

Export strategy in the context of coronavirus (COVID-19), Identifying drivers and critical success factors, Based on the study of active firms in Iranian ports and maritime industries

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ABSTRACT

The coronavirus (COVID-19) crisis, has put everything in a new and complicated situation. Businesses, especially exporters, have also been affected. The main objective of the present study is to investigate and prioritize the factors effective on the development of export strategy in the context of coronavirus (COVID-19), and to test this Phenomenon in the export firms of Iran through mixed method (qualitative-quantitative) research. To this end, 42 export firms were selected from Iranian ports and maritime industries as the statistical sample of the study and the data were gathered using questionnaire and interview and data analyzed with fuzzy Delphi methods and partial least squares technique. The research findings show that the most important inner firm factors effective on the export performance of Iranian firms in the context of the Corona crisis are: Firm's capabilities and resources; Managerial characteristics; Marketing capacity; Strategic capability and Company human resources. The research findings have led to the identification of vital export incentives and stimuli in critical situations and finally to the introduction of a new typology of factors tailored to critical situations that can be useful for empowering businesses in possible future crises.

1. Introduction

The coronavirus (COVID-19) has affected all aspects of human life, from individual and organizational, economic and social to political and cultural [1, 2]. And this epidemic has turned it into a phenomenon of the century [3, 4].

In business area, the virus has been affected all aspects so hard that it has shut down many companies around the world, forced some firms to decrease their human resources [5, 6, 7].

But in this frustrating situation, innovative companies have not left the scene and are thinking of creating opportunities from the imposed conditions. Using the capacity for innovation, think about creating value for existing customer conditions [6, 8].

On the one hand, There are many complexities and certain ambiguities threatening the exporters if, they decide to enter into foreign markets due to the current unpleasant condition of the world economy. In fact, they have to encounter and cope with certain challenges some of which are the followings: the coronavirus crisis, severe competition in the field of business, the risks existing in some developing markets, limitations

of financial resources, providing the raw material, wide changes occurring in the interests of markets, management of costs [9, 1, 10]. As a matter of fact, these are only a small part of the challenges of today's international business world.

The structural change of the world economy since 1980 has had a deserved effect on the competition among corporations, having completely transformed their strategic activity [11].

New global market conditions and widespread environmental changes, coupled with the demands of a new generation of customers, have led business firms to adopt new approaches. Strategic learning concept has led firms to adopt new strategies to overcome environmental uncertainty [9]. Therefore, firms are increasingly forced to try to survive through enhancing their market share in the market of foreign countries. Competition among firms throughout the world will get more and more severe as the World Trade develops. In such a condition, firms are forced to enhance their activity throughout the world or at least in the area beyond their national borders.

On the other hand, to improve export performance is considered by the policy-makers in the field of economy as a main element effective on the national income of each country. In fact, through improvement of export, countries can achieve the following goals: stable growth of economy, reduction of unemployment, and social justice. Moreover, the phenomenon (i.e. improvement of export performance) can play a significant role in equalizing the balance of payments and increase of the countries' resources.

A great deal of research has in the past been done in different countries regarding the factors effective on the development of stable export. In general, two factors have been introduced to be important to this end including inner-firm and outer-firm factors [12, 13].

In critical situations such as the present, many questions arise in the minds of business researchers. In a crisis like the coronavirus, how do business managers view foreign markets?

On what axes is their strategic focus more? What are the critical success factors of firm performance in critical situations?

Although numerous studies have been conducted on the sustainable export performance of firms and the factors affecting it [14, 15, 2, 8], but this issue in the context of critical conditions such as the Covid 19 virus (Corona) requires new and contingent research specific to these conditions.

Firms active in Iran's maritime industry as a value chain, play an important role in developing the country's export performance, currency appreciation in sensitive sanctions conditions and job creation for the young and educated generation.

Examining the status of firms operating in critical situations such as the Covid virus 19 and how to manage the situation and the degree of innovativeness of senior managers in the field of exports can be effective in improving the performance of other firms and also identifying the weaknesses of firms.

Therefore, the present research is aimed to investigate inner-firm factors effective on the development of stable export in critical situations and then to prioritize such factors. Apart from filling some part of the existing gap, the findings can pave the way for policy makers in the area of export inside the country. The results can also be beneficial for subsequent research to be done in this field. In the present study, we will combine the views of successful managers with university professors with a high level of familiarity with the industry, and as a result, we will present innovative findings to introduce successful export strategies in critical situations.

2. Theoretical background of the research

The corona virus has affected the lives of almost all people everywhere in the world and has led to new lifestyles in all areas. In the field of business, the virus

has imposed new conditions on businesses and has brought about many changes and developments [16, 17, 18, 19].

Accordingly, businesses and their senior executives are thinking of taking advantage of the opportunities at the heart of this crisis to better meet the needs and wants of their customers [20, 21, 22].

One of the main factors and indices which are highly important for the economic growth of each country, especially in today's trembling world is 'stable export'. As a matter of fact, a first step that should be taken toward stable export is to recognize the factors effective on it. The results of the previous studies in this area are all indicative of the existence of two types of factors which are considered highly important and effective on the development of export.

In his classification, Leonidou [12] has divided the factors effective on stable export into two types of factors:

The first type: environmental factors. Such factors are called environmental because they can hardly, or at most restrictively, be controlled by exporters. Among these factors are the ones related to macro economy; social, physical, cultural factors, and political aspects. A simple example for such factors is: the elements related to industry which influences firm's export behavior and performance. The second type: the factors at the level of firm or corporation. They are also referred to as organizational factors and consist of structural and behavioral factors occurring inside the firm which have a potential influence on export performance.

In another classification, other researchers [23] have divided the factors effective on export performance into two types including internal and external factors, for which they have introduced two types of theories including 'resource-based theory' and 'industrial organization theory'. While the industrial organization attitude can be particularly helpful to explain the economic performance of exporters, the effect of internationalization process on internal factors (resource theory) can also be beneficial as the main incentives for such a process. In other words, having access to facilities, knowledge about market, physical distance, management's attitudes and perceptions, and many other capacities are all among the many internal factors effective on the development of export [24].

In a pervasive model, other researchers have also examined the factors effective on the development of export. In his research they have divided these factors into the three following groups [25, 26, 27, 28, 29]:

- Firm's capabilities and resources
- Managerial characteristics
- Attitudes and perceptions of management

Having studied the research done in the area of export and international trade, the factors effective on the

success of exporting firms in world markets can be classified as follows:

Based on the findings of some studies, there are three general factors effective on the development of export performance including: structural factors, managerial factors and export obstacles and incentives [30,31, 19, 32, 33, 34, 35, 36].

Structural factors consist of firm's size, age, managerial system, the state of its technology and structure, the position of research and progress in the firm, innovativeness, etc. [13, 36, 14, 37].

Managerial factors usually refer to the entrepreneurial and managerial characteristics of the supreme management team and those who are responsible for making decisions in a critical situation. Such factors consist of the expected profitability of export performance, attitude towards risk and costs, education level and experience of management team, etc. [38, 32, 39, 40]. And the role of small, creative and flexible enterprises in this situation is undeniable [41, 42, 43].

Another point is that members of a value chain in critical situations move towards more cooperation to use innovative strategies [33, 44, 45, 46, 47]. And all members of the value chain, like members of a family, find greater adaptation to the new wants and needs of customers, especially in foreign markets, by making greater use of the strategy of cooperation and reducing competitive areas within the chain (48, 49, 50, 51).

The obstacles and incentives for export are competition pressure, internal negative trends, accessibility to information, etc. [52, 38, 53, 54, 55].

Cavusgil and Naor (1987), in their research showed that firm size has positive effect on export performance. Hart and Tzokas [56], however, in their study reported that success in export performance is not specifically influenced by firm size. Some studies have also reported that firm size has so little impact on export performance [57, 58].

Capital power is among the most important financial determinants effective on the development of export performance whose positive impact has been shown in most studies in this area [59, 60, 61, 62].

In general, based on the results from numerous studies done in the area of the factors effective on export performance and as far as effectiveness on export performance is concerned, the most important variables in inner-firm spectrum can be classified into three general categories:

Marketing factors: market research, market information, marketing advertisement, marketing strategies, and attendance in international exhibits are among the most important variables effective on export performance. [63, 64, 65, 66, 45, 67, 68, 69, 70].

Financial factors: capital power, benefiting from circulating capital and management of financial resources are introduced as the most important financial variables effective on the development of export performance [71, 72, 66, 73].

Managerial power: the attitude of supreme managers towards risk, organizational learning, organization profitability, supreme managers' education level and their field of study, export commitment of supreme managers' team, technology and IT, the experience and knowledge of supreme managers' team in foreign markets and international trading, creativity and the status of export in the culture dominant over organization are introduced as the most significant variables effective on the development of export performance (74, 80, 79, 66).

In a study investigating the relationship between innovation and firm export behavior, [45] showed that innovation, which was formerly assessed by the research and progress costs, is a key element effective on the growth of export performance.

Other researchers [81] showed that the ratio of research and progress costs to sale has a direct impact on firm's export performance. In their model, export performance had been examined by the ratio of export to total sale.

Lages et al [41] in their model showed that the cost of research and progress is an important factor effective on the export performance of small and medium-sized firms. The variable, however, does not lead so much to competitive advantage in high-tech enterprises. In fact, the effect of the variable "research and progress costs" on export performance is shown in other research models, too. Based on the findings of such models, the cost of research and progress is an important factor increasing the probability of firm's entrance into foreign markets and eventually the increase of export share from the total sale [82, 83].

3. Research methodology

The steps for Cavusgil and Zou [19]; collecting and analyzing data, or the process for doing research in general, are shown below. In the first part of the work, a review of the literature was used to identify new business strategies and an initial set of strategies was developed.

Then the interview protocol was designed and after identifying Iranian maritime industry value chain, 42 firms were selected through purposeful sampling for interview. The interviews were semi-structured and the senior managers of the firms were selected for the interviews. The research method used in this study is multiple case study and for data analysis, theme analysis method was used as analysis tool. Fuzzy Delphi technique has also been used after identifying the main themes to objectify them and increase its validity and reliability. In other words, the main themes

extracted from the interviews were distributed through a questionnaire among exporter firms.

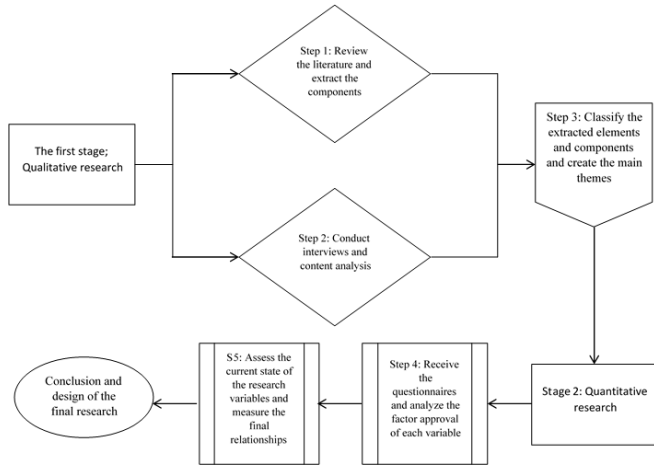


Figure 1. Research method and implementation steps

The statistical population of the study includes all companies that operated in the value chain of Iran's marine industry in 2019 and 2020 and their service or product has led to the export of this industry to foreign markets. Therefore, the first task in this sector was to identify the value chain in the industry, which eventually led to the figure 2. Value chain identification was performed based on interviews with senior industry executives and related academic professors (consultants and industry researchers).

The statistical sample of the research was selected from the statistical population and in the qualitative part of the research, purposive sampling method was used and 42 aquaculture exporting companies were selected. Theoretical sampling is a type of purposeful sampling that helps the researcher to create or discover a theory or concepts whose theoretical connection with the evolving theory has been proven. In theoretical sampling, events are sampled, not necessarily from individuals, if we go to individuals with the aim of exploring events, events that represent various themes related to the phenomenon under study. In the qualitative part, semi-structured interviews were conducted with the managers of 42 exporting companies and 12 university professors related to the mentioned industry. Also, in the quantitative part, 106 university administrators and professors were examined as a statistical sample

The research has been conducted with multiple methodology in such a way that in the qualitative part of the research, it has been studied using the case study method of aquatic exporting companies. Accordingly, theme analysis has been used to analyze the research data in the qualitative part, and in the quantitative part, three techniques include; Fuzzy Delphi technique, interpretive structural method and partial least squares are used. The reason for using these three techniques is that for screening themes identified in the qualitative section, a suitable technique introduced is the fuzzy

Delphi method. On the other hand, in the next stage of the research, in order to determine the level of readiness of firms, as well as the effectiveness and effectiveness of the existing infrastructure of innovation programs, a method is needed that the structural-interpretive technique does well.

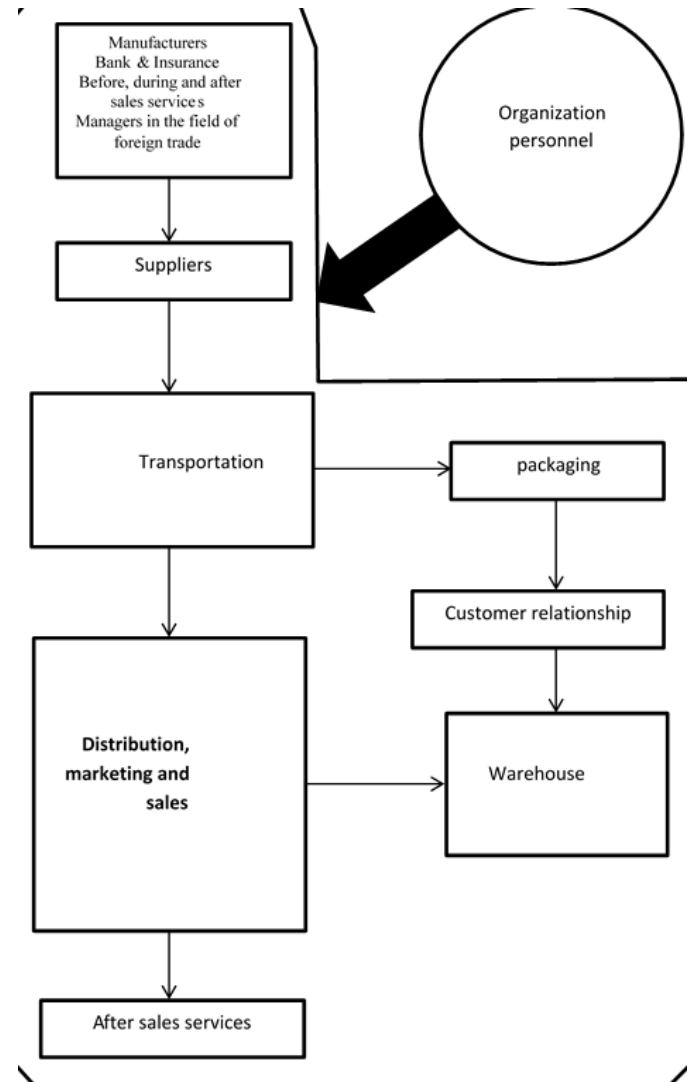


Figure 2. Marine and aquatic industry value

Finally, considering that a general framework of innovative strategies has been presented, a method for confirming the relationships between the introduced indicators or in other words, final approval of the model and validation of the presented indicators and relationships (validity and reliability) is needed. Jizi has done this. Therefore, with the multiple methodology used in the present study, the validity of the final model presented increases the research. The first step of the present study was performed using a qualitative research method. One of the methods of qualitative data analysis or qualitative content analysis is the method of theme analysis. Team analysis is a way to determine, analyze and express the patterns (themes) in the data. This method at least organizes the data and describes it in detail. But it can go beyond this and interpret different aspects of the research topic.

Qualitative data analysis in this study was performed by theme analysis method. Fuzzy Delphi technique will be used to screen early indicators. To fuzzy the view of experts, a spectrum of seven degrees is used according to the table below.

Table 1. Seven fuzzy degrees for evaluating indicators

Completely insignificant	Very insignificant	Insignificant	medium	significant	Very significant	Completely significant
(0.9, 1, 1)	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.3, 0.5, 0.75)	(0.1, 0.3, 0.5)	(0, 0.1, 0.3)	(0, 0, 0.1)

In the next step, the fuzzy average of people's scores must be calculated. In fact, these aggregation methods are experimental methods that have been proposed by various researchers. For example, a conventional method for aggregating a set of triangular fuzzy numbers is considered to be minimum 1, mean m, and maximum u. In this study, we have used the fuzzy mean method. Fuzzy mean n Triangular fuzzy number will be calculated as follows:

$$\tilde{F}_{AVE} = (L, M, U) = \left(\frac{\sum l_i^k}{n}, \frac{\sum m_i^k}{n}, \frac{\sum u_i^k}{n} \right) \quad (1)$$

In this equation, the triangular fuzzy number, $\tilde{f}_i = (l_i^k, m_i^k, u_i^k)$, Fuzzy equivalent of expert view number k, Around the criteria i. Eventually, fuzzing will take place. The surface center method is used for de-fuzzing as follows:

$$DF_{ij} = \frac{[(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})]}{3} + l_{ij} \quad (2)$$

In this study, the tolerance threshold is considered 0.7. Therefore, the de-fuzzy value greater than 0.7 is acceptable and any index with a score above 0.7 is approved. It should be noted that the steps of using fuzzy technique for the present study are outlined in the figure 3.

Structural-interpretive modeling method can be used to analyze the relationship between multivariate properties defined for a problem (Warfield., 1974; Sage., 1997). Structural-interpretive modeling is a methodology for creating and understanding relationships between elements of a complex system. In other words, interpretive-structural modeling is an interactive process in which a set of different and related elements are structured in a comprehensive systematic model. ISM methodology helps to establish order in complex relationships between elements of a system. Structural-interpretive modeling helps to identify the internal relationships of variables, and a suitable technique for parsing and ISM can be to prioritize and analyze the effect of one variable on other variables. It can also prioritize and level the elements

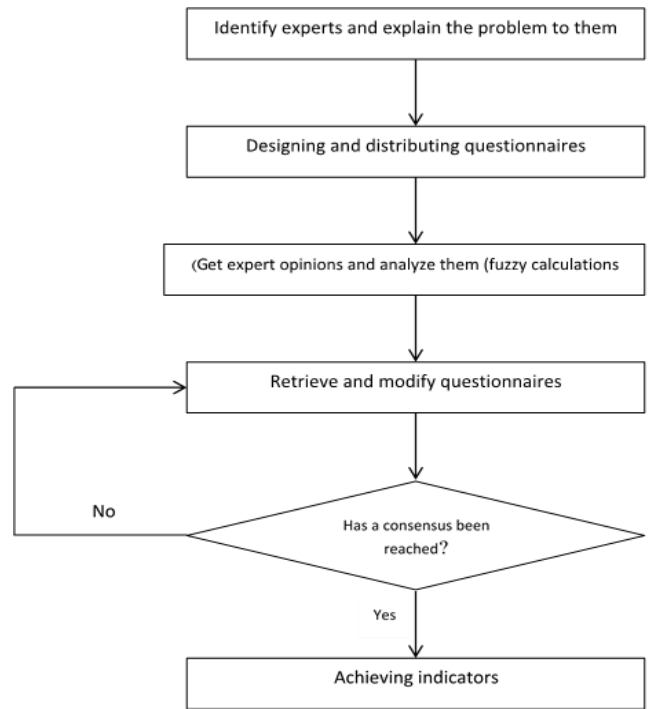


Figure 3. Steps to implement the fuzzy Delphi method (Hsueh et al., 2013)

of a system, which helps managers to better execute the designed model. Therefore, for the present study, which analyzes the relationships of members of the value chain on the coast and offshore, understanding the set of complexities between the elements of this chain can be made possible and facilitated by this method. In this model, after identifying the dimensions and characteristics of the study, the relationships between the dimensions and the identified indicators are analyzed using the conceptual relationship "leading to". The states and symbols used in this conceptual relationship are presented in Table 2.

Table 2. Signs used in designing a structural-interpretive model

O	X	A	V
Lack of relationship	Two-way relationship	The variable j affects i	The variable i affects j

A very important point is that the logic of interpretive structural modeling (ISM) works in accordance with the non-parametric method and is based on mod in frequencies. In this study, the output of the Demetel technique has been used to form the input matrix of the structural-interpretive model. One of the main reasons for the tendency to use the partial least squares technique is that this technique does not rely on the assumption that the statistical population is normal and also the sample size. In the present study, SmartPLS software has been used to solve partial least squares or PLS problems. Finally, the fit of the model is examined. The structural part of the model, unlike the measurement models, does not deal with the questions and observable variables of the model and only pays attention to the hidden variables and the relationships between them. In this research, structural model fitting

is used using coefficient of determination (R²), redundancy and finally GOF statistics.

4. Research Findings

In the qualitative part of the research, the following themes were identified in the critical factors of sustainable export success, key decisions and incentives for Covid 19 virus conditions. Theme analysis was performed based on the 6-step model of Clarke and Braun. (2006), the final findings of which are presented in the tables 3 & 4.

Table 3. Theme analysis of critical factors related to sustainable export success

Row	Basic themes	Comprehensive (main) themes
1	Company financial resources The technological capacity of the company The amount of working capital required	Firm's capabilities and resources
2	Demographic characteristics of management The main attitude and approach of management Financial knowledge and marketing management Level of risk management	Managerial characteristics
3	Company marketing budget Use of new marketing approaches Customer position in company marketing programs	Marketing capacity
4	Intra-firm relationships Inter-firm relations Network and industrial relations	Strategic capability
5	Personnel knowledge Staff training International personnel experiences Innovative staff ideas	Company human resources

After analyzing the theme, the identified themes were left to the experts and for this purpose, fuzzy Delphi technique was used. For the first round of the Delphi technique, managers with a bachelor's degree or higher and university professors related to the industry were selected and a questionnaire related to the items extracted from the theme analysis process was distributed among them. The views of 20 experts on each indicator are shown in the table 5.

Table 4. Key decisions and incentives for Success in Covid 19 virus conditions

Row	Basic themes	Comprehensive (main) themes
1	From the heart of the threats, it creates new opportunities. In crises, it quickly discovers new market needs and wants. Flexibility and innovation are two prominent features of the company's core strategy	opportunities Discovering
2	Always looking to make changes in products and services tailored to the new needs and wants of customers Reward system for presenting new and valuable ideas and suggestions	Innovativeness
3	Use the capacity to collaborate with other members of the value chain For quick response to new requests Strengthen the coordination and alignment capacity between different departments within the firm Receive new comments and ideas from the company's loyal customers in critical situations	Cooperation
4	Receive new comments and ideas from the company's expert staff through the quick suggestion system Empowering personnel through the use of the capacity of specialized personnel with a high level of knowledge Strengthen the creative capacity of staff through timely rewards and promotion of their organizational position	Company specialized personnel
5	Make more use of the capacity of the R&D team in critical situations Designing crisis-specific issues and presenting them to the R&D team to find practical solutions Prioritize the reports of the research and development team in critical situations and timely encourage the best solutions	Research and development team

Table 5. Fuzzy expert panel view for each of the research indicators

Fuzzy	Expert 1	Expert 2	Expert 3	...	Expert 20
Q01	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q02	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.3, 0.5, 0.75)	..	(0.9, 1, 1)
Q03	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	..	(0.75, 0.9, 1)

Q04	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	..	(0.75, 0.9, 1)
Q05	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	..	(0.9, 1, 1)
Q06	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	(0.9, 1, 1)	..	(0.5, 0.75, 0.9)
Q07	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q08	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	..	(0.9, 1, 1)
Q09	(0.5, 0.75, 0.9)	(0.3, 0.5, 0.75)	(0.5, 0.75, 0.9)	..	(0, 0, 0.1)
Q10	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	..	(0.9, 1, 1)
Q11	(0.1, 0.3, 0.5)	(0.75, 0.9, 1)	(0.9, 1, 1)	..	(0.5, 0.75, 0.9)
Q12	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q13	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	..	(0.9, 1, 1)
Q14	(0, 0, 0.1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	..	(0.75, 0.9, 1)
Q15	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	..	(0.9, 1, 1)
Q16	(0.9, 1, 1)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	..	(0.75, 0.9, 1)
Q17	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	..	(0.5, 0.75, 0.9)
Q18	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	..	(0.75, 0.9, 1)
Q19	(0.75, 0.9, 1)	(0.1, 0.3, 0.5)	(0, 0.1, 0.3)	..	(0.9, 1, 1)
Q20	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q21	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q22	(0.5, 0.75, 0.9)	(0.3, 0.5, 0.75)	(0.5, 0.75, 0.9)	..	(0, 0, 0.1)
Q23	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	..	(0.9, 1, 1)
Q24	(0.1, 0.3, 0.5)	(0.75, 0.9, 1)	(0.9, 1, 1)	..	(0.5, 0.75, 0.9)
Q25	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q26	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	..	(0.9, 1, 1)
Q27	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	..	(0.9, 1, 1)

Q28	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	(0.9, 1, 1)	..	(0.5, 0.75, 0.9)
Q29	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	..	(0.9, 1, 1)
Q30	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	..	(0.9, 1, 1)
Q31	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	..	(0.75, 0.9, 1)
Q32	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	..	(0.75, 0.9, 1)

The next step is to consolidate the views of experts. Various methods have been proposed to aggregate the n respondents' opinions. In fact, these aggregation methods are experimental methods that have been proposed by various researchers. For example, a conventional method for aggregating a set of triangular fuzzy numbers is the minimum l, the geometric mean m, and the maximum u.

$$F_{AGR} = (\min\{l\}, \prod\{m\}, \max\{u\}) \tag{3}$$

$$F_{AGR} = (\min\{l\}, \prod\{m\}, \max\{u\}) \tag{4}$$

$$F_{AVE} = \left(\left\{ \frac{\sum l}{n} \right\}, \left\{ \frac{\sum m}{n} \right\}, \left\{ \frac{\sum u}{n} \right\} \right) \tag{5}$$

Each triangular fuzzy number resulting from the aggregation of experts' views for the jth index is represented as follows:

$$\begin{aligned} \tau_j &= (L_j, M_j, U_j) \\ L_j &= \min_{i=1}^n (X_{ij}) \\ M_j &= \sqrt[n]{\prod_{i=1}^n (X_{ij})} \\ U_j &= \max_{i=1}^n (X_{ij}) \end{aligned} \tag{6}$$

- Index I, refers to an expert. So that;
- X_{ij}: The value of the i-th expert evaluation of the j-th criterion
- L_j: The minimum value of evaluations for the criterion j
- M_j: The geometric mean of the experts' assessment of the performance of the standard j
- U_j: The maximum value of evaluations for the criterion j

In this study, we have used the fuzzy mean method. It is usually possible to sum the sum of triangular and trapezoidal fuzzy numbers by a definite value which is the best corresponding mean. This operation is called de-fuzzing. There are several ways to de-fuzzy. In most cases, the following simple method is used for decapsulation;

$$x_m^1 = (L+M+U)/3 \tag{7}$$

In this study, the surface center method is used for de-fuzzing;

$$[(DF)]_{ij} = [(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})] / 3 + l_{ij} \quad (8)$$

The fuzzy mean and the de-fuzzy output are the values for the indices. A de-fuzzy value greater than 7 is acceptable, and any indicator with a score less than 7 is rejected.

Table 6. Results of screening indicators (first round)

Indicators	Bottom line	Probable value	Upper bound	Fuzzy average	Definitive amount	First round result
Item 1	0.584	0.834	0.93	(0.584, 0.834, 0.93)	0.785	Accepted
Item 2	0.649	0.740	0.91	(0.649, 0.740, 0.91)	0.766	Accepted
....
Item 32	0.599	0.701	0.90	(0.599, 0.701, 0.90)	0.736	Accepted

All items with a score of less than 7 have been removed. After reviewing the accepted indicators (all 32 items), in the second round, the questions related to the mentioned items were again asked by the experts in the second round after the corrections of the higher level (academic) experts. In this round, all items were accepted. So we could finish the Delphi rounds.

Table 7. Results of screening indicators (third round)

Indicators	Round 1 result	Round 2 result	Difference	Result
Item 1	0.785	0.798	0.013	Agreed
Item 2	0.766	0.787	0.021	Agreed
....
Item 32	0.736	0.801	0.065	Agreed

The next phase in this research is the use of ISM. Interpretive structural modeling (ISM) was introduced by Sage in 1977. This method classifies the factors and identifies the relationships between the criteria. The steps for performing an interpretive structural model are as follows: Determining effective indicators; SSIM Structural Interactive Matrix Development; Formation of achievement matrix; Segmentation of achievement matrices to different levels; Drawing a diagram of power - dependence and progress. All the above steps were performed and finally classified into three levels as described in the table below. In this section, the key factors and drivers of success along with the required

levels of innovation were classified into three main sections and approved by experts.

Table 8. Leveling of identified critical factors and drivers along with levels of innovation

Sub-bases	The main bases	New levels	Access set	Introduction Collection	Level
Managerial characteristics opportunities	Management factors	Organizational Innovation	F2-I1	I1-F2-F1	1
Discovering Strategic capability Research and development team Cooperation	Structural & strategic factors	Personnel innovation	F4-I5-I3	I4-F4-I3	2
Company human resources Company specialized personnel	Personnel factors	Managerial innovation	F5-I4	I4-F5-I2	3
Firm's capabilities and resources Marketing capabilities Innovativeness	Factors related to market conditions	Inter-firm innovation	F1-F3-I2	I2-F3-F1	4

Finally, GOF criterion was used to fit the research model. This criterion is related to the general part of structural equation models. This means that by this criterion, the researcher can control the overall section fit after examining the fit of the measurement part and the structural part of the general research model. The GOF criterion was introduced by Tenenhaus et al (2005).

$$GOF = \sqrt{Avg(Communalities) \times R^2} \quad (9)$$

Communalities is the mean of the common values of each structure and R ^ 2 is the mean value of the explained variance of the model's derivative structures. Three values of 0.1, 0.25, 0.36 have been introduced as weak, medium and strong values for GOF.

$$Avg(R^2) = 0.369$$

$$GOF = \sqrt{0.713 \times 0.369} = 0.513 \quad (10)$$

Table 9. Structural equation model path analysis

The effect		Path coefficient	Statistics . T
Factors	Factors specific to specific conditions		
Managerial characteristics	Organizational Innovation	0.563	4.625
opportunities Discovering		0.519	4.221
Strategic capability	Personnel innovation	0.580	4.728
Research and development team		0.539	4.311
Cooperation Company human resources	Managerial innovation	0.576	4.449
Company specialized personnel		0.511	4.09
Firm's capabilities and resources	Inter-firm innovation	0.613	4.27
Marketing capabilities		0.501	5.231
Innovativeness		0.629	5.311
		0.678	5.489

As can be seen, all the obtained path coefficients are higher than 0.5 and also the t-statistic related to each path coefficient is greater than 1.96. Therefore, all the assumed relationships (extracted from experts' opinions) between the critical factors, drivers and factors specific to the critical situation in the model are confirmed. In simpler terms, the designed classification of key success factors and the labels for specific conditions, such as the corona virus, have been approved. Another important point is that convergent validity has been calculated for the questionnaire items. Whenever one or more attributes are measured through two or more methods, the correlation between these measurements provides two important indicators of validity. If the correlation between the scores of the tests that measure a single characteristic is high, the questionnaire has convergent validity. The existence of this correlation is critical to ensuring that the test measures what needs to be measured. For convergent validity, the mean of extraction variance (AVE) and composite reliability (CR) were calculated and Cronbach's alpha of all variables was greater than 0.6. Therefore, the reliability of all variables has been confirmed at an acceptable level. Also, the mean value

of extracted variance (AVE) for all items of the numerical questionnaire is greater than 0.5. Therefore, convergent validity is also at a moderate to high level. In addition, the value of composite reliability (CR) is also greater than AVE, so the three necessary conditions to confirm the validity and reliability of the questionnaire items have been met and the designed questionnaire has been statistically validated. In other words, the questions designed in the questionnaire have well examined the situation desired by the researcher. The figures related to the above statistics are presented in the table 10.

As can be seen, the known vital factors, incentives as well as specific factors of critical conditions have been approved by experts and the relationship between factors and classification and typology has been confirmed and the validity and reliability of the items of the designed questionnaires have been confirmed. Highly approved.

Table 10. Convergent validity and reliability of research variables

Factors	Cronbach's alpha	AVE	CR
Managerial characteristics	0.823	0.685	0.825
opportunities Discovering	0.876	0.647	0.795
Strategic capability	0.799	0.654	0.811
Research and development team	0.811	0.679	0.748
Cooperation	0.748	0.643	0.783
Company human resources	0.801	0.650	0.739
Company specialized personnel	0.793	0.672	0.823
Firm's capabilities and resources	0.820	0.669	0.758
Marketing capabilities	0.808	0.648	0.844
Innovativeness	0.784	0.653	0.839

5. Discussion and conclusion

The present study dealt with investigating the inner firm factors effective on the development of stable export. The research model was formulated by identifying the critical success factors, incentives, and also by taking into account specific factors of critical conditions such as coronavirus 19 (coronavirus).

According to the research findings, the most important critical factors for the success of companies' export performance are:

- ✓ Firm's capabilities and resources
- ✓ Managerial characteristics
- ✓ Marketing capacity
- ✓ Strategic capability
- ✓ Company human resources

In addition, key incentives for critical situations such as the Covid 19 virus; as follows:

- ✓ Discovering opportunities
- ✓ Innovativeness

- ✓ Cooperation
- ✓ Company specialized personnel
- ✓ Research and development team

Another important finding of the present study, which according to the authors is research innovation; providing a simultaneous combination of critical success factors and specific incentives and innovations is a critical condition for achieving a sustainable export performance. Based on the relationships identified between these factors, four categories of innovation were finally identified and approved by experts at both managerial and academic levels. It placed. Accordingly, the new typology is introduced as follows.

- ❖ Organizational Innovation
- ❖ Personnel innovation
- ❖ Managerial innovation
- ❖ Inter-firm innovation

Therefore, in order to respond promptly and quickly to environmental changes in critical situations such as the Corona virus, it is necessary for businesses to be empowered in these four levels of innovation (organizational, personnel, managerial and inter-firm). Moreover, the findings of the study showed that there is a direct relationship between management's risk-taking behavior (i.e. the amount to which they accept risk) and firms' export performance. In other words, the amount to which managers accept risk and adopt entrepreneurship behavior, is a factor effective on firms' export performance. In fact, the more managers adopt a risk-taking personality and the more creative persons they are, the more they'll decide to seek for generating an environment which leads to the offering of new ideas and attendance in new markets. The most significant of all, the creative personality of manager will in itself be an effective factor that provides the staff with incentives to participate more in the decision makings of the firm, hence leading them to become more satisfied with their jobs. This, in the end, will improve the performance of firm.

With respect to the attitude of management towards export, it is necessary to maintain that managers' knowledge about export is directly related to export performance. As a matter of fact, the more the managers are aware of export performance (i.e. the more they are familiar with the principles and concepts of export), the more export performance of the firm will improve. Moreover, based on the results, the findings of the Critical Success Factors are consistent with many studies done in this area [12, 19, 84, 85, 20].

And in the section of special incentives for critical situations, the research findings are in line with the research results of Bini et al (2018); [86, 87].

6. Research suggestions

Based on the research findings, the proposed research package and policy of the present study have been designed in two levels;

At the first level, the government and government agencies related to economics and business enterprises and organizations related to crisis management, it is necessary to design new training for managers and other personnel categories on empowering businesses to deal with crisis situations.

At the enterprise level, too, senior managers are needed to empower critical situations at all four levels; Organize organizational, managerial, personnel and inter-enterprise, and include the necessary culture-building in preparation for future crisis situations and discovering opportunities from potential crises as part of the organization's strategies.

An important point, based on the findings of the present study, is the need to focus on innovation to manage crises such as the Corona virus, which requires senior executives to work towards comprehensive empowerment at all four levels.

7. Research Limitations

The main limitation of the present study was its implementation in the corona situation in 2020. Due to social constraints such as maintaining physical distance, researchers were forced to interview the statistical sample through video conferencing with virtual tools such as WhatsApp, etc.

Another point is the combination of the opinions of business managers with university professors that the research team had to select managers with higher university education at this level, which ultimately allows the combination of opinions. In addition, we added a round to the steps of the fuzzy Delphi technique, in which the opinions of both groups and their combinations were returned to the members of the statistical sample (managers and professors) and after their desired corrections were approved.

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