C_2^1 C_4^1 + f_{14}^1 f_{41}^1 C_2^1 C_3^1 + f_{23}^1 f_{32}^1 C_4^1 C_1^1 + f_{24}^1 f_{42}^1 C_1^1 C_3^1 + f_{34}^1 f_{43}^1 C_1^1 C_2^1) + (f_{23}^1 f_{34}^1 f_{42}^1 C_1^1 + f_{24}^1 f_{43}^1 f_{32}^1 C_1^1 + f_{13}^1 f_{34}^1 f_{41}^1 C_2^1 + f_{14}^1 f_{43}^1 f_{31}^1 C_2^1 + f_{12}^1 f_{24}^1 f_{41}^1 C_3^1 + f_{14}^1 f_{42}^1 f_{21}^1 C_3^1 + f_{12}^1 f_{23}^1 f_{31}^1 C_4^1 + f_{13}^1 f_{32}^1 f_{21}^1 C_4^1) + (f_{12}^1 f_{21}^1 f_{34}^1 f_{43}^1 + f_{13}^1 f_{31}^1 f_{24}^1 f_{42}^1 + f_{14}^1 f_{41}^1 f_{23}^1 f_{32}^1 + f_{12}^1 f_{23}^1 f_{34}^1 f_{41}^1 + f_{14}^1 f_{43}^1 f_{32}^1 f_{21}^1 + f_{13}^1 f_{34}^1 f_{42}^1 f_{21}^1 + f_{21}^1 f_{24}^1 f_{43}^1 f_{31}^1 + f_{14}^1 f_{42}^1 f_{23}^1 f_{31}^1 + f_{13}^1 f_{32}^1 f_{24}^1 f_{41}^1).$$

Substituting the numerical values as per the matrix, the next step is to calculate the permanent value of government policy as a factor contributing to the success of foreign entrepreneurs

$$8 \times 4 \times 5 \times 6 + (7 \times 3 \times 5 \times 6 + 6 \times 4 \times 2 \times 6 + 6 \times 4 \times 4 \times 5 + 4 \times 6 \times 8 \times 6 + 4 \times 6 \times 8 \times 5 + 5 \times 5 \times 8 \times 4) + (4 \times 5 \times 6 \times 8 + 4 \times 6 \times 5 \times 8 + 6 \times 5 \times 4 \times 4 + 6 \times 5 \times 4 \times 4 + 7 \times 4 \times 4 \times 5 + 6 \times 6 \times 3 \times 5 + 7 \times 4 \times 4 \times 6 + 6 \times 6 \times 4 \times 6) + (7 \times 3 \times 5 \times 5 + 6 \times 4 \times 4 \times 6 + 6 \times 4 \times 4 \times 6 + 7 \times 3 \times 5 \times 4 + 6 \times 5 \times 6 \times 3 + 6 \times 5 \times 6 \times 3 + 7 \times 4 \times 5 \times 4 + 6 \times 6 \times 4 \times 4 + 6 \times 6 \times 4 \times 4) = 15\ 887.$$

Similarly, permanent values of other factors are calculated:

$$\text{Per (DG)} = \begin{pmatrix} 5 & 8 & 6 & 7 \\ 2 & 5 & 5 & 8 \\ 4 & 5 & 5 & 6 \\ 3 & 2 & 4 & 6 \end{pmatrix} = 18\ 195 \quad (3)$$

$$\text{Per (MC)} = \begin{pmatrix} 5 & 7 & 6 & 5 \\ 3 & 3 & 8 & 3 \\ 4 & 2 & 2 & 6 \\ 5 & 7 & 4 & 4 \end{pmatrix} = 11\ 256 \quad (4)$$

$$\text{Per (BR)} = \begin{pmatrix} 6 & 7 & 6 & 3 \\ 3 & 6 & 4 & 6 \\ 4 & 6 & 5 & 8 \\ 7 & 4 & 2 & 7 \end{pmatrix} = 13\ 306 \quad (5)$$

$$Per (Fu) = \begin{pmatrix} 5 & 7 & 8 & 2 \\ 3 & 4 & 4 & 4 \\ 2 & 6 & 7 & 5 \\ 8 & 9 & 5 & 9 \end{pmatrix} = 18\ 878 \quad (6)$$

These values further allow the calculation of the permanent index of the CSF as follows

$$CSF = \begin{pmatrix} 15887 & 7 & 6 & 7 & 5 \\ 3 & 18195 & 6 & 5 & 7 \\ 4 & 4 & 13306 & 5 & 4 \\ 3 & 5 & 5 & 11\ 256 & 5 \\ 5 & 3 & 6 & 5 & 18878 \end{pmatrix} = 8.17 \times 10^{20} \quad (1)$$

The computed index values of the critical success factors for foreign entrepreneurs are shown in Table 4. The index value of a specific factor shows the extent of its influence on the ability of foreigners to set up profitable businesses in China. Higher index values suggest that a factor has stronger impact on the outcome meanwhile a lower index value suggests relatively weaker impact of that factor.

Table 4. Permanent Index Values

| Critical Factor | GP | DG | BR | MC | Fu | TBV | TWV | CSF | TBV for CSF | TWV for CSF |
|-----------------------|--------|--------|--------|--------|--------|--------|-------|-----------------------|-----------------------|-----------------------|
| Permanent Index Value | 15,887 | 18,195 | 13,306 | 11,256 | 18,878 | 33,336 | 6,776 | 8.17×10^{20} | 4.11×10^{22} | 1.43×10^{19} |

In order to give meaning and allow for a sort of measurement the calculation of the theoretical best and worst value is necessary. It will also facilitate the estimation of the coefficient of similarity. The theoretical best value (TBV) of the permanent index value, equation 8, is obtained by making the inheritance of the subfactors have the best possible value (in this case 9).

$$\text{Theoretical best value for major factors} = \begin{pmatrix} 9 & 5 & 5 & 5 \\ 5 & 9 & 5 & 5 \\ 5 & 5 & 9 & 5 \\ 5 & 5 & 5 & 9 \end{pmatrix} = 33\ 336 \quad (8)$$

Meaning the highest possible value of any major factor hypothetically is 33 336.

The theoretical worst value (TWV) of the permanent index value, equation 9, is obtained by making the inheritance of the subfactors have the worst possible value, in this case 1.

$$\text{Theoretical worst value for all the factors} = \begin{pmatrix} 1 & 5 & 5 & 5 \\ 5 & 1 & 5 & 5 \\ 5 & 5 & 1 & 5 \\ 5 & 5 & 5 & 1 \end{pmatrix} = 6\ 776 \quad (9)$$

Meaning the lowest possible value of any major factor hypothetically is 6 776.

The coefficient of similarity on the three most important factors was computed. The co-efficient of similarity with best value of a factor connotes the intensity of that factor with the success of foreign entrepreneurs in China Mainland. It is calculated in equation 10, to find how critical these success factors are in comparison to each other as follows:

$$K'_{si} = \frac{W_{ij} - C_{ij}}{W_{ij} - B_{ij}} \quad (10)$$

Where B_{ij} is the best theoretical value

C_{ij} is the permanent index value

W_{ij} is the theoretical worst value

K'_{si} is the co-efficient of similarity compared with the worst value

$$K_{si} \text{ for Funding factor} = \frac{6776 - 18878}{6776 - 33336} = 0.46 \quad (10a)$$

$$K_{si} \text{ for Demographics factor} = \frac{6776 - 18195}{6776 - 33336} = 0.43 \quad (10b)$$

$$K_{si} \text{ the Government Policy} = \frac{6776 - 15887}{6776 - 33336} = 0.34 \quad (10c)$$

Measured on a scale of 0-1, a smaller value shows a weaker intensity of the relationship while a higher value shows a stronger one. This implies that the intensity of the factor F_u , equation 10a, is more critical ($K_{si}=0.46$) to the success of foreign entrepreneurs than that of demographics ($K_{is}=0.43$) although the degree should be noted as small.

Most of the variables presented index values that are closer to the best value than the worst value indicating that the level of influence the factors chosen is above average and their influence on the business outcomes of foreign entrepreneurs is significant.

Findings and Discussion

The CSF index of 8.17×1020 out of a possible 4.11×1022 shows how important the factors chosen for this study are to the success of foreign-owned businesses setting up shop in China Mainland. The critical success index value is closer to the best value than the worst value also indicating the factors chosen have a significant though not absolute influence on the success of foreign entrepreneurs.

Main Findings

The most critical success factor for foreign entrepreneurs in China is determined to be Funding (F_u : $PI = 18\,878$), confirming earlier studies (Blachman, 2018; Bo, 2019). Some of the most lucrative foreign owned businesses are actually technology companies which have a tremendous amount of government support in terms of capital and preferential treatment (Bo, 2019; Deloitte, 2017). This result is replicated in the coefficient of similarity ($K_{si}=0.46$). Access to financial capital is therefore the most critical success factor that influences the activity of foreign entrepreneurs in China. While self-organized entrepreneurship is common amongst foreign entrepreneurs in China, (Deloitte, 2017) notes that should a venture be started without at least 1 million RMB, this startup runs the risk of hemorrhaging cash and failing with 3-5 years. This means financial resources are

extremely crucial for foreign entrepreneurs because they cannot easily attain loans and credit instruments from Chinese banks and institutions.

The next most important factor is are the Demographic profile of the country (DG: PI= 18 195) followed by the Government Policies (GP: PI= 15 887). These results stand to back the trends that have been observed by (Goodman, 2008) who described the lucrative large population and wealthy upper- and middle-class consumers that make China such an alluring market to capture. China's population is largely modernized now and has been described as being tech-savvy. Understanding the populations dynamic wants, needs and expectations for products, services and organizational conduct and policies will make firms more attractive to consumers and gain them an advantage over others. And this integration of the Chinese style of service and product delivery, must not be just on face value, it must run throughout the organization, because in China, culture matters (Stoermer, Hildisch, Froese, & Tung, 2016). The central government's recent policies to boost international trade through the BRI and domestic innovative companies also shows how national strategy is bringing about opportunities for foreign entrepreneurs. This supports (Woetzel et al., 2014) who states that the 'most powerful shaping forces' in the business sector in China are government policies and the attractiveness of a huge wealthy population.

One crucial interdependency brought out in this study was that Funding, which has the highest index value, is actually a result of government policies. According to (Deloitte, 2017), government efforts to develop certain geographic regions is the driving force behind funding for foreign entrepreneurs in certain cities and industries including agriculture, software and integrated circuit industries, transfer of technology and environmental enterprises. Even non-government income sources for entrepreneurs such as crowdfunding, venture capital and private equity are all heavily regulated by the central government and state controlled financial institutions. It is only through Government policy that Funding can be attained. This means Government Policy, which drives Funding, is the most crucial factor.

The factors with the lowest index values, Market Competition (13 306) and Business relations (11 256) have little yet still significant influence on the success of foreign entrepreneurs. As more Chinese companies build strong brands that can rival foreign companies, the market has slowly been leveled out, making an almost fair chance to any entrepreneur to capture their customers, if only they can maintain an exceptional level of. Furthermore, market competition has been leveled out over the years and foreign firms have lost that asset of foreignness (Ikegami et al., 2017). Now, product and service quality must appeal to consumers more than other brands to gain a competitive advantage, which requires foreign firms to better understand the market demographic and serve them better. Meanwhile as much of China's business is conducted via the internet and business trading platforms, the versatility of personal relations is slightly diminished and the absence therefore may not be detrimental to business dealings. Therefore, in this digital age, the role of guanxi and social capital still exists but is less and less apparent.

Practical Implications

The authors expect this research to inform on the critical success factors and to explore the exact nature of these factors and their interdependencies. It is clear that not all aspects of the economy or institutional framework have the same amount of influence on the business environment. Looking back, the main contribution of the paper was to find out market entry for foreigners in China remained difficult. With Funding and Government policies coming out on top, it is imperial that entrepreneurs align their businesses, innovations and creations according to ongoing national strategies and policies. This can help not only to receive special considerations, build much needed vertical ties but will also avoid unpredictable and sudden policy changes that may work against the entrepreneurs. Much of the government strategies for business and entrepreneurs is available publicly sometimes in English but mostly in Chinese. Aspiring and current entrepreneurs looking to enter or further penetrate the Chinese market are encouraged to use this research to better understand their options and gain competitive advantage, meanwhile not taking the CSFs into considerations may hinder growth of their ventures.

Decision-makers and entrepreneurs can get direction from the findings stated here and frame informed plans and business tactics to consider these factors. These critical success factors are not only helpful for identifying the best course of action but also to help choose the industries to enter as well as how best to ameliorate current business practices. As China becomes a battleground where innovative entrepreneurs fight for market share, entrepreneurs should build highly specialized skills and products and services that can rival not only domestic offerings but also other foreign counterparts. The Government Policies are geared towards recruiting top tier talent while Funding and Demographics will be drawn towards new products and brands that exhibit exquisite craftsmanship in quality, design, offering and delivery. Entrepreneurs who need Funding, that is technology entrepreneurs and self-organized entrepreneurs must enter the STEM fields to benefit from tax holidays and business incubation and acceleration programs. They must also choose cities that can offer them skilled talent and access to other government funded programs and VCs. In summary, there are countless opportunities that have been offered to foreign entrepreneurs and in this paper an outline of what factors can be exploited to take full advantage of these opportunities are explained.

Conclusion

Notwithstanding its impressive economic development, China is still a transitional economy, as it is arguably still moving from a position where few market supporting institutions existed. Thus, it may still be problematic to apply management approaches from advanced Western countries in China. Most foreigners in China yearn to capitalize on the enabling business environment to actualize their business ideas by building new companies or enterprises, but obstacles constrain them daily. Despite the challenges, there are other major success factors promoting foreign entrepreneurship. Perhaps the challenges are not what to expect but the persistent efforts by entrepreneurs to rise out of all odds through the success factors. The findings of the study have revealed numerous factors influencing the foreign entrepreneurial front. These factors seem to be cutting across all forms of entrepreneurship. Finally, what are the critical success factors for foreign entrepreneurs doing business in China? Evidence from literature and established entrepreneurs (experts' opinion) points to the government policies of China, funding

opportunities and demographic make-up of the population present the strongest influences.

Therefore, to create a genuine enterprise in China and enhancing the influencing factors of foreign entrepreneurs, new and growing businesses need to consider government policies on entrepreneurship, access to finance and the demographic structure of the populace. Particularly, Government policies actively promoted new and growing entrepreneurial firms with funding for new and growing companies that focus on prioritized portfolios. Entrepreneurs can carefully navigate these factors to get the niche market they can flourish in. Within these factors it was found that establishing startups in government supported and funded industries such a technology, targeting products for upper- and middle-class consumers, locating within 1st and 2nd tier cities and taking advantage of online business will give foreign entrepreneurs the greatest opportunities.

Limitations and areas for further study

This study outlined 20 factors that influence the entrepreneur's establishment in China. China has one of the biggest economies and has much potentials for foreign entrepreneurs as such it makes it significant for research study of this kind. It is entirely possible that there are other factors that were not accounted for, because the experience of each entrepreneur is different. Future research may consider more subfactors and major factors, subsystems that can consider more factors and develop a more comprehensive model. The use of GTMA in this study shows the efficacy of combinatorial mathematics in understanding complex social issues. Going further, research can make us of simulation models such and agent-based modelling or systems dynamic to better understand the behavioral patterns of foreign entrepreneurs in China, and add to the research on transnational entrepreneurs.

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Original Research

Analysis of the Effect of Competitive Intelligence on Strategic Decision Making in Small and Medium-Sized Food Enterprises

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Abstract

The main goal of this study was to analyze the relationship between competitive intelligence (CI) and strategic decision-making and its six aspects such as quality, agility, flexibility, integration, effectiveness and efficiency in small and medium-sized food enterprises in Iran. This was an empirical study in which we searched to prove that competitive intelligence elevates the process of managing and making important decisions to a higher level. In this study, a conceptual model was developed to demonstrate the effect of CI on strategic decisions. The statistical population estimated at 90 senior managers from top small and medium-sized food enterprises in Iran, and based on the Cochran formula, the sample of this research included 73 managers of the SMEs in Iran food industry. We used factor loading, path analysis, t-value, and Probability value (p-value) to analyze the data. The study's results indicated that CI could help with strategic decisions and significantly affect considered strategic decision's sides. Based on the t-value's findings, CI had the most impact on the quality, flexibility, and effectiveness of the strategic decision-making, 15.139, 12.868, and 11.641, respectively. Therefore, CI acts as a support system to develop strategic decisions.

Keywords: Competitive intelligence, Strategic decision making, Efficiency, Food enterprises.

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Introduction

Novel products and services are increasing in the market, and organizations should be agile to such dynamic changes on the market (Elbanna, 2018). In order to develop and be innovative in this highly competitive global market, managers need to make rapid and valid strategic decisions (Hlavatý & Ližbetin, 2021). The development and survival of an organization are contingent on sufficient related information that leads to correct strategic decisions (Afolayan & de la Harpe, 2020).

Top managers who are known as organization's strategists are responsible for the success of their company for an extended period as well as satisfying their stakeholders. Since strategic decisions result in the future, organizations need professional and competent managers (Hlavatý & Ližbetin, 2021). One of the most critical scopes of today's management is making strategic decisions, which produces an outstanding contribution to obtain success and preserve the company of current and potential competitors, and that is why there is an emphasis on the vital role of management and the process of strategic decision-making (Papulova & Gazova, 2016). Strategic decisions trigger other company choices and activities that influence the company's path, and they are also crucial in integrating the company's many activities and allocating resources (Luffman et al., 1996).

Strategic decisions are long-term unique organizational decisions connected with a great deal of data and actions, and it is one of the essential responsibilities of top managers because its outcome affects the company's future direction. (Aghaei & Asadollahi, 2013). The view of Strategic forecasting is to use practical approaches to forecast changes and their effects on an organization's strategies and decisions and take the lead in the dynamic environment, and this is feasible by scanning and observing the new events and changes that happened in the market and environment (Vecchiato & Roveda, 2010). The fundamental question is how decision-makers and managers prepare themselves and their organizations for the coming future and changes. Generally, managers are individuals who develop organizational strategies and consider their long-term results. Besides, they meet the organizational goals and fulfill its mission by sharing responsibilities and managing the alterations. The speed of changes is too high that business survival is contingent on the higher level of strategies and decisions as well as a broader range of abilities and approaches to deal with the external dynamic market (Buehring & Bishop, 2020; Desmet et al., 2015). Moreover, Effective decisions in different managerial conditions have a substantial and decisive influence on management activities and an organization's development and success in domestic businesses' operation (Bushovska et al., 2019).

Rousseau (2018) stated that a wide range of reliable and accurate information is necessary for improving the quality of decisions. Therefore, supportive tools play a crucial role in developing strategic decisions. Competitive intelligence (CI) gathered the maximum amount of the latest information about a determined subject, which is the primary technical purpose of CI. Moreover, this intelligence creates long-term strategies rather than imitate competitors' strategies (Domashova & Zasyapkina, 2021). Therefore, CI is a decisive factor in altering the initial data to helpful information contributing to strategic decision-making (Stefanikova et al., 2015). Hence, organizations can be more

successful in attracting customers, improving engaging employees, and developing their performance that uses competitive features such as CI (Köseoglu et al., 2021). Competitive intelligence has three main steps, including data gathering, processing, and storing data that individuals in different levels of an organization have access to such information. In addition, CI helps individuals form the future of their organization and preserve it from competitive threats. Such data is related to competitors, suppliers, customers, technologies, and the environment (Negash & Gray, 2008).

Nowadays, organizations face too much information and data; this considerable amount of information is not sufficient for success in this competitive world. So, the vital matter and practical approach are about using this data and information intelligently and correctly in making decisions. Strategic decision-making is sophisticated and entails reliable and the latest information. As a result, it is imperative to have solutions and tools that make data administration easier and accelerate the process (Silva et al., 2019). Moreover, increasing the volume of data riddled with unreal news gives organizations extra and inefficient data that cause misleading (Lazer et al., 2018). Also, a drastic split is observed between the data used to make decisions and the amount of data senior managers receive. The issue is that this split has not reduced over the recent years (Global, 2019). As a result, organizations encounter more challenges in making high-quality strategic decisions. Hence, organizations' operations are becoming more complex, so firms' lifespan decreases (Madureira et al., 2021). CI is used to support organizations to make efficient decisions in order to develop and maintain their performance as well as increase organizations' lifespan (de Almeida et al., 2016; López-Robles et al., 2019; López-Robles et al., 2020).

The food industry is a competitive and turbulent market in Iran and other countries. Hence, organizations and managers need to monitor the products in the market, their rivals' activities, and market risks to be able to make better decisions and develop their performance. Competitive power is the backbone of companies' survival and maintaining this power needs useful data and information. CI provides managers with useful data to improve the process of making a decision. Thus, organizations will be able to recognize their competitors and detect their weaknesses and strengths to choose optimal strategies and overtake their rivals. Hence, this research has considered CI as a valuable and supportive tool for making better strategic decisions in several specific aspects. Since competitive intelligence is a discipline that seeks to obtain accurate and up-to-date information and acts as a supportive tool for strategic decisions, it can lead organizations and companies to analyze external and internal settings more accurately and quickly. They can also store and use these beneficial results in making decisions. This action can accelerate the interaction of transferring data and knowledge at different levels of an organization. Therefore, it improves the effectiveness of strategic thinking, making decisions, and planning to a significant extent. Accordingly, the primary objective of this study is to investigate whether CI can improve strategic decisions by developing six considered aspects. According to the peruse through previous pertinent studies to CI and strategic decision-making, it is a new sight into the relationship between competitive intelligence and making strategic decisions, and it is considered an aspect in the food industry.

Literature Review

Trunk et al (2020) have investigated the effect of artificial intelligence on the quality of strategic decisions alongside human decision-makers. The findings indicate that decision-makers should translate the results of AI instead of controlling it, and the view to AI is related to individuals' overview. Therefore, both AI results as a supportive tool and human responsibilities are needed for improving strategic organizational decisions.

Meissner et al (2021) have investigated the effect of anger on the process of making strategic decisions. Since anger is one of the most frequent feelings that effects on individuals' thoughts and decisions, it is essential to focus on the effect of this factor on organizational decisions. The findings indicate that anger affects the quality of strategic decisions. However, it does not affect the speed of decisions.

Prange (2020) defines agility as a rapid and flexible item in making a decision. This study has designed a conceptual model of agility transformer to develop the idea of strategic agility through perpetuity factors such as merging flexibility, slowness, and reflection in an uncertain setting. This model determines three levels; including, resilient, versatile, and transformational, for agility to improve the process of making decisions.

Elali (2021) in a study entitled "The Importance of Strategic Agility to Business Survival during Corona Crisis and beyond" investigated the vital role of strategic agility in Covid-19 Unexpected occurrences, like the Covid-19 outbreak, occurred in this tumultuous market and environment, overshadowing corporate success. Therefore, organizations must take concrete deliberated steps in the market, make agile decisions and define agile strategies, and adapt their strategies and approaches to the new situation to survive their business from failure. The findings indicate that strategic agility can develop organizations' performance, leading businesses to succeed in uncertain conditions.

Aghaei & Asadollahi (2013) have analyzed the effect of BI on some aspects of strategic decisions, such as quality, efficiency, integration, etc. The results indicated that BI could develop the integration of strategic decisions, and it suggested that organizations use integrated resources to make such decisions.

Bushovska et al (2019) have focused on developing managements decisions under uncertain circumstances and increasing their effectiveness. The improvement and adjustment of strategic decisions are contingent on managers' performance, and if they operate efficaciously in different managerial situations, they will be successful in making effective decisions and domestic businesses. Therefore, it is vital to creating the approaches to develop the effectiveness of strategic decision-making to support organizations of risks and threaten markets.

Netz et al (2020) in a study entitled "Business Disruptions and Effective Reactions: A Strategic Perspective as Action in Rapid Strategic Decision Making" examined the work of managers in making swift strategic decisions under intense time pressure. Focusing on effective responses as behavioral responses to business disruptions caused by unforeseen events, the strategic vision as an action using quantitative and qualitative data sets

collected from 39 sites in a corporate environment over three consecutive stages over a while. The data shows two types of patterns: intensity-focused and type-focused emotional reactions to management teams' use of management tools as part of mental shortcuts during rapid decision-making. These patterns depend on whether the teams have acted in areas with previous experience managing similar unforeseen events. Effective responses to the use of tool-based mind shortcuts reveal the mechanism of action that explains the strategic actions of middle management teams during a business disruption due to an unforeseen event. While research mainly shows that the impact on management teams in crisis-related areas is "bad," the results show that this view is misleading. Emotional reactions prevent it and help vital exchange information between middle management teams and company levels while making strategic decisions under intense time pressure. Therefore, a redefined perspective of rapid strategic decision management is proposed, and the concepts of theory and practice are discussed.

Treffers et al (2020) have investigated the impact of emotions and time limitation on two managers' tasks: making decisions in generating ideas and choosing the strategy. The results show that happy managers, under more time limitations, generated fewer main strategic ideas, which are not much feasible, and it seems that they produce worse strategic choices. While, in comparison with managers in the defused situation having minor time limitations, sad managers with high time limitations have effective main strategic choices. As a result, time and emotion restrictions have a common effect on different aspects of quality in various tasks such as strategic decision making.

Liu et al (2021) have considered two main issues in the high-level decision-making literature: the CEO's influence and the top management team. Using ethnographic video data of the two top management teams in making decision sessions, patterns of interaction between CEOs and members of the top management team are discovered. Twenty topic discussions identify five "forms," a team-level structure that explores the core dynamics of the relationship through the influence of co-CEO-senior management team members during the discussion, which is related to a strategic topic. It is created, acquired. It also explains how the forms are revealed and their consequences for the top management team's strategic decision processes and their results. Then explain how the findings contribute to the top management team literature and higher levels and our understanding of team policy.

Dukić et al (2016) have analyzed the role of business intelligence (BI) on operational and strategic decisions in the changeable world and time limitation. The study's result shows that using BI positively affects the efficiency of decisions by reducing dormancy and increasing the efficiency of an organization's profits, its success, and a better outlook market's threats and chances.

Adidam et al (2012) have investigated the effect of competitive intelligence and the firm's performance in emerging markets in the Indian industry. The results demonstrate a positive relationship between competitive intelligence and firms' financial performance in two levels. Indian firms that use higher levels of CI have better performance, and Indian firms that use the present level of CI have a delicate operation.

Appiah-Adu et al (2001) in a research entitled "Marketing effectiveness and business performance in the financial services industry", has investigated the relationship between effective marketing and the performance of organizations in the finance industry, and data was collected from 52 banks. This study investigated different dimensions of effective marketing on profit, growth, and customer performance. The result indicated that several aspects including, the philosophy of customers, the efficiency of operation, the information of marketing, and its integration, can have a positive and meaningful effect on the performance of the business.

Ranjan & Foropon (2021) have studied that organizations have begun to use big data and novel technologies to a significant extent to analyze and obtain valuable insights through the decision-making process over recent years. Moreover, the permeability and liberation of considerable data potential and technics are dominant elements of competitive intelligence and strategies. In this study, researchers have surveyed the usage of big data in competitive intelligence by dealing with extensive data analysis. This study's results indicated a ratio of the concentrated informal process to a formal structure (process) in competitive intelligence.

Material and Methods

In terms of purpose, this study was in the field of applied research and the method of this study was quantitative. This research used two underlying statistical analysis for structural equations: 1. factor loadings and path analysis 2. T-value test. We used factor loading to analyze the accuracy of statements, path analysis to determine the strength of variables' relationship, t-value, and Probability value (p-value) to analyze the research hypotheses. LISREL, PLS, and SPSS software were used to analyze the data.

The statistical population(N) of this research was senior managers of the best enterprises operating in Iran's food industry, which was estimated at 90 people. The criterion for selecting these enterprises were the number of enterprises' employees, the number of their brands and products, their market share, and their leading position in the market. According to the Cochran formula, the sample size(n) was equivalent to 73. In the process of calculating the statistical sample based on this formula, p (estimated proportion of the population) and q (1-p) were considered 0.5, the amount of $Z_{\alpha/2}$ at 0.05 confidence level was 1.96, and e (margin of error) was equivalent to 0.05. Our statistical population's demographic profile has been divided based on their age, level of education, and years of work experience, and the demographic data analyzed through SPSS software that provided us with pie charts and figures based on managers' profiles.

The sampling method in this study was simply random, and a questionnaire was designed by google form and because of the Corona Virus Pandemic, the questionnaire was distributed among the managers of small and medium-sized enterprises through their emails, and they responded to the questions based on Likert five scales method. The research had two questionnaires. The first one was related to competitive intelligence and was a standard questionnaire. It was designed based on Nwokah and Frannces' (2009) research questionnaire in which they studied five sides of competitive intelligence, including marketplace opportunities, competitor threats, competitive risks, core assumptions, and vulnerabilities. Cronbach Alpha was used for analyzing the reliability

of the questionnaires in SPSS statistical software. According to the amount of Cronbach Alpha Coefficient, the reliability of competitive intelligence was 0.79 and since this value was higher than 0.7, the reliability was accepted. We use confirmatory factor loading to investigate this variable. The second questionnaire was pertinent to strategic decision-making and its aspects. The reliability of these variables based on the Cronbach Alpha Coefficient was 0.87. The second questionnaire was researcher-made, and the validity of questions was determined through most cited publications and experts' opinions. We distributed the questions among nine experts in the field of management and business, and according to the Content Validity Index (CVI), the validity of questions was calculated at 0.77, which is more than the acceptable value (0.75) for nine people. Structural equations used to analyze the effect of competitive intelligence on determined sides of strategic decisions through path analysis and t-value

Competitive intelligence data has been analyzed by confirmatory factor loadings in LISREL software. Factor loading was used to analyze the compatibility and correlation of competitive intelligence and its factors, which was the research independent variable. Factor loading of confirmatory is from zero to one. If the factor is less than 0.3, the relationship is considered weak and ignored. The factor loading between 0.3 and 0.6 is acceptable, and if the factor is more than 0.6, the relationship or outcome is optimal (Hulland, 1999). Structural equation modeling is used for investigating the role of competitive intelligence on strategic decisions and their considered aspects.

The pertinent data to strategic decision and mediator variables are analyzed by factor loading and path analysis in PLS statistical software. "Path analysis is a statistical technique used primarily to examine the comparative strength of direct and indirect relationships among variables" (Lleras, 2005). The amount of this statistical analysis is between -1 and +1. The positive value describes the direct impact, and the negative value is defined as versa direction. And, the closer the value of variables is to 1, the more the changes affect each other. Composite Reliability (CR) was used to analyze the construct reliability of strategic decision's aspects and, Average Variance Extracted (AVE) was used to analyze the convergent validity of the construct.

One of the outcomes of PLS software is T values (Z score) that are used for research hypotheses testing. The amount of t-value must be more than 1.96 and at 95% confidence reliable level to be acceptable and the hypotheses will confirm. Also, the p-value is used for testing hypotheses and the amount of p-value must be less than 0.05 to be acceptable.

The conceptual model of this research was designed based on the conceptual model of (Aghaei & Asadollahi, 2013) research. In the mentioned study, business intelligence operates as a supportive system for making organizational decisions. In the current model of this study, competitive intelligence is the independent variable, and strategic decision-making is the dependent variable. It is appointed to analyze the effect of competitive intelligence on quality, agility, flexibility, integration, effectiveness, and efficiency, which are the mediator variables of this study. Investigating these six variables indicates the relationship between competitive intelligence and strategic decision-making.

The conceptual model of this research (the effect of competitive intelligence on the strategic decision) is illustrated in figure (1).

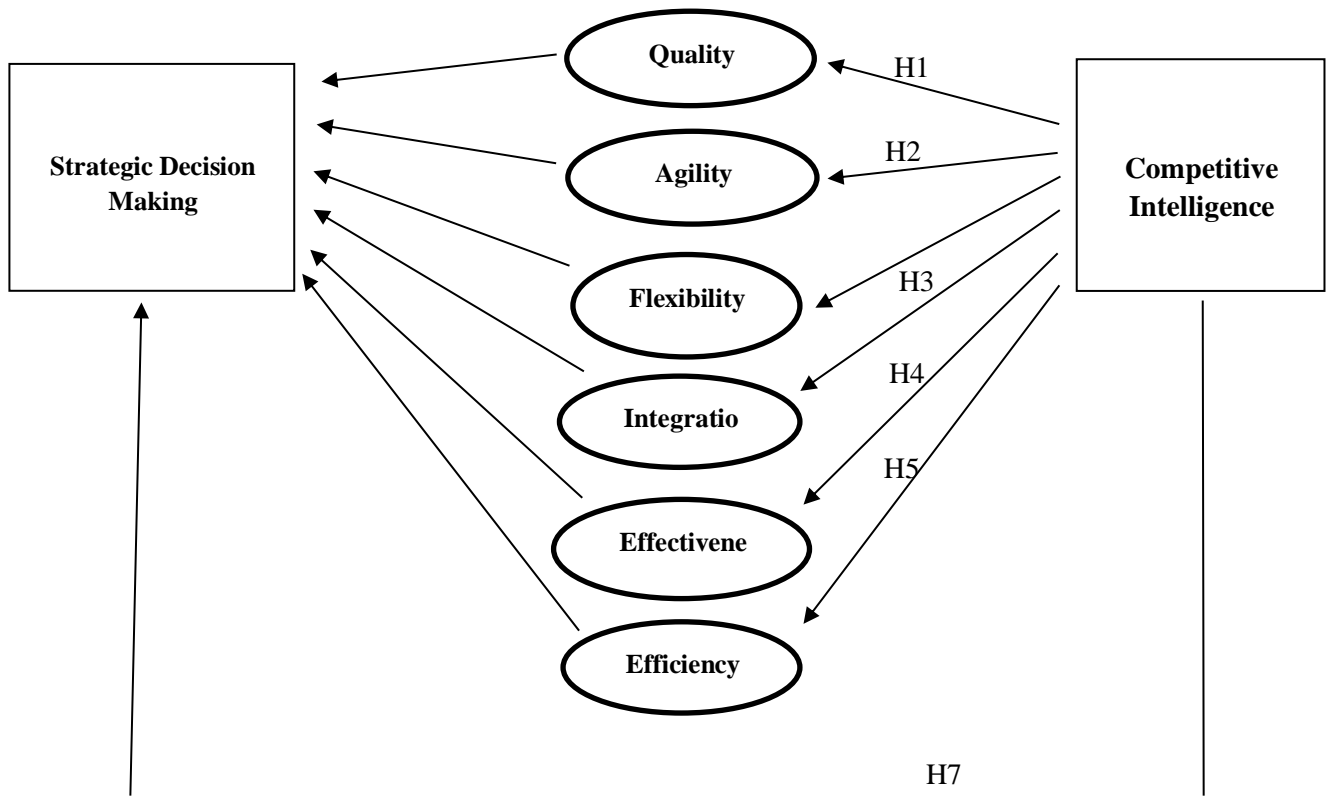


Figure (1). Conceptual model of research (Aghaei & Asadollahi, 2013)

According to the conceptual model of research and the relationship between variables, the research hypotheses are:

1. Competitive Intelligence improves the quality of strategic decision making.
2. Competitive Intelligence improves the agility of strategic decision making.
3. Competitive Intelligence improves the flexibility of strategic decision making.
4. Competitive Intelligence improves the integration of strategic decision making.
5. Competitive Intelligence improves the effectiveness of strategic decision making.
6. Competitive Intelligence improves the efficiency of strategic decision making.
7. Competitive Intelligence improves the strategic decision making.

Results

The factor loading of analyzing different statements of competitive intelligence is illustrated in Figure (2).

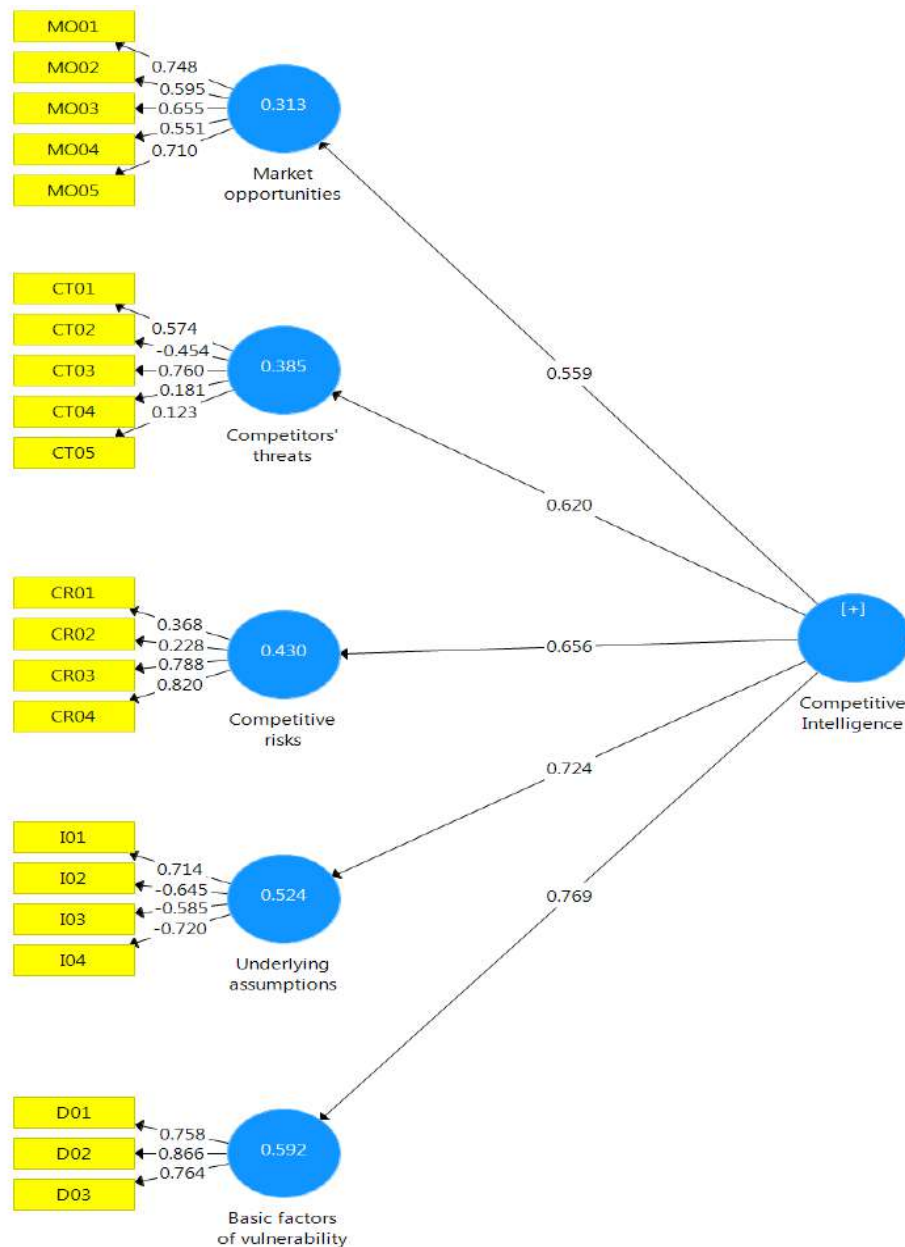


Figure (2). Competitive intelligence Confirmatory factor analysis

The factor loading relates to the impact of an observable variable on a latent variable. The strength between these two variables indicates by factor loading, which is from zero to one. The items which have minus factor loading will be omitted. There is no limitation to keep measured things that are under 0.3. However, the value and reliability of these items are not high. Thereby, the items with below 0.3 factor loading will be deleted. The factor loading between 0.3 and 0.6 is acceptable, and if the factor is more than 0.6, the relationship or outcome is optimal. We analyzed competitive intelligence through five factors, which were marketplace opportunities, competitor treats, competitive risks, core assumptions, and vulnerabilities. According to the findings of factor loading analysis, the amount of factor loading of measured items was more than 0.6 and indicated the optimal relationship of this variable. The value of two statements, underlying assumptions, and

essential vulnerability factors, were more than others that displayed the more powerful impact.

The factor loading of each measured item is depicted in the table (1).

Table (1). The factor loading of measured items in competitive intelligence

| Row | Competitive intelligence dimensions | Factor loading | Questions | Factor loading |
|-----|-------------------------------------|----------------|-----------|----------------|
| 1 | Marketplace Opportunities | 0.559 | Q1 | 0.748 |
| 2 | | | Q2 | 0.595 |
| 3 | | | Q3 | 0.655 |
| 4 | | | Q4 | 0.551 |
| 5 | | | Q5 | 0.710 |
| 6 | Competitor Treats | 0.620 | Q5 | 0.574 |
| 7 | | | Q7 | 0.754 |
| 8 | | | Q8 | 0.760 |
| 9 | | | Q9 | 0.181 |
| 10 | | | Q10 | 0.123 |
| 11 | Competitive Risks | 0.656 | Q11 | 0.368 |
| 12 | | | Q12 | 0.228 |
| 13 | | | Q13 | 0.788 |
| 14 | | | Q14 | 0.820 |
| 15 | Core assumptions | 0.724 | Q15 | 0.714 |
| 16 | | | Q16 | 0.645 |
| 17 | | | Q17 | 0.585 |
| 18 | | | Q18 | 0.720 |
| 19 | Vulnerabilities | 0.769 | Q19 | 0.758 |
| 20 | | | Q20 | 0.866 |
| 21 | | | Q21 | 0.764 |

It is evident that the factor loadings of all measured items were more than 0.3. As a consequence, the results were acceptable. Only three questions of 21 pertinent questions to competitive intelligence were below 0.3. Nevertheless, the total factor loading was above this value.

Strategic decision-making analysis its results

We analyzed the correlation between aspects of strategic decisions and their pertinent questions via using confirmatory factor loading. The amount factor loadings of observable (measured items) and latent variables are depicted in table (2).

Table (2). The factor loadings of observable and latent variables

| Row | Aspects of strategic decisions | Questions | Factor loading |
|-----|---------------------------------------|-----------|----------------|
| 1 | Quality of strategic decision | Q1 | 0.856 |
| 2 | | Q2 | 0.853 |
| 3 | | Q3 | 0.826 |
| 4 | | Q4 | 0.837 |
| 5 | | Q5 | 0.785 |
| 6 | The agility of strategic decision | Q5 | 0.793 |
| 7 | | Q7 | 0.811 |
| 8 | | Q8 | 0.813 |
| 9 | | Q9 | 0.715 |
| 10 | The flexibility of strategic decision | Q10 | 0.740 |
| 11 | | Q11 | 0.756 |
| 12 | | Q12 | 0.806 |
| 13 | | Q13 | 0.732 |
| 14 | Integration of strategic decision | Q14 | 0.635 |
| 15 | | Q15 | 0.675 |
| 16 | | Q16 | 0.666 |
| 17 | | Q17 | 0.888 |
| 18 | Effectiveness of strategic decision | Q18 | 0.827 |
| 19 | | Q19 | 0.830 |
| 20 | | Q20 | 0.795 |
| 21 | The efficiency of strategic decision | Q21 | 0.700 |
| 22 | | Q22 | 0.651 |
| 23 | | Q23 | 0.857 |
| 24 | | Q24 | 0.887 |

It is evident that all measured items in all pertinent questions to the sides of strategic decisions were higher than 0.3. Therefore, the impact of observable and latent variables was acceptable.

The path analysis of the relationship between dependent and independent variables is illustrated in figure (3).

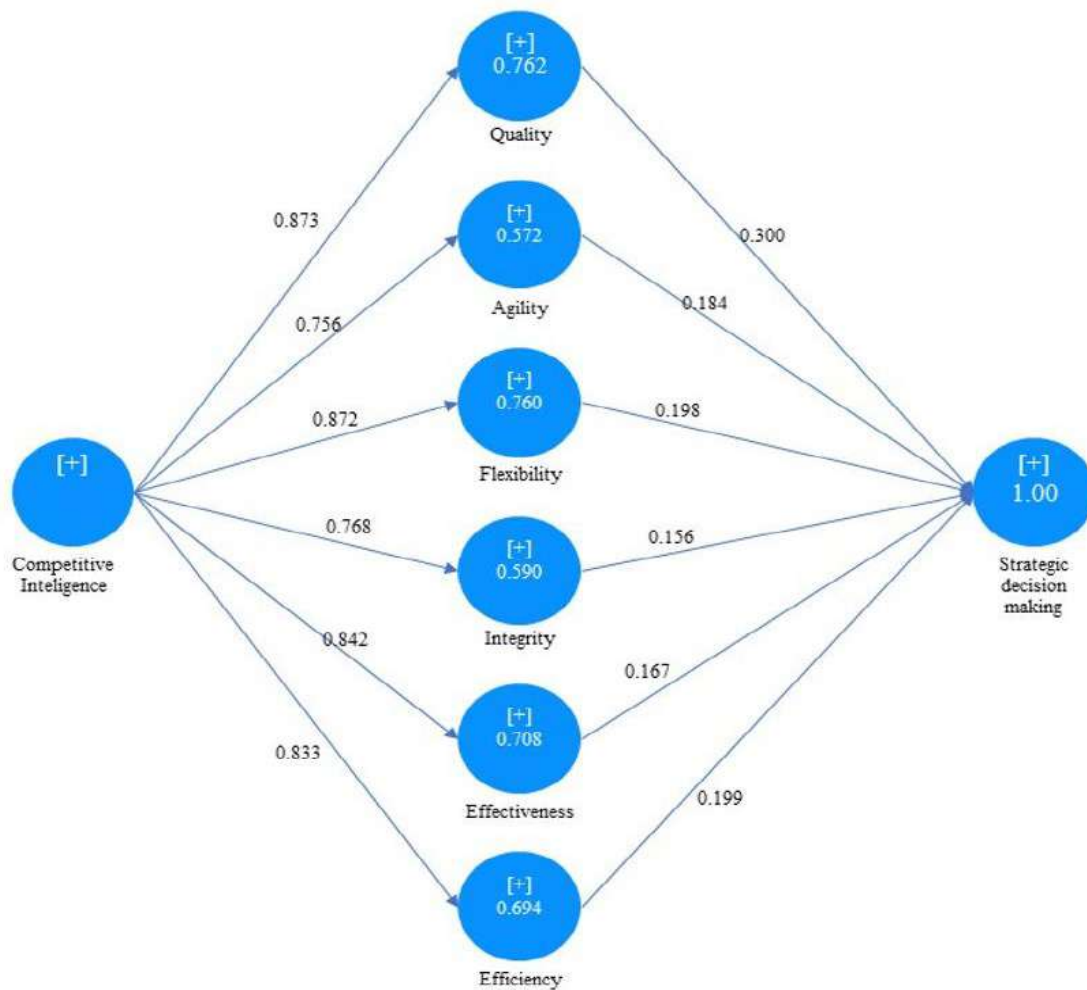


Figure (3). The path analysis of the dependent and independent variables

Path analysis is used to determine the direction and intensity of the relationship between variables. The amount of all measured items was positive so that indicated a direct relationship. And, the intensity of the relationship between variables that their path analysis value was closer to 1 was higher.

Analyzing Composite reliability and Convergent validity

The composite reliability factor used for analyzing composite reliability as well as average variance extracted (AVE) was used to analyze the convergent validity of the research model.

The outputs of analyzing these data are demonstrated in the table (3).

Table (3). Composite reliability and Average Variance Extracted outputs

| Latent variables | composite Reliability $\alpha \geq 0.7$ | average Variance Extracted $AVE \geq 0.5$ |
|------------------|--|--|
| Quality | 0.918 | 0.891 |
| Agility | 0.944 | 0.796 |
| Flexibility | 0.844 | 0.758 |
| Integration | 0.811 | 0.753 |
| Effectiveness | 0.858 | 0.753 |
| Efficiency | 0.860 | 0.833 |

The bar figure (4) gives information on the Average Variance Extracted.

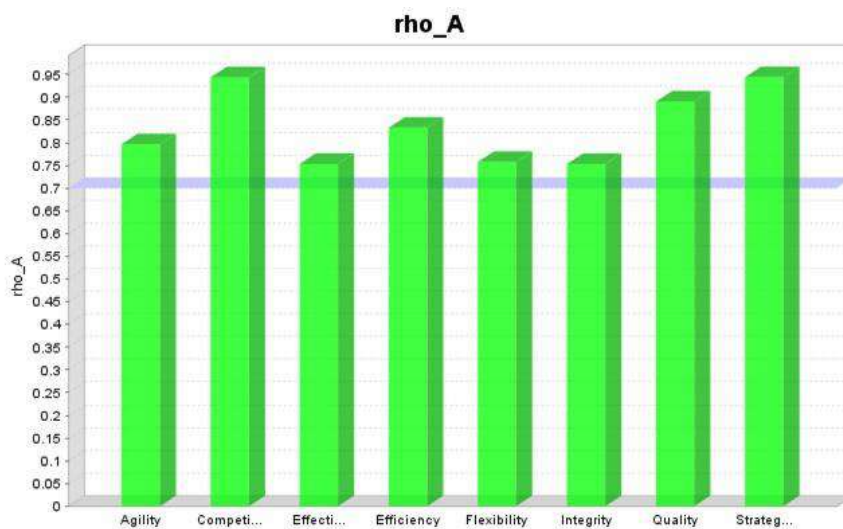


Figure (4). Average Variance Extracted

The bar figure (5) gives information on composite reliability.

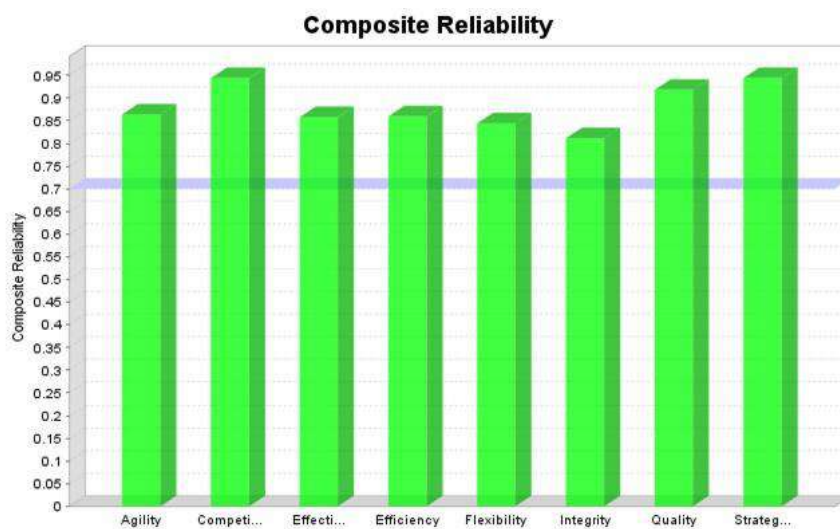


Figure (5). Composite reliability

Table (3), figures (4), and (5) indicated that all variables had acceptable the value of composition reliability and average variance extracted that proved composite reliability and convergent validity of the research model.

Z score significant (t-values)

This statistical analysis was used to examine the structural equations model of the research by PLS software. The value of T statistics has to be more than 1.96 to the meaningful relationship between variables and their confirmation. Since the value of all measured items were over 1.96, the variables had a meaningful relationship.

The results of t-values are demonstrated in figure (6).

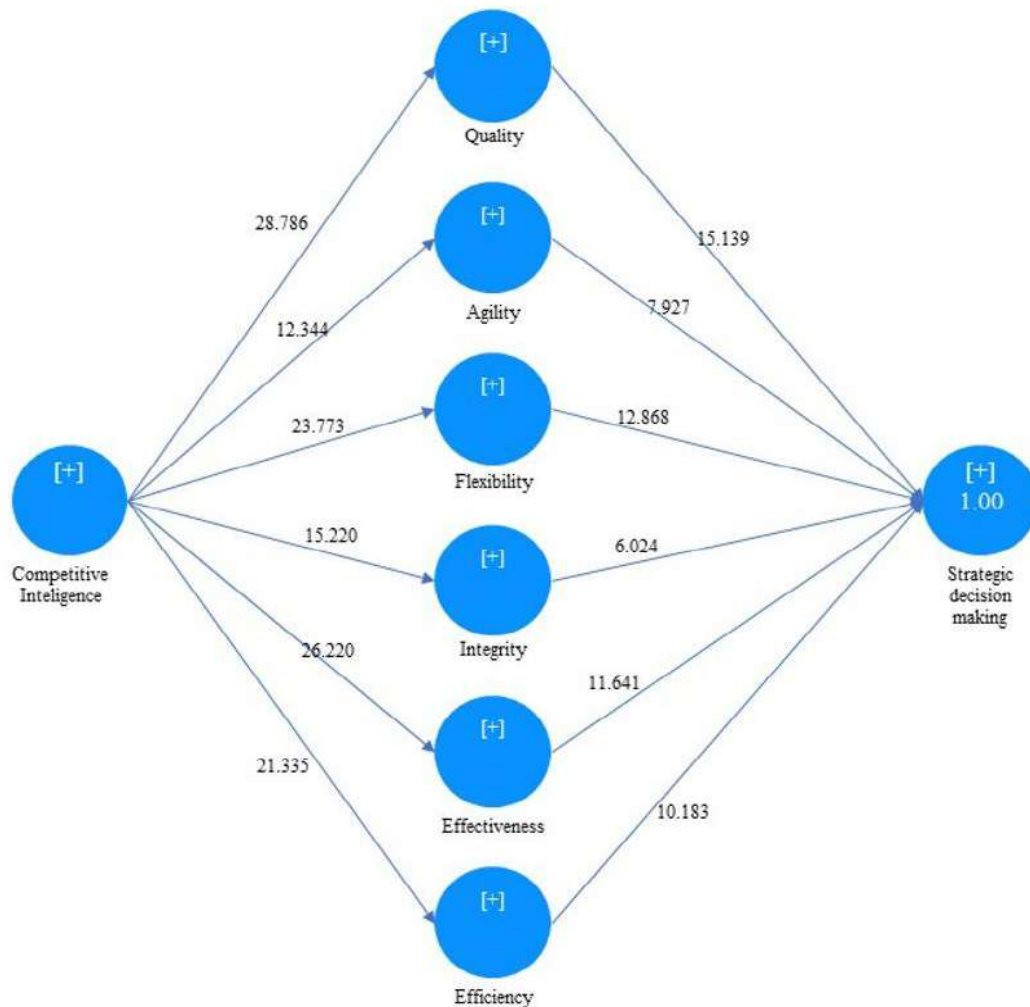


Figure (6). Z score significant (t-values)

Since the values of all measured items were more than 1.96, the hypotheses of research were confirmed and the test of this research model was at a 95% reliable level. Also,

according to the t-value of three factors; quality, effectiveness, and flexibility, which were more than other factors, these three mediator variables were more affected by competitive intelligence and affect strategic decisions.

Analyzing descriptive statistics and values

The amount of variables' impact on each other is demonstrated in the table (4).

Table (4). P-values of variables

| Path | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|--|---------------------|-----------------|----------------------------|--------------------------|----------|
| Competitive Intelligence ---->Agility | 0.756 | 0.754 | 0.061 | 12.344 | 0.000 |
| Competitive Intelligence ---->Effectiveness | 0.842 | 0.844 | 0.032 | 26.220 | 0.000 |
| Competitive Intelligence ---->Efficiency | 0.833 | 0.836 | 0.039 | 21.335 | 0.000 |
| Competitive Intelligence ---->Flexibility | 0.872 | 0.870 | 0.037 | 23.773 | 0.000 |
| Competitive Intelligence ---->Integrity | 0.768 | 0.781 | 0.050 | 15.220 | 0.000 |
| Competitive Intelligence ---->Quality | 0.873 | 0.872 | 0.030 | 28.786 | 0.000 |
| Agility ---->Strategic decision making | 0.184 | 0.180 | 0.023 | 7.927 | 0.000 |
| Effectiveness ---> Strategic decision making | 0.167 | 0.166 | 0.014 | 11.641 | 0.000 |
| Efficiency ----> Strategic decision making | 0.199 | 0.198 | 0.020 | 10.183 | 0.000 |
| Flexibility ----> Strategic decision making | 0.198 | 0.196 | 0.015 | 12.868 | 0.000 |
| Integrity ---->Strategic decision making | 0.156 | 0.160 | 0.026 | 6.024 | 0.000 |
| Quality ---->Strategic decision making | 0.300 | 0.298 | 0.020 | 15.139 | 0.000 |

Table (4) demonstrated the amount of variables' impact on each other and statistical samples. The rows show the effect of independent variables on mediator variables and, therefore, on the dependent variables. If P-values are less than 0.05, the mentioned effectiveness relationships are correct. As a result, it is evident that the amount of P-value for all the committed relationships was zero, and the effectiveness of variables' relationship, therefore, proved.

The first column related to the original sample and showed the average factor loading of a part of the statistical sample that had the most effect on the response. The second column was the sample mean, and the amount of the factor loading of this column was exceptionally close to the previous column, which means the model accuracy. The third column dedicated the value of standard deviation. Since this factor should be lower, the amount of all measured items in this column was low, showing the closeness of sample average and sample mean. The T statistics, which is the fourth column, dedicated the meaningful relationship between variables and it should be over 1.96 to be acceptable. Consequently, since all the values of the measured items in T statistics were much over 1.96, they had a meaningful and effective relationship.

The internal relations of variables are demonstrated in table (5).

Table (5). P-values of variables

| Path | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|--|---------------------|-----------------|----------------------------|--------------------------|----------|
| Competitive Intelligence -> Agility -> Strategic decision making | 0.139 | 0.137 | 0.026 | 5.248 | 0.000 |
| Competitive Intelligence -> Effectiveness -> Strategic decision making | 0.140 | 0.141 | 0.014 | 9.734 | 0.000 |
| Competitive Intelligence -> Flexibility -> Strategic decision making | 0.173 | 0.169 | 0.018 | 9.638 | 0.000 |
| Competitive Intelligence -> Integrity -> Strategic decision making | 0.120 | 0.126 | 0.025 | 4.796 | 0.000 |
| Competitive Intelligence -> Performance -> Strategic decision making | 0.166 | 0.165 | 0.020 | 8.204 | 0.000 |
| Competitive Intelligence -> Quality -> Strategic decision making | 0.262 | 0.261 | 0.021 | 12.485 | 0.000 |
| Competitive Intelligence -> Strategic decision making | 1.000 | 1.000 | 0.000 | 17.520 | 0.000 |

In the table (5), the effectiveness of all variables on each other is dedicated. In this step, research analysis was investigated at a 95% reliable level, and the P-values has to be less than 0.05 unless all measured items (the variables' relationship) be confirmed. As a result, the amount of P-value of all determining relationships was zero, therefore, approved.

Overview of research results

Path analysis and T statistics were used to investigate the statistical hypothesis in structural equations modeling. T statistics dedicates the meaningful relationship between variables. Path analysis showed the strength of the relationship between variables, and the closer it is to number 1, the stronger the relationship would be.

The hypothesis of the research is investigated in the table (6).

Table (6). Research hypothesis investigation

| Hypothesis | Path analysis | t-values | Results |
|---|---------------|----------|-----------|
| CI affects the quality of strategic decision-making | 0.300 | 15.139 | Confirmed |
| CI affects the agility of strategic decision-making | 0.184 | 7.927 | Confirmed |
| CI affects the flexibility of strategic decision-making | 0.198 | 12.868 | Confirmed |
| CI affects the integration of strategic decision-making | 0.156 | 6.024 | Confirmed |
| CI affects the effectiveness of strategic decision-making | 0.167 | 11.641 | Confirmed |
| CI affects the efficiency of strategic decision-making | 0.199 | 10.183 | Confirmed |

According to the statistical analysis, it is evident that all hypotheses of this research were confirmed. Consequently, competitive intelligence had direct, positive, significant, and constructive effects on strategic decision-making and its determined aspects: quality, agility, flexibility, integration, effectiveness, and efficiency.

Discussion

According to the highly competitive era in which numerous companies and brands are increasing in the market, organizations should make practical and valuable strategic decisions to gain the market share among their competitors and survive the organization in stiff competition and current or potential threats. According to the previous studies and the primary aim of the current investigation, some tools and technologies improve strategic decisions. One of the most crucial tools in the competitive market is CI. This intelligence helps organizations recognize the market's threats and risks alongside understanding rival companies' information to make better strategic decisions. Thus, numerous researchers and experts have investigated using competitive intelligence to succeed in the market and creating approaches to develop strategic decision-making.

The Data related to CI was analyzed by confirmatory factor loading, and the value of all measured items was over 0.3, so they are confirmed. Two statistical methods were used for structural equations: 1. factor loadings and path analysis 2. T-value. The amount of t-value of all measured items was over 1.96; the variables had a meaningful relationship. According to all proofs, it is evident that competitive intelligence had a positive and meaningful relationship with the quality, agility, flexibility, integration, effectiveness, and efficiency of strategic decision-making. Based on the t-values, competitive intelligence had a more substantial effect on the quality (15.139), flexibility (12.868), effectiveness (11.641) of the strategic decision-making, and it had a minor effect on the integration (6.024) of strategic decisions.

According to the findings of factor loading of competitive intelligence analysis, two statements, underlying assumptions (0.724) and primary vulnerability factors (0.769), had the highest value. It means that the accuracy of these two statements in the questionnaire was more than other statements. Furthermore, the market opportunity statement had the lowest value, although all statements were acceptable and had sufficient accuracy in questions to rely on.

According to the factor loading of observable and latent strategic decision aspects, the average value of quality and effectiveness-related questions were more than other aspects that demonstrated more accuracy and strength. Based on the path analysis output of analyzing the relationship between dependent and independent variables, competitive intelligence had the most impact on the quality of strategic decisions (0.873), and this mediator variable also had the highest effect on making decisions (0.300). Likewise, Competitive intelligence significantly impacted the flexibility, effectiveness, and efficiency of making strategic decisions, which were 0.872, 0.842, and 0.833, respectively. Moreover, CI had the lowest influence on strategic decision integrity (0.768) and agility (0.756).

Based on CR findings, although the composite reliability of all mediator variables was more than 0.7, the reliability of agility was more than other aspects (0.944), and the reliability of integration was the lowest one (0.811). According to AVE, the value of quality and efficiency was more than other measured items, which means that the validity of these two latent variables was more than others. However, since the value of AVE of all variables was more than 0.5, the validity of all items was evident.

According to the findings of t-values, competitive intelligence had a significant impact on strategic decisions and six considered aspects. CI affected the quality of strategic decision-making (15.139) rather than other aspects. Likewise, flexibility (13.868) and effectiveness (11.641) of the strategic decision can develop to a significant extent by using CI. The integration (6.024) and agility (7.927) of making a strategic decision were two variables with the lowest amount of t-value, and it means that CI had the lowest effect on these two variables.

Nwokah and Frances defined five variables for CI according to Fahey's statement, which was about competitive intelligence strategies to increase marketing effectiveness, and the results indicate that competitive intelligence has a positive effect on marketing effectiveness (Nwokah & Ondukwu, 2009). This study aims to investigate competitive intelligence and its strategies on strategic decisions and its different aspects. Another study indicated that competitive intelligence could boost an organization's financial performance (Adidam et al., 2012). Also, a study has investigated the different aspects of effective marketing and the performance of organizations in 52 banks. The result indicated that several aspects, including the philosophy of customers, the efficiency of operation, the information of marketing, and its integration, can have a positive and meaningful effect on the performance of the business (Appiah-Adu et al., 2001). We investigated the effect of competitive intelligence on six aspects of strategic decision-making to improve the strategic decision, which is one the most key scope of manager's responsibilities, and the results indicated that competitive intelligence had an affirmative and meaningful effect on quality, agility, flexibility, integration, effectiveness, and efficiency of strategic decision-making. As a result of improving strategic decisions, this research made it possible to cover mentioned studies' cases.

An investigation analyzed the effect of business intelligence (BI) on the quality, agility, flexibility, integration, effectiveness, and efficiency of strategy decisions, and the results indicate that business intelligence have a positive and meaningful impact on agility, flexibility, integration, effectiveness, and efficiency of strategy decisions but the hypothesis which was related to the quality of strategic decision, has rejected after its statistical analysis (Aghaei & Asadollahi, 2013). According to the t-value in the research of the effect of business intelligence on strategic decision-making, the amount of t-value of variables was: quality (1.22<1.96), agility (9.42), flexibility (8.31), integration (10.32), effectiveness (9.43), efficiency (6.78) and the value of the effect of BI on strategic decision-making was 9.83. While, in this current research, the amount of

t-value was: quality (15.139), agility (7.927), flexibility (12.868), integration (6.024), effectiveness (11.641), efficiency (10.183), and the value of the effect of CI on strategic decision-making was 17.52. It is evident that the t-values of all measured aspects of strategic decision-making in our study were higher than mentioned study except agility

and integration. As a result, competitive intelligence significantly affects the quality, flexibility, effectiveness, and efficiency of strategic decision-making rather than business intelligence. However, using both bits of intelligence are imperative for an organization's success.

Also, there is an investigation on the effect of artificial intelligence as a supportive tool on strategic decision-making under uncertain conditions. The result shows that humans are necessary to translate the outcomes, and it is not just about conducting machines, and this intelligence is related to the human's self-point of view (Trunk et al., 2020). Another study investigated that if competitive intelligence comes up with strategic implementation, the result will be a competitive advantage. The researcher has studied the samples of competitive technical intelligence in planning and operating activities in companies (Colakoglu, 2011). Furthermore, the result of the current study proved that CI has a direct effect on improving the process of making a strategic decision and its considered aspects.

Conclusion

The role of competitive intelligence (CI) in strategic decision-making and its different aspects has been analyzed in this research. Making strategic decisions is one of the dominant roles of managers' responsibilities and some factors and tools can support the process of making decisions in order to develop strategic decisions. We have analyzed the effect of competitive intelligence as a supportive tool. CI can be defined as an organization's approach to investigate rival markets or rival company's information and collect such data to help with strategic decisions. The study concluded that CI directly affects the quality, agility, flexibility, integration, effectiveness, and efficiency of strategic decision-making. Therefore, it can be considered a valuable tool and as a backbone of the process of making decisions in organizations.

This research is investigated on food small and medium-sized enterprises. Consequently, this study might result in different outcomes in other industries or big scale companies. Another limitation was about the place of study, which was in Tehran, Iran, so there might be other results in other countries. In addition, Iran's economic conditions and current market circumstances may affect this study's findings. Moreover, according to the size of Tehran and a large number of food enterprises in this city, the statistical sample of this study is small, which is another research limitation.



There are several recommendations for future studies. It is recommended to investigate variables of this research on other industries such as Information Technology (IT) enterprises or companies. Other aspects of strategic decision-making can be considered, or other models or aspects of competitive intelligence can be used in further research. Furthermore, investigating the effect of other independent variables on the process of making strategic decisions is recommended.

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Case Study

Prioritization of Green Supplier Selection Attributes Using Fuzzy Extent Analysis: A Case Study of Iranian Cosmetics Industry

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Abstract

The environmental considerations have gained increasing attention both from industry practices and academic research over the past three decades. Selection and cooperation with appropriate suppliers have become strategically important in the cosmetics' industry, too. There are various publications concerning green supplier selection and evaluation in general. However, a review on the supplier selection literature focusing on cosmetics industry shows a poor attention to "Green" criteria. Hence, the novelty of the paper is concentrating on this question: what are the most important criteria for "Green" evaluation and selection of the suppliers in the "Cosmetics" industry. Due to the inherent uncertainty in subjective opinions of the industry experts, the Fuzzy Extent Analysis and Delphi methods were applied. Finally, this study aims at identifying and prioritizing the supplier selection measurement indicators with environmental concerns under uncertain conditions in the Iranian Cosmetics Industry. The preferences of experts over the attributes were gathered using a pairwise comparison-based questionnaire. The hierarchical clustered representation of the four main attributes; Quality, Risk, on time delivery, environment; and their importance weights were achieved as the result of the study.

Keywords: Green Supplier Selection; Fuzzy Extent Analysis; Cosmetics Industry; Prioritization.

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Introduction and Literature Review

Since the development of supply chain concept in the late 1970s, nothing has attracted the governments, corporate executives, and the public as much as the design of green supply chains. The green supply chain is the most important tool for organizations to adapt their activities to the environment. Not only governments and corporations but also consumers care about environmental issues; customers pay attention to environmental factors in addition to traditional factors when selecting and buying products. Therefore, any effort to improve the compatibility of the production process with environmental factors can also increase the general popularity and improve the business brand credibility. Especially in the cosmetics industry, a strong and proportional brand personality can drive customers towards product use, because the person has the feeling that the brand personality is reminiscent of and appealing to his own personality (Gholamreza Tehrani, Asadollah, Mohebbi, & Azizi, 2020).

In traditional supply chains, the flow of materials and information is usually from one end of the chain to the other. Participation and transparency in such chains are usually low, and organizations have little knowledge of the environmental issues of other supply chain partners. However, in a green supply chain, in order to oblige and encourage suppliers to accept and comply with environmental standards, it is necessary for the organization to provide some technical, organizational and financial support to its suppliers. On the other hand, the organization should lead suppliers to accept environmental criteria by adding provisions in accordance with environmental requirements to procurement contracts and considering new criteria for selecting a supplier. In this regard, the organization should ensure environmental compliance by conducting environmental audits at the time of selection and also during the time of cooperation with suppliers. Although this process can significantly improve the organization's environmental performance, it may result in fewer eligible candidate suppliers.

Achieving green supply chain goals is not possible without the active and sustainable participation of suppliers. Therefore, organizations must pay special attention to the supplier selection process to achieve their environmental goals. The purpose of selecting green suppliers is to identify suppliers with the highest potential to meet the company's requirements in an environmentally friendly manner. There are various criteria in the literature for the selection of suppliers traditionally and also with environmental considerations, which are reviewed and categorized in Table 1.

Table 1. General and Green supplier selection attributes in the literature

| General Attributes | References |
|--|--|
| Quality, delivery, historical performance, production facilities and capacity, net price, technological capabilities | (Dickson, 1966) |
| Performance, finance, technology, organizational culture and strategy | (Ellram, 1990) |
| Price, delivery, quality, capacity and facilities, geographical location, technological capability | (Weber, Current, & Benton, 1991) |
| Finance, price, quality, delivery, technology, capability, business communication history | (Cusumano & Takeishi, 1991) |
| Quality, ability to deliver, price feedback | (Chaudhry, Forst, & Zydiak, 1993) |
| Product, usability, degree of reliability, experience, price | (Swift, 1995) |
| Finance, Agreement, Communication, Flexibility, Technological Capability, Service, Reliability, Price | (Choi & Hartley, 1996) |
| Cost, quality, service | (Ghodsypour & O'Brien, 1998) |
| Quality level, production capacity, delivery time, warehouse capacity | (Jayaraman, Srivastava, & Benton, 1999) |
| Cost, quality, delivery, service | (Lee, Ha, & Kim, 2001) |
| Quality, delivery, technological facilities | (Muralidharan, Anantharaman, & Deshmukh, 2001) |
| Quality, Delivery, Price, Technological Capability, Financial Situation, Past Performance, Facility, Flexibility, Service | (Muralidharan, Anantharaman, & Deshmukh, A multi-criteria group decision making model for supplier rating, 2002) |
| Product performance, service, cost | (Kahraman, Cebeci, & Ulukan, 2003) |
| Service, Compatibility, Financial Stability, Performance, Price, Physical Equipment, Quality, Organizational Strategies, Trust | (Bottani & Rizzi, 2006) |
| Research and development, cost, quality, responsibility | (Chang, Wang, & Wang, 2007) |
| Cost, quality, delivery, service | (Celebi & Bayraktar, 2008) |
| Experience, financial strength, management stability, installation costs, monthly costs, reliability, speed, security, availability, chain changes | (Amin & Razmi, 2009) |
| Cost, delivery, quality, service | (Wang, 2010) |

| | |
|---|--|
| Net price, quality, on time delivery | (Yücel & Güneri, 2011) |
| Cost, quality, logistics, technology | (Erdem & Göçen, 2012) |
| Process and product quality, service level, innovation management, financial position | (Bruno, Esposito, Genovese, & Passaro, 2012) |
| Level of trust, quality, cost, timely delivery, management and organization, financial | (Tahriri, Mousavi, Hozhabri Haghighi, & Zawiah Md Dawal, 2014) |
| Product volume, on-time delivery, payment method, supply diversity, reliability, work experience, emerging business relationship, management, geographical location | (Karsak & Dursun, 2014) |
| Green Attributes | References |
| Number of training hours (environmental) per employee, energy label, biodegradable, green packaging, chemical behavior, product label, personnel awareness programs, gas resources, safe water, Climate Wise eco label, Design for the environment, require periodic environmental inspections, list of hazardous chemicals, public disclosure of environmental records, harmful substances for the ozone layer, emissions and pollution (per unit of product), ozone depleters, recyclable items, Reconstruction / Reusable, Third Party Certificate (ECO Label), Landfill (Tons per Year), Total Energy Consumption, Secondary Markets for Waste Production, Resource Recovery and Energy Per Unit, Waste Return With reverse logistics programs, water pollution with toxic substances, ISO 14000, application of environmental standards, incineration, transportation of gaseous waste, risk of harmful elements | (Walton, Handfield, & Melnyk, 1998) |
| Product pollution, resource consumption, ecology, ratio of green customers to total customers, environmental management system, commitment of green supply chain managers, use of environmentally friendly materials, use of environmentally friendly technologies, Environmental training of employees | (Shen, Olfat, Govindan, Khodaverdi, & Diabat, 2013) |
| Pollution rate, clean technology usage, Waste disposal, Recycling rate, Renewable and non-renewable energy use | (Tabatabaei & Bazrkar, 2019) |

The cosmetics market is one of the largest and most thriving markets in the world (Karami & Karami, 2021). Achieving competitive advantage in such market through selection and cooperation with appropriate suppliers has become strategically important in the cosmetics industry over the past two decades. In order to analyze and manage such an important issue with environmental considerations, the cosmetics manufacturing companies must identify and prioritize the related indicators first.

Although lots of work has been conducted to explore and explain the green supplier selection criteria, a review on the supplier selection researches focusing on cosmetics industry shows a poor attention to "Green" attributes identification and prioritization as illustrated in Table 2. So, given the importance of the environmental considerations, this question will arise: what are the most important criteria for green evaluation and selection of the suppliers in the cosmetics industry?

Due to the inherent uncertainty in subjective opinions of the industry experts, the Fuzzy Extent Analysis and Delphi methods were applied. This study aims at identifying and prioritizing the supplier selection measurement indicators with environmental concerns under uncertain conditions in the Iranian Cosmetics Industry.

Table 2. "Green" supplier selection attributes in cosmetics industry in the literature

| Supplier Selection Attributes | | Method | Case study | Reference |
|--|--|---|---|------------------------------------|
| General | Green | | | |
| <ul style="list-style-type: none"> • Delivery time • Equity acceptance • Abiding by Laws, regulations, and standards • Health and security • Flexibility • Loyalty • Willingness to long-term participation • Accessibility and customers' support | - | QFD, ANP, and Mixed-Integer Programming | Cosmetic company | (Abbasi, Hosnavi, & Tabrizi, 2013) |
| <ul style="list-style-type: none"> • bid-oriented factors • exporter oriented factors • country of origin factors • relationship factors • other external factors | - | Semi-structured interviews | importing Korean cosmetics | (Kim, 2019) |
| <ul style="list-style-type: none"> • Cost/Price • Delivery reliability • Quality • Flexibility and responsiveness | <ul style="list-style-type: none"> • Green competencies • Environment management system (EMS) • Pollution | Topsis | herbal cosmetics and personal care products | (Atthirawong, 2020) |

| Supplier Selection Attributes | | Method | Case study | Reference |
|--|--|------------------------------------|---|--|
| General | Green | | | |
| <ul style="list-style-type: none"> • Service capability • Strategic alliance | <ul style="list-style-type: none"> • control • Green image | | from a Thai OTOP2 producer | |
| <ul style="list-style-type: none"> • Quality control system • Appropriate equipment for sustainable manufacturing • Suitable storage space • Packaging quality and transportation services • Appropriate quality management • Responsiveness • Sanitation in production operations • Distance between the company and its suppliers • Financial strength • Work experience • Production planning system • After-sale services • Maintenance management system • Professional workforce | - | A locally linear neuro-fuzzy model | Kaf company: a leading producer of cosmetic and hygienic products in Iran | (Vahdani, Iranmanesh, Mousavi, & Abdollahzade, 2012) |
| <ul style="list-style-type: none"> • Cost and price • Quality • Delivery speed and time delay reduction | - | Fuzzy VIKOR method | Cosmetics and sanitation industry | (Shariari & Pilevari, 2016) |

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| Supplier Selection Attributes | | Method | Case study | Reference |
|--|-------|--------|------------|-----------|
| General | Green | | | |
| <ul style="list-style-type: none"> • Customer Satisfaction • Flexibility • Commitment • Distribution • After sales service • Production capacity | | | | |

Research Methodology

The research methodology can be shown in the general framework of Figure 1.

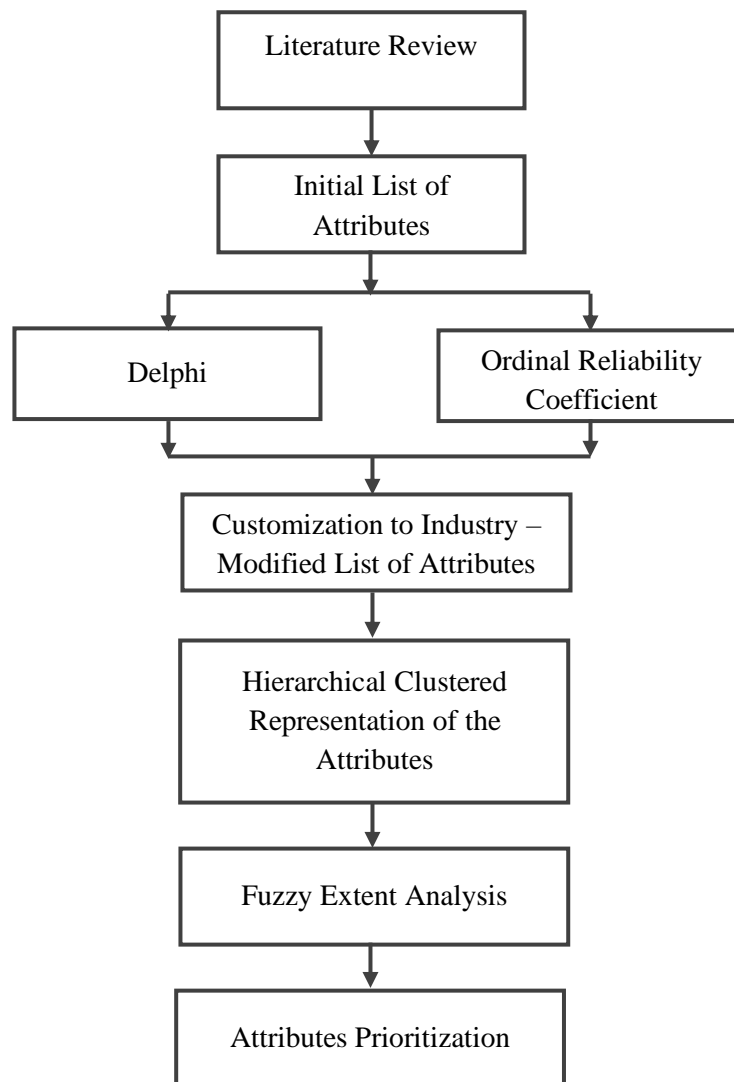


Figure 1. Research methodology and its steps

An initial list of criteria can be extracted from the literature review and adapted to the cosmetics industry according to expert opinions via Delphi technique. Delphi is one of the common formal consensus methods. It was developed in the 1960s by the Rand Corporation (Dabbaghi & Dehghan, 2019). The method used to arrive at a group opinion or decision and also assist structure the group communication processes based on an iteration approach (Aghajanian & SeyedAliAkbar, 2015). The experts respond to several rounds of questionnaires, and it continues until a level of agreement reaches (Cheng & Lin, 2002).

Since the preference information on the green supplier selection attributes belongs to the decision-makers' (DMs) subjective judgments and cannot be estimated by an exact numerical value, uncertainty approaches have been adopted in this paper. Besides, Delphi technique have been utilized a means of reaching a group consensus through multiple rounds. Fuzzy theory is one of the most-often applied theories and methods employed in such uncertainties (Sadeghieh, Dehghanbaghi, Dabbaghi, & Barak, 2012). A fuzzy extent analysis was used to conduct the attributes prioritization.

In the following, the outlines of the fuzzy extent analysis method are given based on (Bozbura & Beskese, 2007):

Let $X = \{x_1, x_2, x_3, \dots, x_n\}$ be an object set, and $U = \{u_1, u_2, u_3, \dots, u_n\}$ be a goal set. Based on each goal, m extent analysis values can be calculated for each object $M_{g_i}^1, M_{g_i}^2, \dots, M_{g_i}^m$, $i = 1, 2, \dots, n$. All the $M_{g_i}^j$ ($j = 1, 2, \dots, m$) are triangular fuzzy numbers.

Step1.

The fuzzy synthetic extent can be calculated using Eq (1).

$$S_i = \sum_{j=1}^m M_{g_i}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1} \quad (1)$$

M extent analysis values for a particular matrix should be added to obtain $\sum_{j=1}^m M_{g_i}^j$ based on Eq (2).

$$\sum_{j=1}^m M_{g_i}^j = \left(\sum_{j=1}^m a_{ij}, \sum_{j=1}^m b_{ij}, \sum_{j=1}^m c_{ij} \right), \quad i = 1, 2, \dots, n \quad (2)$$

$M_{g_i}^j$ ($j = 1, 2, \dots, m$) values should be added to obtain $\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1}$ based on Eq (3).

$$\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j = \left(\sum_{i=1}^n \sum_{j=1}^m a_{ij}, \sum_{i=1}^n \sum_{j=1}^m b_{ij}, \sum_{i=1}^n \sum_{j=1}^m c_{ij} \right) \quad (3)$$

And the inverse of the mentioned vector can be computed based on Eq (4).

$$\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^n \sum_{j=1}^m c_{ij}}, \frac{1}{\sum_{i=1}^n \sum_{j=1}^m b_{ij}}, \frac{1}{\sum_{i=1}^n \sum_{j=1}^m a_{ij}} \right) \quad (4)$$

Step 2.

The degree of possibility of $M_2 = (a_2, b_2, c_2) \geq M_1 = (a_1, b_1, c_1)$ is defined using Eq (5).

$$V(M_2 \geq M_1) = \sup_{y \geq x} [\min(\mu_{M_1}(x), \mu_{M_1}(y))] \quad (5)$$

Step 3.

The normalized weight vectors are defined using Eq (6).

$$W = (d(A_1), d(A_2), \dots, d(A_n))^T \quad (6)$$

Where W is a non-fuzzy number.

Application: Cosmetics Industry case

Selection and cooperation with appropriate suppliers have become strategically important in the cosmetics industry in recent two decades. In this research, the cosmetics industry in Iran has been studied. This study was conducted with the focus on one of the companies supplying and producing cosmetics. The company is registered as one of the largest manufacturers in this industry and has been operating in this industry for more than eighteen years. The company offers its various products in four groups of skin, hair, cosmetics and perfume products and in two sections for men and women. These products are produced in three different brands and are widely marketed throughout the country. In more than a decade of activity, this company has been able to be the largest manufacturer and distributor in the cosmetics industry. Due to confidentiality, the name of the company has been avoided in this study.

Considering the importance of suppliers in the production and supply of raw materials in this company, and as the main purpose of this research, important criteria were selected in order to evaluate suppliers in this industry. In this section, the results of applying the research steps (Figure 2) are presented step by step.

Using the literature review (Table 1), an initial list of green supplier evaluation attributes was prepared. In order to customize the list of attributes to the corporate needs and requirements, expert opinions were collected. Five company experts who were familiar with the industry needs have been carefully selected to ensure the comprehensiveness of the sample and the generalizability of the results.

The main research tool in this study was the questionnaire survey. Based on the initial list, the set of green supplier evaluation attributes were considered in the form of

a semi-structured questionnaire. In the first round of the Delphi, the preference of the experts over the attributes was gathered with the 5-point Likert scale. To investigate the reliability, we utilized R software and reported Ordinal Theta Coefficient (Hajhosseini, Hosseini Shabanan, Sadat Naji, & Naghsh, 2020) as shown in Table 3. Ordinal Theta Coefficient for all factors, indicating good internal validity. The Experts were also asked to categorize the provided attributes. Based on the collected data and the calculations in each round, each expert was asked to modify his opinion as a result of considering the views of their peers in the panel. The Delphi rounds continue until the expected level of agreement is reached. The Modified List of Attributes is shown in Figure 2.

Table 3. the reported Ordinal Theta Coefficient

| Ordinal Theta if a Question Deleted | New Theta |
|--|-----------|
| Without Question 1 | 0.813298 |
| Without Question 2 | 0.811141 |
| Without Question 3 | 0.815389 |
| Without Question 4 | 0.851330 |
| Without Question 5 | 0.807052 |
| Without Question 6 | 0.792577 |
| Without Question 7 | 0.805624 |
| Without Question 8 | 0.768899 |
| Without Question 9 | 0.788479 |
| Without Question 10 | 0.761354 |
| Without Question 11 | 0.860319 |
| Without Question 12 | 0.776699 |
| Without Question 13 | 0.846416 |
| Without Question 14 | 0.815889 |
| Without Question 15 | 0.814072 |
| Without Question 16 | 0.822899 |
| Without Question 17 | 0.785284 |
| Without Question 18 | 0.820025 |
| Ordinal Theta for all Question= 0.812303 | |

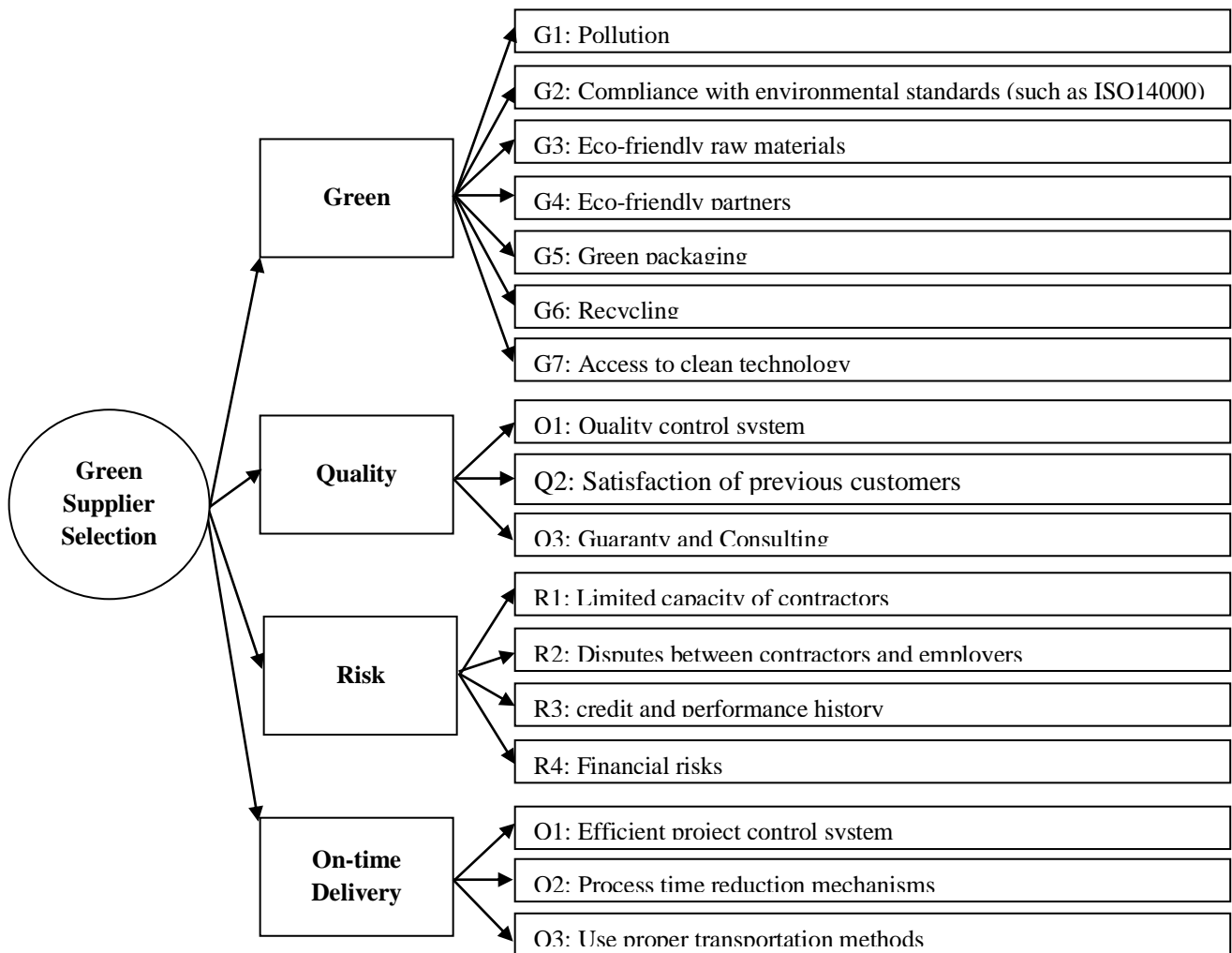


Figure 2. Hierarchical clustered representation of the attributes

The fuzzy extent analysis steps, as mentioned in Section 2, were applied to prioritize the attributes. The preferences of the experts about each attribute were gathered by triangular fuzzy numbers and via pair wise comparisons questionnaire. The results are shown in Table 4, 5, 6, 7.

Table 4. pair-wise comparisons for “Green” sub-attributes

| Green | G1 | G2 | G3 | G4 | G5 | G6 | G7 |
|-------|---------------|---------------|---------------|---------------|-------------|-----------|-------------|
| G1 | (1,1,1) | (1,3/2,2) | (1,3/2,2) | (1/2,1,3/2) | (1/2,1,3/2) | (1,3/2,2) | (3/2,2,5/2) |
| G2 | (1/2,2/3,1) | (1,1,1) | (1,3/2,2) | (1/2,2/3,1) | (1,3/2,2) | (1,3/2,2) | (3/2,2,5/2) |
| G3 | (1/2,2/3,1) | (1/2,2/3,1) | (1,1,1) | (1/2,2/3,1) | (1/2,2/3,1) | (1,3/2,2) | (3/2,2,5/2) |
| G4 | (2/3,1,2) | (1,3/2,2) | (1,3/2,2) | (1,1,1) | (1/2,2/3,1) | (1,3/2,2) | (3/2,2,5/2) |
| G5 | (2/3,1,2) | (1/2,2/3,1) | (1,3/2,2) | (1,3/2,2) | (1,1,1) | (1,3/2,2) | (1,3/2,2) |
| G6 | (1/2,2/3,1) | (1/2,2/3,1) | (1/2,2/3,1) | (1/2,2/3,1) | (1/2,2/3,1) | (1,1,1) | (1/2,1,3/2) |
| G7 | (2/5,1/2,2/3) | (2/5,1/2,2/3) | (2/5,1/2,2/3) | (2/5,1/2,2/3) | (1/2,2/3,1) | (2/3,1,2) | (1,1,1) |

Table 5. pair-wise comparisons for “Risk” sub-attributes

| Risk | R1 | R2 | R3 | R4 |
|------|-------------|-------------|-------------|-------------|
| R1 | (1,1,1) | (2/3,1,2) | (1/2,2/3,1) | (1,1,1) |
| R2 | (1/2,1,3/2) | (1,1,1) | (2/3,1,2) | (1/2,1,3/2) |
| R3 | (1,3/2,2) | (1/2,1,3/2) | (1,1,1) | (1,3/2,2) |
| R4 | (1,1,1) | (2/3,1,2) | (1/2,2/3,1) | (1,1,1) |

Table 6. pair-wise comparisons for “On time delivery” sub-attributes

| On time delivery | O1 | O2 | O3 |
|------------------|-------------|-----------|-------------|
| O1 | (1,1,1) | (1,3/2,2) | (1,3/2,2) |
| O2 | (1/2,2/3,1) | (1,1,1) | (1/2,2/3,1) |
| O3 | (1/2,2/3,1) | (1,3/2,2) | (1,1,1) |

Table 7. pair-wise comparisons for “Quality” sub-attributes

| Quality | Q1 | Q2 | Q3 |
|---------|---------------|---------------|-------------|
| Q1 | (1,1,1) | (3/2,2,5/2) | (1/2,1,3/2) |
| Q2 | (2/5,1/2,2/3) | (1,1,1) | (3/2,2,5/2) |
| Q3 | (2/3,1,2) | (2/5,1/2,2/3) | (1,1,1) |

Step 1.

$$\sum_{j=1}^m M_{g_i}^j = (\sum_{j=1}^m a_{ij}, \sum_{j=1}^m b_{ij}, \sum_{j=1}^m c_{ij}), i = 1, 2, 3, \dots, n$$

$$\sum_{j=1}^7 M_{g_1}^j = (6.5, 9.5, 12.5)$$

$$\sum_{j=1}^7 M_{g_2}^j = (6.5, 8.8333, 11.5)$$

$$\sum_{j=1}^7 M_{g_3}^j = (5.5, 7.1667, 9.5)$$

$$\sum_{j=1}^7 M_{g_4}^j = (6.6667, 9.1667, 12.5)$$

$$\sum_{j=1}^7 M_{g_5}^j = (6.1667, 8.6667, 12)$$

$$\sum_{j=1}^7 M_{g_6}^j = (4, 5.3333, 7.5)$$

$$\sum_{j=1}^7 M_{g_7}^j = (3.7667, 4.6667, 6.6667)$$

$$\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right] = (\sum_{i=1}^n \sum_{j=1}^m a_{ij}, \sum_{i=1}^n \sum_{j=1}^m b_{ij}, \sum_{i=1}^n \sum_{j=1}^m c_{ij})$$

$$\sum_{i=1}^7 \sum_{j=1}^7 M_{g_i}^j = (39.1001, 53.3334, 72.1667)$$

$$\left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1} = \left(\frac{1}{\sum_{i=1}^n \sum_{j=1}^m c_{ij}}, \frac{1}{\sum_{i=1}^n \sum_{j=1}^m b_{ij}}, \frac{1}{\sum_{i=1}^n \sum_{j=1}^m a_{ij}} \right)$$

$$\left[\sum_{i=1}^7 \sum_{j=1}^7 M_{g_i}^j \right]^{-1} = \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right)$$

$$S_i = \sum_{j=1}^m M_{g_i}^j \otimes \left[\sum_{i=1}^n \sum_{j=1}^m M_{g_i}^j \right]^{-1}$$

$$S_1 = (6.5, 9.5, 12.5) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0901, 0.1781, 0.3197)$$

$$S_2 = (6.5, 8.8333, 11.5) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0901, 0.1656, 0.2941)$$

$$S_3 = (5.5, 7.1667, 9.5) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0762, 0.1344, 0.2430)$$

$$S_4 = (6.6667, 9.1667, 12.5) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0924, 0.1719, 0.3197)$$

$$S_5 = (6.1667, 8.6667, 12) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0855, 0.1625, 0.3069)$$

$$S_6 = (4, 5.3333, 7.5) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0554, 0.1, 0.1918)$$

$$S_7 = (3.7667, 4.6667, 6.6667) \otimes \left(\frac{1}{72.1667}, \frac{1}{53.3334}, \frac{1}{39.1001} \right) = (0.0522, 0.0875, 0.1705)$$

Step2.

$$V(M_2 \geq M_1) = \text{Sup}[\min(\mu_{M_1}(x), \mu_{M_2}(y))], y \geq x$$

$$V(S_1 \geq S_2) = 1, V(S_1 \geq S_3) = 1, V(S_1 \geq S_4) = 1$$

$$V(S_1 \geq S_5) = 1, V(S_1 \geq S_6) = 1, V(S_1 \geq S_7) = 1$$

$$V(S_2 \geq S_1) = 0.9423, V(S_2 \geq S_3) = 1, V(S_2 \geq S_4) = 0.9697$$

$$V(S_2 \geq S_5) = 1, V(S_2 \geq S_6) = 1, V(S_2 \geq S_7) = 1$$

| | | |
|----------------------------|-----------------------------|-----------------------------|
| $V(S_3 \geq S_1) = 0.7777$ | $,V(S_3 \geq S_2) = 0.8305$ | $,V(S_3 \geq S_4) = 0.8006$ |
| $V(S_3 \geq S_5) = 0.8486$ | $,V(S_3 \geq S_6) = 1$ | $,V(S_3 \geq S_7) = 1$ |
| $V(S_4 \geq S_1) = 0.9737$ | $,V(S_4 \geq S_2) = 1$ | $,V(S_4 \geq S_3) = 1$ |
| $V(S_4 \geq S_5) = 1$ | $,V(S_4 \geq S_6) = 1$ | $,V(S_4 \geq S_7) = 1$ |
| $V(S_5 \geq S_1) = 0.9329$ | $,V(S_5 \geq S_2) = 0.9859$ | $,V(S_5 \geq S_3) = 1$ |
| $V(S_5 \geq S_4) = 0.9580$ | $,V(S_5 \geq S_6) = 1$ | $,V(S_5 \geq S_7) = 1$ |
| $V(S_6 \geq S_1) = 0.5803$ | $,V(S_6 \geq S_2) = 0.6221$ | $,V(S_6 \geq S_3) = 0.7799$ |
| $V(S_6 \geq S_4) = 0.5952$ | $,V(S_6 \geq S_5) = 0.6431$ | $,V(S_6 \geq S_7) = 1$ |
| $V(S_7 \geq S_1) = 0.4702$ | $,V(S_7 \geq S_2) = 0.5073$ | $,V(S_7 \geq S_3) = 0.6678$ |
| $V(S_7 \geq S_4) = 0.4806$ | $,V(S_7 \geq S_5) = 0.5313$ | $,V(S_7 \geq S_6) = 0.9020$ |

$$d'(A_i) = \min V(S_i \geq S_k)$$

$$d'(A_1) = \min V(S_1 \geq S_k) = 1, k = 2, 3, 4, 5, 6, 7$$

$$d'(A_2) = \min V(S_2 \geq S_k) = 0.9423, k = 1, 3, 4, 5, 6, 7$$

$$d'(A_3) = \min V(S_3 \geq S_k) = 0.7777, k = 1, 2, 4, 5, 6, 7$$

$$d'(A_4) = \min V(S_4 \geq S_k) = 0.9737, k = 1, 2, 3, 5, 6, 7$$

$$d'(A_5) = \min V(S_5 \geq S_k) = 0.9329, k = 1, 2, 3, 4, 6, 7$$

$$d'(A_6) = \min V(S_6 \geq S_k) = 0.5803, k = 1, 2, 3, 4, 5, 7$$

$$d'(A_7) = \min V(S_7 \geq S_k) = 0.4702, k = 1, 2, 3, 4, 5, 6$$

Step 3.

$$W' = (1, 0.9423, 0.7777, 0.9737, 0.9329, 0.5803, 0.4702)^T$$

The resulted prioritization of the attributes is reported in Table 8.

Table 8. Green supplier selection Attributes and their weights in cosmetics industry case

| Category | Green supplier selection Attributes | Calculated weight |
|------------------|--|-------------------|
| Green | G1: Pollution | 0.1761 |
| | G2: Compliance with environmental standards (such as ISO14000) | 0.1661 |
| | G3: Eco-friendly raw materials | 0.137 |
| | G4: Eco-friendly partners | 0.1715 |
| | G5: Green packaging | 0.1643 |
| | G6: Recycling | 0.1022 |
| | G7: Access to clean technology | 0.0828 |
| Quality | Q1: Quality control system | 0.4075 |
| | Q2: Satisfaction of previous customers | 0.3474 |
| | Q3: Guaranty and Consulting | 0.2451 |
| Risk | R1: Limited capacity of contractors | 0.2244 |
| | R2: Disputes between contractors and employers | 0.2518 |
| | R3: credit and performance history | 0.2994 |
| | R4: Financial risks | 0.2244 |
| On-time Delivery | O1: Efficient project control system | 0.4495 |
| | O2: Process time reduction mechanisms | 0.2072 |
| | O3: Use proper transportation methods | 0.4333 |

Conclusions

Achieving green supply chain goals is not possible without the active selection and sustainable participation of suppliers. To evaluate suppliers, it is necessary to prepare a list of important criteria in the first step. In this paper, the green supplier selection attributes were listed by reviewing the literature. Then, Experts' opinions on the attributes were aggregated using the Delphi method. Due to the inherent uncertainty of preferences, the fuzzy extent analysis was utilized to prioritize and calculate the importance weight of attributes. Finally, seventeen criteria in four categories: Green, quality, risk and on-time delivery, were identified as green supplier selection attributes in the cosmetics industry in Iran.

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Conceptual Paper

A Survey on Behavioral Models of Intra-Household Consumption

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Abstract

In the theory of microeconomics, in discussions related to consumer behavior, it is usually assumed that the household acts as a decision-making unit like an individual, and for a household, a budget constraint and a utility function are considered. As a result, only the general behavior of the household will be observable and analyzed. Since the 1980s, this method, which is called the Unitary Household Model, has been criticized theoretically and empirically, and issues such as the inequality of household members have been raised. In contrast to the Unitary Household model, Collective Household Model was proposed in consumer behavior. According to this method, in multi-member households, each member has their own preferences, and what can be important between these members is the intra-household bargaining process. In this article, at first, we will give an introduction including the theoretical foundation and the background of the research, then, while introducing the unitary model as an introduction to collective models, we will examine the collective model and intra-household collective models. At the end, the contents are summarized and suggestions for future research are presented.

Keywords: Unitary Household Model, Collective Household Model, Household Bargaining, Intra-household Allocation, Consumption behavior, Labor Supply.

Jel Classification: D13, C61, D70

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Introduction

Samuelson (1947) in the book of “Foundation of Economic Analysis” begins the chapter on the theory of consumer behavior by mentioning that if we want to distinguish modern economics from classical economics, it is necessary to examine the individualism theory of value. In fact, one of the outstanding features of the traditional microeconomics theory is the assumption of rational preferences, which determine the individual's behavior by including his/her tastes and interests. It is also assumed that the individual's preferences are represented by a constant utility function, and the problem of consumer choice is based on maximizing this utility function and also taking into account the budget constraint, determining the individual's set of options in the selection method, can be solved using the Slutsky Matrix on the demand function.

What Deaton and Muellbauer (1980) and Barten and Bohm (1982) proposed was that they considered the behavior of the household as the behavior of a consumer, and regarding household consumption and labor supply, the behavior of a multi-member household is considered the same as the behavior of a single-member one. These researches and similar to them indicate that in the mainstream economy, a household with several members was considered as a decision-making unit, and as a result, household consumption and labor supply was obtained according to the problem of maximizing the household's preferences, which was considered fixed, and the constraint of the budget. This model is called Unitary Model.

The Unitary Model lost its credibility due to the issues related to welfare economics and economic methodology (Vermeulen, 2002). Considering that the household is a group of people who each have their own preferences and making decisions among household members is obvious; The distinction between individual preferences and household preferences will change the behavior model of the household. What can be seen in the theory of conventional consumer behavior is that the behavioral foundations of a consumer and manager or household leader are considered the same, and as a result, the unitary model was approved. But due to the changes in the modern world, this model is not accepted now. In fact, a household is a small community that includes a number of people and each of these people has their own rational preferences. According to rational preferences and Arrow's impossibility theorem, the behavior of a group of people is not necessarily the same as an individual. One of the constraints of the unitary model is that the non-labor income of the household members is considered as the non-labor income of a one-person household. The income pooling hypothesis indicates that the source of this type of income does not play a role in the allocation of labor supply and consumption among household members, while this stipulation has been rejected in empirical studies (Lundberg et al., 1997). The second flaw of this model is related to the symmetry of the Slutsky matrix, for example, in which the effect of the final compensatory wage on labor supply is the same for two members of the household, which has also been empirically rejected (Fortin and Lacroix, 1997; Browning and Chiappori, 1998).

According to the mentioned cases, the unitary model is not able to determine the way of allocating the consumption and supply of labor among household members without considering stronger assumptions, and as a result, it cannot provide a correct analysis in the field of household members' well-being. Conventional economic models of well-

being consider only the distribution of well-being on the household, and the intra-household well-being of people is not important from this point of view (Bourguignon et al., 2009). For example, Apps and Rees (1996) showed that considering the welfare effects of tax changes, distributional effects among household members cannot be neglected in general. Knowledge about the decision-making process among household members is very important in many cases, including in programs that classify people into certain groups (such as women's groups or children's groups). Samuelson (1954) and Becker (1974) were the first people who stated that the household consists of people who each have their own preferences. By presenting his structure on the household decision problem, Samuelson showed that the utility function of the household cannot be presented with a unitary model. Becker also considered a head for each household in his model, which includes the preferences of all members of the household. Two other methods that consider all household members as decision makers use game theory means. The first method includes a model in which household behavior is considered in a Non-cooperative framework. In this model, each household member maximizes his own utility by assuming the behavior of other household members. In these types of models, the constraints that balance the household's behavior are different from the constraints that the unitary model imposes on the household. One of the drawbacks of non-communal models is that they do not necessarily meet Pareto's efficiency conditions in allocations related to household members. The second method was presented by Manser and Brown (1980) and McElroy and Horney (1990). They applied the means of cooperative game theory or in other words the principles of bargaining theory in the household model. In this model, household members are considered as economic agents who discuss and negotiate how to share the benefits of cooperation (living together), and depending on the bargaining power of the household members, a certain type of Pareto efficient allocation among the members is obtained in terms of welfare.

Donni (2003) developed a collective labor supply model based on nonlinear budget constraints. In this testability model, the certainty of the results was obtained without any contradictions.

Dercon and Krishnan (2000) related the collective household model to the principles of consumption homogenization and risk sharing. They used panel data from Ethiopia and showed that under uncertain conditions, the assumption of Pareto's efficiency related to household allocations requires income shock integration.

The collective model shows that household preferences depend on individual wages, prices, and non-labor income. In this model, the problem related to the Slutsky matrix and the hypothesis related to income sharing has been solved and the distribution of bargaining power in the household is dependent on the level of each of the mentioned variables.

With these explanations, the collective model has been accepted in modern microeconomics and economists such as and Browning and Chiappori (1998) have tried to expand this model.

Analysis framework

In this part, we first take a brief look at the unitary model, and then the general collective household model presented by Browning and Chiappori (1998) is examined. This model includes leisure time, which is considered against labor supply.

The Unitary Model as an introduction to the Collective Household Model

The basic assumption of the unique method of household behavior is that its needs and desires are determined by rational preferences related to consumption and leisure bundles. These preferences are monotonic in ascending order. The form of the utility function of a household that includes two people who can enter the labor market in terms of age is as follows:

$$u = u(q, q_0^A, q_0^B)$$

The utility function u is strictly pseudo-concave, continuously ascending and differentiable.

The vector $q = (q_1, \dots, q_n) \in \mathbb{R}_+^n$ represents the consumption vector of the household and the amount of free time of the individual is determined as q_0^A and q_0^B . The budget requirement of a household of two is defined as follows:

$$pq + w^A q_0^A + w^B q_0^B \leq y^A + y^B + y^H + w^A T + w^B T$$

In this expression, the price vector is $p = (p_1, \dots, p_n) \in \mathbb{R}_{++}^n$, w^I is the wage rate of the household members and I ($I = A, B$) represents the household members. We also denote the non-labor income of individual I by y^I .

Y^H is the household's non-labor income that cannot be allocated to a specific person in the household and T represents time.

By using the maximization method in the following function, the selected package of the household is obtained:

$$\max u(\tilde{q})$$

Subject to:

$$\tilde{p}\tilde{q} \leq y^s + w^A T + w^B T$$

$\tilde{q} = (q, q_0^A, q_0^B)$ represents the consumption and leisure of the household, $\tilde{p} = (p, w^A, w^B)$ is the price vector and $y^s = y^A + y^B + y^H$ shows the total non-labor income of the household.

In this case we have:

$$\tilde{q} = g(y^s + w^A T + w^B T, \tilde{p}) \quad (1.1)$$

The obtained demand functions have the properties of additive, homogeneity and symmetry of the Slutsky matrix. Apart from the collectability condition, other properties have been rejected in various studies (Deaton and Muellbauer, 1980).

In addition to the constraints and theoretical constraints that exist on the demand function, the unitary model implies the hypothesis of income integration, which indicates that the source of non-labor income does not play a role in determining the allocation method in the household. This issue is quite evident according to equation (1.1), because the final changes of different non-labor incomes have the same effect on demand, i.e.:

$$\frac{\partial g}{\partial y^A} = \frac{\partial g}{\partial y^B} = \frac{\partial g}{\partial y^H} = \frac{\partial g}{\partial y^s}$$

which has also been rejected in many cases (browning et al., 1994; Fortin and Lacroix, 1997; Browning et al. 2010).

The rejection of the hypothesis of income integration caused the theory of consumer behavior to be revised again. This revision was to pay attention to the fact that households are made up of different people, each of whom has their own preferences, and the decision-making process takes place among household members.

Examining General collective household model

We continue the discussion by considering the same household that includes two members of working age. In contrast to the unitary model, we have the collective model of the household, in which each person has his own rational preferences. These preferences are defined on the individual's consumption and leisure as well as the consumption and leisure of another person. Therefore, external factors are effective on a person's consumption and leisure. These external factors can have a positive or negative effect. There are no restrictions on goods here. Goods can be consumed privately or publicly or both.

Preferences of individual I; (I=A,B) is presented in the form of the following utility function:

$$U^I = u^I(q^A, q^B, q_0^A, q_0^B, Q)$$

U^I is a strictly concave, continuously ascending and differentiable utility function. Consumption vectors are $q^A=(q_1^A, \dots, q_n^A)$ and $q^B=(q_1^B, \dots, q_n^B)$. The values of q_0^A and q_0^B both represent leisure values. The general consumption vector is $Q=(Q_1, \dots, Q_n)$. Since we included external factors in this function and these factors can have a positive or negative effect, in cases where $J \neq I$, u^I will not necessarily increase in q^J . The household budget is as follows:

$$p(q^A + q^B + Q) + w^A q_0^A + w^B q_0^B \leq y^A + y^B + y^H + (w^A + w^B)T$$

When a household makes a purchase, that purchase is the result of the decision-making process among the members of that household, and many models have been presented in this regard. For example, Manser and Brown (1980) as well as McElroy and Horney (1990) followed a bargaining method in their model and their assumption was that the behavior of the household follows specific bargaining rules related to the Nash and Kalai-Smorodinsky method (Bourguignon et al., 2009; Browning et al., 1994; Chen and Woolley, 2001; Chiappori et al., 2011). Browning and Chiappori (1998) provided arguments for the collective household model. First, in a repeatable game and assuming complete information on the preferences of household members, it is possible that household members can develop a Pareto efficient allocation mechanism. Secondly, it can be said that the Pareto's efficiency of the general state is the assumption of maximization of utility in the unitary model, considering multi-member households. In many bargaining laws, the assumption of Pareto's efficiency is considered as the basic assumption in general. For example, we can mention the methods of Nash and Kalai-Smorodinsky, utilitarian and egalitarians (Thomas, 1990). $(q^A, q^B, q_0^A, q_0^B, Q)$ will be a Pareto optimal allocation of consumption and leisure in a household if this allocation is obtained by maximizing the following function:

$$\max u^A(q^A, q^B, q_0^A, q_0^B, Q) \quad (2.1)$$

Subject to:

$$U^B(q^A, q^B, q_0^A, q_0^B, Q) \geq u^{-B}$$

$$p q + w^A q_0^A + w^B q_0^B \leq y^s + (w^A + w^B)T$$

According to the above relation u^{-B} is the level of utility required for person B and $y^s = y^A + y^B + y^H$ and $q = q^A + q^B + Q$. Therefore, the maximization problem (2.1) seeks to find an allocation that maximizes the welfare of individual A according to the level of welfare allocated to individual B and the constraints of the household budget. By changing the utility level of individual B, all Pareto efficient allocations are obtained. This set of Pareto efficient allocations forms the utility possibilities frontier and represents all the vectors of the attainable utility levels of the household. Since individual utility functions are strictly concave and the budget constraint presents a convex set, all Pareto efficient allocations are characterized as stationary points on a linear social welfare function (Mas-Colell et al., 1995).

The solution to problem (2.1) will be as follows:

$$\text{Max } \mu(p, w, y) u^A(q^A, q^B, q_0^A, q_0^B, Q) + [1 - \mu(p, w, y)] u^B(q^A, q^B, q_0^A, q_0^B, Q) \quad (2.2)$$

So that:

$$p q + w^A q_0^A + w^B q_0^B \leq y^s + (w^A + w^B)T$$

In the above social welfare function, weight coefficients $\mu(p,w,y)$ and $1-\mu(p,w,y)$ are related to both household members. In the general case, the Lagrangian coefficients of the maximization relation (2.1) depend on the exogenous variables w,p,y . These coefficients show the bargaining power of household members in the intra-household allocation process. Changes in wages, non-labor income and prices can change the bargaining power from one person to another, which will result in changes in the consumption and supply of labor. For example, a change in the non-labor income of a household member will not only affect the consumption and supply of household labor through the income effect, but will also affect the bargaining power.

Since the changes in non-labor income of the individual change the bargaining situation of household members, the source of non-labor income is very important to determine the allocations related to household members, which is one of the important arguments of the collective household model and rejects the hypothesis of income integration in the unitary model. Such a conclusion is also true for changes in wages and prices, as a result of these changes, apart from the substitution and income effects, the transfer of bargaining power to household members is not far from expected. According to the relationship (2.2), household preferences indicate that the Slutsky matrix does not always remain symmetric and is not necessarily negative semi-definite, which is one of the important results of the collective model. The weighting coefficients in relation (2.2) can be changed according to changes in wages, non-labor income and prices, and as a result, household preferences do not remain constant for a long time, and the probability that preferences remain rational, complete and transferable is low. So it cannot be expected that the consumption and supply of household labor will remain stable. While in the unitary model, according to the rationality of preferences, the stability of consumption and supply of labor was not far from expected. The question raised here is that under what conditions does the collective household model become a unitary model using the relationship (2.2)?

There are three ways to achieve this goal: The first possible way is to consider the preferences of the household as the preferences of the household leader or planner (Cherchye et al. 2011). This method is obtained in the condition that the welfare weight coefficient of person A, i.e. $\mu(p,w,y)$ of the constant form, is equal to one or zero. In this method, which is known as the dictator method, if the coefficient is one, individual A will be the determining individual (dictator) and if it is zero, he will be a member of the household (B).

It should be noted that a dictator can be a caring person who optimistically determines and evaluates the consumption and leisure of other household members. In this situation, the dictator's individual's utility function $u^I(q^A, q^B, q_0^A, q_0^B, Q)$ will be upward, in other words, external factors have only a positive effect.

In the second method, the weight coefficient of people's well-being is a fixed number between zero and one. In this case, the individual's utility function is equal to (Blundell and Robin, 2000):

$$\mu u^A(q^A, q^B, q_0^A, q_0^B, Q) + (1-\mu)u^B(q^A, q^B, q_0^A, q_0^B, Q)$$

The third way to convert the collective household model into a unitary model is that the preferences of both household members are the same preferences on consumption and leisure, in which case the total utility function will be equal to the utility function of both individuals.

Now, by entering an assumption on equation (2.2), the concept of collective household model can be tested. We assume that the function $\mu(p, w, y)$ is a continuous, differentiable and homogeneous function of degree zero. This assumption leads us to a unique solution for the maximization function of the utility function. The second assumption is that only the overall consumption of the household can be seen, that is: $q = q^A + q^B + Q$.

According to the unitary model:

$$\tilde{p} = (p, w^A, w^B) \text{ and } \tilde{q} = (q, q_0^A, q_0^B)$$

Considering two different wages and Pareto's efficiency, household allocation is obtained using the equation (2.2):

$$\tilde{q} = g(y^s + w^A T + w^B T, \tilde{p}) \quad (2.3)$$

In this regard, the vector \tilde{q} for all goods is equal to: $\tilde{q}_i = q_i^A + q_i^B + Q_i$.

According to the above assumptions, the demand functions are continuous, differentiable and homogeneous from degree zero, and the total income is as follows:

$$Y = y^s + w^A T + w^B T$$

According to the observable demand functions, the Slutsky matrix will be in the following form:

$$S = \frac{\partial g}{\partial \tilde{p}} + [\partial g / \partial (y^s + w^A T + w^B T)] \tilde{q} \quad (2.4)$$

This relation is known as pseudo-Slutsky matrix.

Browning and Chiappori (1998) showed that the household demand function that is consistent with the collective model can be expressed by the following expression:

$$S = \Sigma + uv' \quad (2.5)$$

where the rank of the matrix $R = uv'$ is at most one and Σ is a negative semi-definite symmetric matrix.

Extension of the general model with distribution factors

In the previous sections, it was explained that the weight coefficients related to welfare in the household's utility function, which actually represent the bargaining power of household members, are dependent on prices, wages, and non-labor income. In Browning and Chiappori's model (1998), it was shown that prices and wages play an important role

in this. But, other factors also affect the allocation process. For example, an increase in a person's non-labor income can transfer bargaining power from one person to another, which is effective in allocating the consumption and supply of household labor. Other factors, such as environmental parameters outside the household, such as divorce laws, tax laws, etc., affect the bargaining power of people, but their effect is not so clear. Browning et al. (1994) call such factors as distributional factors. Distributional factors are variables that affect μ or bargaining power, but do not have a direct effect on individual preferences and household budget constraints, such as individual non-labor incomes. Browning and Chiappori's model (1998) showed that the collective household model is also obtained through a distributed factor Z . In this case, the pseudo-Slutsky matrix becomes the following form:

$$S = \Sigma + \frac{\partial g}{\partial z} v'$$

This relationship shows that the final change in the distribution factor z is directly related to the pseudo Slutsky matrix S and the normal symmetric Slutsky matrix Σ . With the use and careful selection of distribution factors, the collective household model cannot be rejected (Browning and Chiappori, 1998).

Constraints of the general collective household model

The model that we considered so far as a collective household model was a general model in which we did not include any constraints on individual preferences. We saw that in this model, both external factors and public goods were allowed to enter individual utility functions. The obtained arguments could also be expressed according to price changes. Now we want to limit the general collective household model. By limiting individual preferences, the way of allocation among household members will be clearer and more specific. In addition to preference constraints, available data sets can impose additional constraints on the general model. For example, in the household budget, the wages and working hours of each person are not specified separately.

Constraints related to preferences and examination of the distribution rule

1. Egoistic Preferences and Caring Preferences

So far, we have assumed that people's preferences are represented by the utility function $u^I(q^A, q^B, q_0^A, q_0^B, Q)$ ($I = A, B$). We know that external factors can change consumption and leisure with positive and negative effects. Here, to limit the preferences, we only consider egoistic preferences and caring preferences. People have egoistic preferences if their preferences depend only on their consumption and leisure, and it is defined in the following form:

$$U^I = u^I(q^I, q_0^I) \quad I = A, B$$

In this type of preferences, the change in the individual's consumption and leisure has no effect on the well-being of the individual. Caring preferences are also defined in the following form:

$$U^I = f^I(u^A(q^A, q_0^A), u^B(q^B, q_0^B)) \quad I=A, B$$

The f^I function is an ascending function. Caring preferences are defined as household members determine and evaluate the well-being of other people in a positive way, in other words, each household member seeks to optimize the utility function of the entire household, because in this way, the utility of all household members increases. These types of preferences, in addition to considering the relationship of friendship, affection and benevolence that actually exists between household members, also show the degree of cooperation between household members (Cherchye et al., 2010).

2. Sharing rule

Assuming the existence of egoistic or caring preferences, the Pareto efficient allocation of the household of equation (2.2) will be in the form of function $\Phi(p, w, y)$ where the amount of leisure of individuals q_0^A and q_0^B and their consumption i.e. q^A and q^B will be obtained from the maximization of the following function:

$$\text{Max } u^I(q^I, q_0^I) \quad (2.6)$$

Subject to:

$$pq + w^I q_0^I \leq \Phi^I(p, w, y) + w^I T$$

in this relationship, $\Phi^A(p, w, y) = \Phi(p, w, y)$ and $\Phi^B(p, w, y) = y^s - \Phi(p, w, y)$.

Φ is the distribution law according to which, y^s is the total non-labor income of the household which is divided between both household members and depends on exogenous prices, wages and non-labor income. According to this rule, people independently allocate their share of income to consumption and leisure in a way that maximizes individual well-being.

The distribution rule, which expresses the Pareto's efficiency of household behavior, is actually the application of the second fundamental theory of welfare economics. The sharing rule and its results are fruitful in determining individual preferences and the allocation process among household members.

Collective labor supply models

1. Collective labor supply with observable distribution factors

Many data sets that include labor supply data (wages and working hours) do not include household consumption information. In microeconomic data, the only information related to price changes is the difference in wages between individuals. Since there is no information about the relative price changes related to the consumption of goods at different stages, we can only rely on Hicks' composite commodity theorem. According to this theory, if a group of prices change in parallel, the consumption behavior of the commodities corresponding to those prices will be as a single commodity, which is called the Hicksian aggregate commodity (Deaton and Muellbauer, 1980).

One of the assumptions here is that what are considered as sources of relative price change are the wages of both household members. Another assumption is related to preferences that we consider individual preferences as egoistic. The third assumption is to consider at least one observable distribution factor z , which is different from people's non-labor incomes. According to this assumption, equation (2.5) is as follows:

$$\text{Max } \mu(w, y, z) u^A(c^A, q_0^A) + [1 - \mu(w, y, z)] u^B(c^B, q_0^B) \quad (2.7)$$

Such that

$$C^A + c^B + w^A q_0^A + w^B q_0^B \leq y^s + (w^A + w^B)T$$

Here, c^I is individual I 's unobservable consumption of the Hicksian aggregate commodity, and z is the distribution factor that affects only the functions $1 - \mu$ and μ . The price of Hicksian commodity is assumed to be equal to one. By solving the above equation, we will have:

$$L^I = h^I(y^s, w, z) \quad (2.8)$$

This relationship shows that labor supply equations depend on non-labor income, wages and distribution factor. According to the assumption of egoistic preferences, we have:

$$\begin{aligned} L^A &= l^A(\Phi(w, y, z), w^A) \\ L^B &= l^B(y^s - \Phi(w, y, z), w^B) \end{aligned} \quad (2.9)$$

In these relationships, Φ is the distribution rule and determines the allocation process among household members. These equations also show the constraints of the collective model on the observed labor supply behavior. According to the relation (2.9), the final changes in the distribution factor z affect only the supply of labor i.e. l^A and l^B through the distribution rule. Also, the final change in the salary of a household member only has an income effect on the labor supply of another person, and the final changes in non-labor incomes have an indirect effect on the labor supply. Considering these cases, the final rates of substitution between each pair of variables in the set $\{w^A, w^B, y^A, y^B, y^H, z\}$ are obtained. Having this set of final substitution rates, the partial derivative of the distribution rule is obtained. What can be considered as the result of the distribution rule is that if all the conditions are met, the distribution rule is determined as a constant addable number.

2. Collective labor supply without observable distribution factors

Here we want to apply more constraints. Unlike the previous part, in this part we assume that only the individual wages of both household members and the total non-labor household income are observable. This work was done by Chiappori (1992). According to the mentioned cases, the collective model of the household is as follows:

$$\text{Max } \mu(w, y^s) u^A(c^A, q_0^A) + [1 - \mu(w, y^s)] u^B(c^B, q_0^B) \quad (2.10)$$

Such that:
$$C^A + c^B + w^A q_0^A + w^B q_0^B \leq y^s + (w^A + w^B)T$$

As we know, y^s represents the total non-labor household income. According to the solution of this problem, the set of labor supply functions is obtained, in which non-labor income and wages can be seen. Also, considering the assumption of egoistic or caring preferences, individual labor supply can be written as the individual's own wage rate and his share of non-labor income. Chiappori derived a set of testable constraints on the collective model on the observable labor supply. This constraint was tested by Fortin and Lacroix (1997). They concluded that the constraints related to the unitary model are strongly rejected, while the collective model cannot be rejected in some circumstances. So far, our assumption has been based on the fact that we only have labor supply information in our dataset. Therefore, consumption information is limited to Hicksian aggregate commodity consumption only. According to the studies related to the household budget, there is detailed information about the allocation of household expenses for different commodities, while there is no information about labor supply and wages in many cases. If we assume that the supply of labor is constant, i.e. both household members work a certain amount of hours (it can be zero), then the exogenous income is considered and will be included in the equation as a total. Also, as is usual in household budget research, we do not consider relative price changes. By considering individual consumption preferences in a egoistic or caring way, we have the possibility to use the distribution rule to obtain testable arguments in this collective model and obtain decisive results. Another assumption that we consider in this model is that at least one commodity demanded by the individual is observable and there is also at least one observable distribution commodity.

By introducing this assumption to the new maximization problem, which leads to the allocation of expenses to the private commodity demanded by the individual in a Pareto efficient manner, the general model of equation (2.2) is summarized in the following form:

$$\text{Max } \mu(x, z) u^A(q^A) + [1 - \mu(x, z)] u^B(q^B) \quad (2.11)$$

Subject to:

$$l(q^A + q^B) \leq x$$

Here, q^I is the consumption vector of individual I , and I is a vector that contains a column of one because we assumed the prices of commodities to be equal to one, z is the observable distribution factor, and x is the total household expenditure. Weight coefficients related to bargaining power are generally dependent on x , and x is an exogenous variable. Due to the fact that the demand of individuals A and B for commodity 1 is assumed to be observable in the form of q_1^A and q_1^B , solving the problem with the maximization method leads to the following solution, which are the same Engel's curves:

$$\begin{aligned} q_1^A &= g_1^A(x, z) \\ q_1^B &= g_1^B(x, z) \\ \tilde{q} &= \tilde{g}(x, z) \\ \tilde{q} &= (q_2^A + q_2^B, \dots, q_n^A + q_n^B) \end{aligned} \quad (2.12)$$

In this regard, \tilde{q} is the observed demand of the household for the consumption of commodities, and individual consumption cannot be identified. Considering that individual preferences can be egoistic or caring, the distribution rule can be used again. According to the share of expenses of individual A and B from the total expenses of the household, i.e. $x - \Phi(x, z)$ and $\Phi(x, z)$, Engel's curves related to commodity 1 can be written as following:

$$\begin{aligned} q_1^A &= f_1^A(\Phi(x, z)) \\ q_1^B &= f_1^B(x - \Phi(x, z)) \end{aligned} \quad (2.13)$$

By using the four partial derivatives of these equations, the final substitution rates of Φ can be obtained through which the partial derivatives of the distribution rule are obtained and the expression of the collective model is as follows:

$$\frac{\partial^2 \Phi}{\partial x \partial z} = \frac{\partial^2 \Phi}{\partial z \partial x}$$

The following results are obtained according to the above constraints:

1. The division rule is determined as a fixed addable number.
2. Individual shares in expenses on private commodities can be obtained by determining the rule of distribution which will also be a fixed addable number. According to Browning et al. (1994) research on the budget of Canadian households, the difference in age and income of both household members, as well as the expenses of the whole household, have a statistically significant effect on the sharing rule, and the constraints of the collective household model cannot be rejected.

Bargaining principles and cooperative models

So far, in collective household models, we only considered the Pareto's efficiency condition for allocations among household members. The utility possibilities frontier includes the infinite Pareto efficient allocation. By introducing other principles in addition to Pareto's efficiency, other results of household behavior can be obtained. Manser and Brown (1980) obtained empirical arguments for bargaining solutions such as the dictator solution, the Nash solution, and the Kalai-Smorodinsky solution. McElroy and Horney (1990) also studied the Nash solution and the generalization of Slutsky symmetry. The Nash solution is obtained according to the cardinal information and there is no need to compare the preferences between individuals. The behavior of the household according to these principles follows the following equation:

$$\max [u^A(q^A, q^B, q_0^A, q_0^B, Q) - \tilde{u}^A] [u^B(q^A, q^B, q_0^A, q_0^B, Q) - \tilde{u}^B] \quad (2.14)$$

subject to:

$$p^A q^A + w^A q_0^A + p^B q^B + w^B q_0^B \leq y^s + (w^A + w^B)T$$

In this equation, \tilde{u}^I is the Threat point or disagreement point of individual I. This answer is related to the time when collective agreement is not reached. Therefore, the Nash solution provides a solution that maximizes the results of cooperation according to the constraints of the household budget. In order to apply the Nash bargaining method, the threat points must be defined correctly, but it is not clear which threat point should be chosen.. McElroy and Horney (1990) derived threat points from labor supply and consumption data of divorced individuals. With this method, consumption and labor supply of multi-person household can be obtained through the estimated threat points. Any variable that is expected to affect the threat points is included in the analysis. In fact, these variables are effective on the bargaining power of people and affect the selected Pareto efficient allocation.

Non- cooperative Household Models

In examining the models related to the household, we come across a model in which several decision makers are included in the household. These types of models are based on non-cooperative game theory. In this type of non-cooperative models, it is assumed that household members maximize their utility based on a person's budget, and the individual behavior of other members is considered given. One of the distinctive characteristics of this type of model is that the allocations between household members are not necessarily Pareto efficient. But, this depends on how the dependence of individual in the household is defined.

Early research on the non-cooperative model was provided by Leuthold, (Ashworth and Ulph, 1981). In their labor supply model, individuals allocated total income to their leisure and consumption of Hicksian commodity, which was assumed to be a public good. This model takes into account the effects of external factors in people's leisure and includes more behavioral constraints than the unitary model. But in this model and similar models, Pareto efficiency is not considered in allocations among household members. Non-cooperative consumption models also have the mentioned characteristics. For example, the non-cooperative consumption models presented by Chen and Woolley (2001) and Cherchye et al. (2010) are of this type. In general, these models provide Pareto inefficient allocations among household members. Assuming the integration of income or when we consider the preferences of the household as caring, the distribution of income among household members has no effect on the allocation of consumption among them.

According to the Pareto inefficient allocation in these types of models, it is possible to obtain the saving behavior and the selection of the household's portfolio. Household members can obtain the utility related to the current and future consumption of the household's general good by using the Nash equilibrium.

Conclusion

Theoretical models related to the household are classified into two categories: unitary model and collective model. The collective models themselves are divided into two categories: cooperative models and non-cooperative models. The results of cooperative models are always Pareto efficient, while in non-cooperative models this feature is not always present.

According to the experimental tests, the distinctive feature of the unitary model, which is the integration of income, was not accepted. The collective model in household behavior is a suitable alternative to the unitary model. In the unitary model, it is assumed that households act as a single decision-making unit. On the other hand, the collective model considers the household to consist of members who each have their own preferences and the bargaining process occurs among these members. This process can have different forms, for example, the collective model presented by Chiappori (1992) considers bargaining between household members as a result of Pareto efficient allocation of resources in the household.

Due to the greater advantages of the collective model than the unitary model, this model became the beginning of many social theories such as the theory of social welfare, and since it considers individual preferences, it bases its work on the methodological principles of individualism. The assumption of Pareto efficiency regarding household decisions in these types of models leads to the creation of observable allocations of the household in such a way that it has the ability to be tested and rejected as well as determinable. Another advantage of collective models is that they explain the intra-household distribution of resources, which was neglected in the unitary model. By using the collective model, it is possible to obtain the changes in the share of the household members from the resources according to the changes in the economic environment. What can be emphasized about these models is that their study can be useful in the evaluation of policies, in other words, if policy makers want to adopt a policy regarding health and happiness and individual well-being, considering the household as a single unit (without considering the preferences of household members) is insufficient and will lead to wrong decision.

According to the experimental and theoretical evidence in various studies, Pareto efficiency can change from time to time or by changing the location or geographic location, and In fact, there is a need to dynamically examine the collective model of the household and the factors affecting the decision-making process in the household over time and Intertemporal space. This requires more complex research that is beyond the scope of this article. Also, due to the multiplicity of types of households, more studies should be done in this field, which types of households can be analyzed using the unitary model and which ones should be analyzed using the collective model, and in other words, which types of households can be included in the Pareto efficiency of collective models. Mentioning these things can pave the way for future studies and research.

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