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Uncertainty analysis of business components in Iran with fuzzy systems: By comparing hypermarkets and Net markets

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ABSTRACT

Purpose: Today's businesses, especially in Iran, face many factors and challenges, one of which is uncertainty in inputs and laws and regulations. Especially in the current situation and with the development of e-commerce on the one hand and on the other hand despite critical conditions such as COVID-19, the purpose of this article is a comparison between businesses with the study of hypermarkets and net markets.

Methodology: This research is a descriptive-analytical type that after explaining the goals and components of organizational business using library resources and Internet search, interviews and questionnaires, from a multi-criteria decision approach and fuzzy logic for effective analysis The implications of organizational business are exploited. Two areas of physical retail businesses such as hypermarkets and virtual ones such as net markets have been compared and analyzed. The necessary decisions for the activities of these businesses are inferred using the principle-based principles of fuzzy systems.

Findings: The result of the research has been that due to the capabilities of the development of net markets such as the effective use of information technology and experts, their comprehensive development and growth in the future is more realistic that The ability to extend this to other areas of virtual business. Especially in spite of critical conditions such as the spread of pandemics, the popularity of using net markets has increased.

Originality/Value: The virtual and internet business platform has not yet been significantly developed in Iran. The most important approach in this study is to examine the components of business in Iran and a comparative study to change attitudes toward e-business.

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1. Introduction

Information related to the organization's business environment is information about competitors, changes in customer trends, products and services that are constantly changing and cannot be commented on with certainty [1]. This uncertainty becomes more complicated when it is linked to the future. Scientific methods for studying today and yesterday have existing or available studies, while future studies almost do not. At the same time, futurists believe in many different possible, probable, or preferred options in the business environment [2].

Business environment refers to the factors affecting the performance of economic units such as the quality of governance, stability of laws and regulations, quality of infrastructure, etc., which change beyond the authority and power of managers of enterprises [3]. Research shows that electronic infrastructure plays a key role in the development and growth of markets and, consequently, for the economy and tourism [4]. The business and investment environment is a political, institutional, and behavioral environment that affects returns and risks associated with economic activities and investments [5]. The business environment is affected by various areas, the most important of which are the degree of openness of the economy, government sovereignty and efficiency, market efficiency, socio-political environment, international issues, labor market flexibility, management and environment prone to It is the development of technology and its result is to create an incentive to increase the level of production of domestic firms and to gain advantage and advantage of firms to compete on the world stage [6]. Recent research in the field of strategy has shown that in a situation where no event can be predicted with certainty, no clear solution can be found by performing any amount of analysis. But what is important is the use of tools and techniques by which this uncertainty can be measured and analyzed [7, 8].

In the continuation of this article, the researches done in the field of business and the prevailing competitive environment and the fuzzy logic approach to explain the uncertainty of business components are introduced. The methodology of this paper is based on the use of multi-criteria decision making, logic and fuzzy systems, and by determining the relevant variables, a comparison is made between examining the uncertainty conditions in physical hypermarkets and virtual net markets.

2. Literature review

The logic and approach of fuzzy systems believes that there is ambiguity in the nature of all sciences and this ambiguity is far greater in the social sciences. Contrary to the thinking of business leaders who believe that input should be very accurate to make output better and more executable, Professor Lotfizadeh, the father of fuzzy science, believes that models should be built that are ambiguous and uncertain [9]. Business is any repetitive economic activity such as the production, purchase and sale of goods and services for the purpose of gaining economic benefits [10]. Uncertainty is everywhere, and in the case of business it manifests itself differently. Studies show that the study of uncertainty in the business environment through different methods has been the main concern of managers and researchers [11].

The nutritional transition is fueling a concerning rise in Non-Communicable Diseases (NCDs) in Low and Middle-Income Countries (LMICs). These countries lack strong health infrastructure capable of supporting the long-term and expensive medical treatment for those living with NCDs. It is important to identify stakeholders involved in food retail and dietary choices as part of a population-level strategy

to reduce the burden of NCDs in LMICs. The aim of one study is to explore stakeholder perspectives on the impacts of new and existing food retail on local diets in Kenya [12].

The re-emerging outbreak of COVID-19 in Beijing, China, in the summer of 2020 originated from a SARSCoV-2-infested wholesale food supermarket. The retail shop closure strategy reduced the number of visitors to the market by nearly half. In addition, the buy-local policy option reduced the infection by more than 70% in total. Therefore, retail closures and buy-local policies could serve as significantly effective strategies that have the potential to reduce the size of the outbreak and prevent probable outbreaks in the future [13]. Another study proposes and empirically examines a case-outcome configurationally theory for explaining shoppers' demographic configurations and sustainability and place attractiveness assessments impact their behaviors toward culturally traditional mega-markets (CTMM). The empirical study here supports the case-outcome theory that recipes of (separate) customer screens (i.e., a few unique complex configurations of shopper conditions) identify shoppers who will (not) shop frequently at the mall and commit high (low) shopping expenditures. The study constructs models from a foundation of complexity theory tenets to propose alternative (separate) configurations (i.e., shopper recipes or screens) that accurately indicate outcomes of frequent (infrequent) shoppers with high (low) expenditures. Configuration theory of shoppers represents a major paradigm shift beyond the currently dominant logic of variable-directional relationship theory and testing. The findings support the general conclusions that CTMM place sustainability and place attractiveness case-outcome configurationally models indicate shoppers having high (low) rates of visiting and high (low) expenditures accurately [14]. Business models and business model innovation and particularly their Opportunities have been a popular topic recently, but a study finds the extant literature on the subject lacking. The risk and uncertainty aspect typical of business models has not been sufficiently addressed. This study draws upon the existing literature and triangulate results with an extensive expert group interview to identify 28 risk and uncertainty factor groups, creating a checklist that can be used as the first step in an integrative business model risk management process for existing and new iterations. With an established process for managing and identifying risk in business models, managers can make more conscious and well-informed decisions [15]. Despite the perennial need to understand and manage uncertainty in international business, there is no comprehensive framework that incorporates different types of uncertainty, their antecedents and outcomes, and the different coping strategies used by managers and their outcomes. This makes it difficult for international business managers to understand the types of uncertainty in their businesses and develop appropriate strategies to deal with it effectively, especially during times such as the ongoing Covid-19 pandemic. A paper uses an extensive review of the international business literature to address the above research gap by identifying the different types of uncertainty, their antecedents and outcomes, the coping strategies used to mitigate their impact, and the consequences of these actions. The authors also use examples from the current Covid-19 crisis to assess the firms' responses and their consequences. The paper concludes with some implications for international business managers and directions for future research [16].

Online Grocery Shopping is still insignificant when compared to the traditional bricks and mortar stores in the United Arab Emirates, despite the very high internet penetration, the high availability of smartphones and personal computers, grocery retailer's focus on this channel to strengthen market share, and the consumers searching for convenience and time saving. OGS can have a stronger role to play in consumers' life, and E-Business development. Therefore, it is important to understand what influences intention and attitude of consumers towards OGS. This particular study was conducted in order to analyze the trends of OGS in the UAE. The study was diverse and took into account various

segments of respondents differentiated on the basis age, gender, education level, employment status, and salary compensation [17].

Business process outsourcing represents a strategic option to obtain the overall improvement of performance in business process management context. It consists in externalizing whole sub-processes (e.g., production, logistics, and human resources) of a value chain. Last decade, the concept of value chain moved toward the more flexible concept of value net that implies the assembly of several value chains tailored to specifics, objectives, markets, etc. Thus, the composition of a value chain within a value net environment can be understood as the modeling of a macro business process in which sub-processes can be outsourced. Such composition activity foresees crucial decision-making moments that need to be sustained by a group of decision-makers owning several and heterogeneous competences in order to select the most suitable external providers to which delegate specific sub-processes. A work proposes a framework to enhance business process outsourcing by introducing group decision-making support that relies on a fuzzy linguistic consensus model. In addition, the framework implements algorithms to learn and assign different weights to decision-makers considering the context and time at which they participate in the group decision making. The framework is applied to an Italian footwear company by describing a numerical example [18]. Maintaining and improving customer loyalty is an important strategic goal for businesses as competition has intensified in almost all sectors of the economy. Retailers, in particular, feel the need to invest in customer loyalty more than ever before as channels and store format alternatives available for consumers to shop at have proliferated. However, current research in marketing provides little guidance to retail managers about developing and sustaining shopper loyalty across different store formats. Toward filling this gap, a research examines the shopper satisfaction-loyalty link in two different store formats (supermarkets and hypermarkets). Using data from surveys of 505 Spanish shoppers at both types of retail formats, this study examined how shoppers' attitudinal and behavioral loyalty develop differently. Results reveal important differences and offer directions for the pursuit of different strategies by supermarkets and hypermarkets. The specific strategies, and the implications of this research for theory and practice are discussed [19]. Examining the business situation and its context in planning and under different circumstances are other major research topics. Quantitative comparative analysis of definite and fuzzy sets in business management to effectively compare the results and implications of starting a new business and improving the current business situation and providing the results to managers and analysis Expensive puts [20]. Modeling business management systems by fuzzy mapping is one of the most important approaches that is being developed. E-businesses, performance appraisal, appropriate business decision making, effective management of human resources in business, planning and investment processes are some of the main items that are properly analyzed in these models [21].

Designing and developing new business models with systemic approaches is one of the most important interests of researchers and business owners to prosper and improve the business environment. A practical approach in this field has been developed using a combination of decision-making models and fuzzy logic, and the result has been a new approach to business actors and appropriate decision-making in this field [22]. With advances in modern technology, the Internet population has increased year by year globally. For young customers who consider convenience and speed as prerequisites, online shopping has become a new type of consumption. In addition, business-to-customer (B2C) home delivery markets have taken shape gradually, because virtual stores have risen and developed, e.g. mail-order, TV marketing, e-commerce. To integrate the above statements, one study combines online shopping and home delivery, and attempts to use association rules to determine unknown bundling of

fresh products and non-fresh products in a hypermarket. Customers are then divided up in clusters by clustering analysis, and the catalog is design based on each of the cluster's consumption preferences. By this method, to increase the catalogue's attraction to customers, hypermarkets are offered an online shopping and home delivery business model for sales services and propositions. With such a model, we can expect to attract more customers open up more broad markets, and earn the higher profits for hypermarkets [23].

3. Data and Methodology

Numerous decision-making methods have been used to explain the characteristics and selection of portfolios, the oldest of which is the Simple Additive Weighting (SAW) method [24]. The SAW method is one of the simplest multi-criteria decision methods that selects the best option with a weighted average of the decision matrix values. The preferences of decision makers on indicators in this method are independent of each other [25].

First, with library studies and considering the opinions of 25 business experts, the two important dimensions that have been agreed upon in the business portfolio are the environmental conditions or the attractiveness of the relevant industry and the capability of the institution. The indicators of this matrix are selected based on strategy formulation models [26]. Then, by collecting the opinions of experts on the impact of each index on the two options of hypermarket and net market, decision matrices in each of these dimensions are extracted and the SAW method is applied to determine the value of the option. This effect is reported with qualitative variables in the range of very low, low, medium, high and very high (1 to 5).

Two methods can be considered to explain the uncertainty in the above decision. Either use the fuzzy SAW method or develop a fuzzy system in which the efficiency of the second method is more appropriate to determine the solutions and consequences. Fuzzy language descriptions (often called fuzzy systems, or more simply language descriptions) are common representations of systems that are constructed fuzzy if-then by rules. A linguistic variable is a variable whose identifiers or arguments are fuzzy numbers and, more generally, words expressed by fuzzy sets. Fuzzy numbers are fuzzy sets that are used when an implicit representation of uncertainty with numerical data is required. Fuzzy numbers have different shapes, in this study, triangular and trapezoidal fuzzy numbers have been used [27]. Fuzzy Toolbox, the latest professional version (R2016a) of MATLAB software, has been used to scientifically and effectively investigate this method and also to provide solutions in such situations. The inputs of this fuzzy system are two variables of environmental attractiveness and business capability. For each of these inputs, according to the value of the weighted score, the values 1 and 5 are defined as the boundary of the range, with trapezoidal fuzzy numbers and the rest of the numbers with a triangular fuzzy number. Note that a fuzzy triangular number is shown $\widetilde{M} = (l, m, u)$ and defined as follows:

$$\mu_{\widetilde{M}}(x) = \begin{cases} \frac{x-l}{m-l} & ; l < x \leq m \\ \frac{u-x}{u-m} & ; m < x \leq u \\ 0; & otherwise \end{cases} \quad (1)$$

Where l and u are the lower and upper bounds of the fuzzy number $\widetilde{M}$, respectively. In other words, the degree of membership in l and u is zero and in m its maximum value is 1. When this maximum value is an interval instead of a point, we have a trapezoidal fuzzy number [28]. Linguistic descriptions of these input variables with the software are shown in Figure (1).

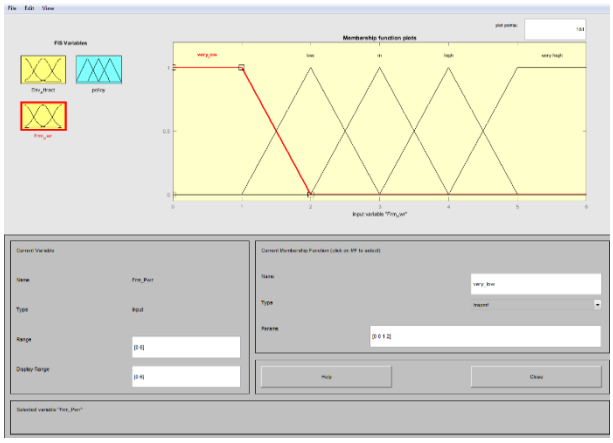

Fig. 1. Linguistic descriptions of input variables

The output of this system is a set of solutions that define business area policies in the portfolio matrix. The set of actions and decisions is also accompanied by some degree of uncertainty, and some of these decisions may overlap. These policies and decisions include [29]:

- Dissolve and eliminate existing business
- Selective reduction of some activities in the field of business
- Continue the status quo as before
- Selective growth and development of some units and business affairs
- Comprehensive growth and development by investing in new areas of business

The values defined in these measures, according to Figure (2), have been normalized in the range of zero and one, for example, 0.5 indicates a decision to continue the status quo, while 0.7 is definitely a decision on growth and development. Shows the selection and the value of 0.6 with an equal degree, explains the action to continue the status quo and selective growth.

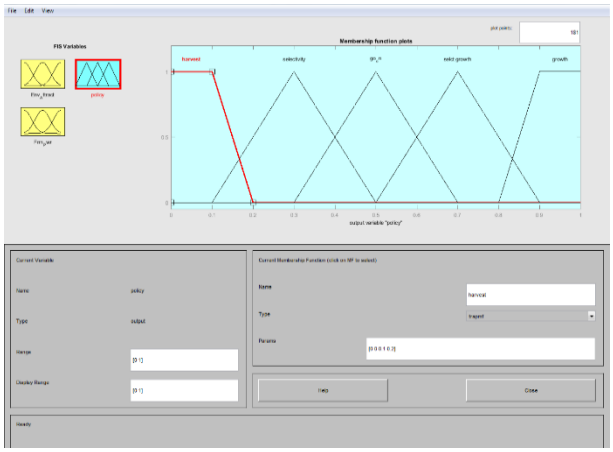

Fig. 2. Fuzzy normalized values

The most important part of a fuzzy system is the inference or processing engine. This is where the rules are defined and decisions are formed based on descriptive variables. These rules, as stated, are if ... then

... that the type of combination of variables in the introduction of these rules, is specified by the software. Consider a if-then rule containing two language variables, each on one side of the rule, such as: : If x is equal $\tilde{A}$, then y is equal $\tilde{B}$. Also, suppose the linguistic variables x and y take the values of $\tilde{A}$ and $\tilde{B}$, respectively. There are different forms of impulse relationships, the most important of which is the Mamdani minimum impulse operator, which was proposed by Mamdani in the 1970s and has many applications in fuzzy control and is defined as follows [30]:

$$\mu(x,y) = \mu_{\tilde{A}}(x) \wedge \mu_{B}(y) \quad (2)$$

Where μ indicates the degree of membership of the variable in the fuzzy set. We also used this method in this article. There are 25 rules defined in this process, some of which are:

- If the environmental attractiveness score is too low and the power of the institution is too low, it is a business liquidation action.
- If the environmental attractiveness score is low and the power of the institution is very high, action is taken to continue the status quo.
- If the environmental attractiveness score is normal and the capacity of the institution is very high, then some things are selected for development.
- If the environmental attractiveness score is very high and the power of the institution is very high, it is a comprehensive business development action.

4. Results and discussion

Based on the average frequency obtained from the range of applied opinions, Tables (1) and (2) determine these decision matrices, which as a specific scenario, the weights of the indicators are considered the same.

Table 1. Decision matrix of the institution's capability dimension, consensus of expert opinions and application of SAW method

institution's capability	Expert Manpower	Management Ability	Liquidity	Research & Development	Brand	Best Business Process	Optional value
Physical Retail	3.55	4.45	4.35	2.45	3.35	2.55	3.45
Virtual Retail	4.60	3.90	2.95	4.95	4.75	4.05	4.20

Table 2. Decision matrix of environmental attractiveness, consensus of expert opinions and application of SAW method

institution's capability	Market size	Market growth rate	Purchasing power	Inflation	Taxation	Labor rules	Technological requirements	Optional value
Physical Retail	3.95	4.06	3.76	4.47	4.06	3.94	3.41	3.95
Virtual Retail	4.72	3.22	3.52	2.49	2.40	2.28	4.85	3.35

What distinguishes the fuzzy system from other developed models is its fully managerial approach to making appropriate decisions. In this system, the inputs enter the system completely definitively and its output is completely definite. But what works as a black box is to turn these demands into fuzzy ones and determine their uncertainties and then present them to the corresponding output. The first output is related to explaining decisions based on rules in Figure (3). As can be seen, when the variables return to normal, the corresponding decision activates Rule 13, the corresponding decision of which is to continue the status quo (blue). The yellow triangles in the input variables also indicate in which of the following rules the normal state of the variables is satisfied.

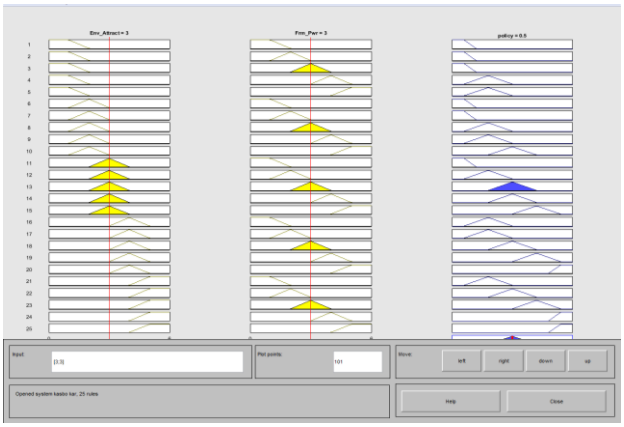

Fig. 3. Output explaining decisions based on rules

Now suppose that for one of the specialists, the weighted score related to the environmental attractiveness variable is 3.5 and the weighted score related to the capability variable of the institution is 2.5 (Fig. 4). In this system, we can easily enter these definite numbers and see a definite result for it to take effective action. But we note that the process of this problem is in the form of fuzzy explanation of the problem. As can be seen in this case, all the relevant triangles in the input variables are not completely satisfied (not completely yellowed), i.e. they have a degree of normal and high conditions together and as a result the relevant decision in The rules that have been activated indicate what decision needs to be made: of equal value, the declining choice of some business, or the continuation of the status quo. (According to the definite value of 0.4)

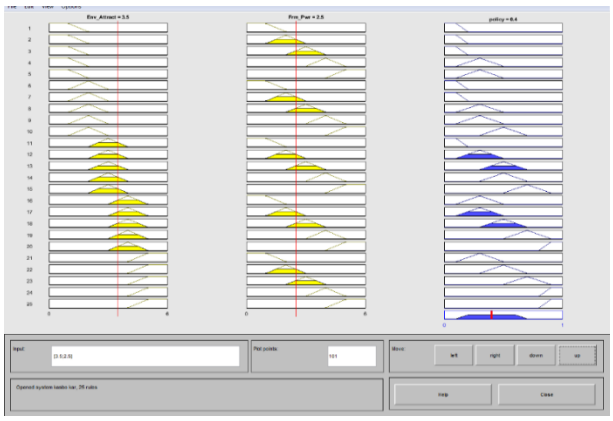

Fig. 4. Degree of satisfied conditions of decisions

According to Figure (5), according to the defined variables, with the minimum rules satisfied with an equal degree of two actions, the continuation of the current situation or the selective growth of important decisions in the field of physical retail business. According to Figure (6), which shows that virtual business policies are uncertain, unlike physical retailers, net markets have a better ability to do business in the future in the face of uncertainty, and by satisfying more rules, Even future comprehensive development decisions in these businesses can be a necessary step.

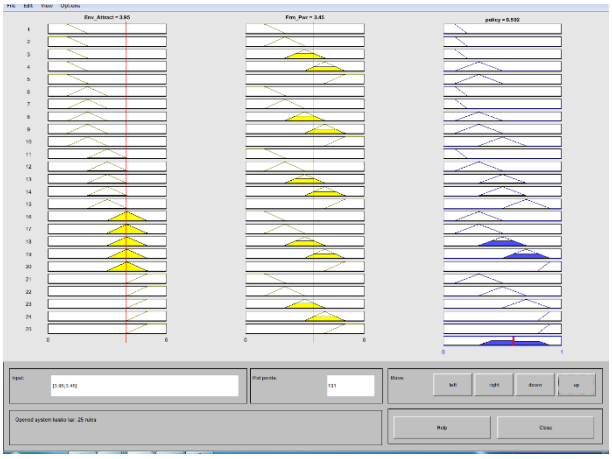

Fig. 5. Physical retail business actions

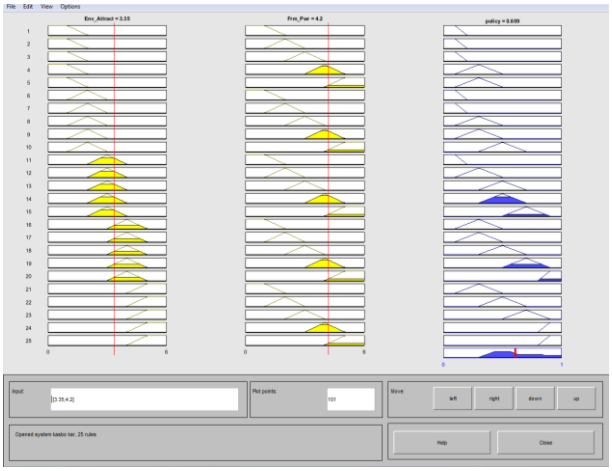

Fig. 6. Actions in the field of net market

5. Concluding remarks

At a glance, the most important factors that affect the business environment can be classified into political, social, economic, international, technological, legal factors, and ethical and value issues. According to the interviewees, the automotive industry, the main materials such as cement, food (all Iranian brands) have the opportunity to become competitive industries in the next two decades. Achieving this requires major improvements in productivity, investment in new equipment and technologies, and upgrading of management and workforce skills. On the other hand, tourism-related industries and businesses have great potential for 2050.

What is important is that many of these factors and conditions are in a state of uncertainty. In this article, we tried to examine these factors by interviewing and arranging a questionnaire, and based on previous studies, and explain their uncertainty in the portfolio matrix with fuzzy systems. As a clear result of this approach, we examined the two areas of retail business in physical terms (hypermarket) and Internet (net market). In the meantime, we first applied the multi-criteria decision-making method for these two options and with the simple weighted sum method, we calculated the value of the option for the two dimensions of environmental attractiveness and institution capability, and then fuzzy system to properly

explain portfolio strategies. For these two developments and we came to the conclusion that growth and development strategies in net markets have a high capability and given that these areas of business are less affected by the threat of strategic variables, their growth and development will be with higher potential.

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