Caspian J Intern Med 2020; 11(Suppl1):S501-511
DOI: 10.22088/cjim.11.0.501

Original Article

Preventing the frequency of infectious diseases in vulnerable groups - by anticipating the role of actors in implementing the decision-making model in conditions of uncertainty pandemic experience Covid-19

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Received: 20 June 2020
Revised: 1 Aug 2020
Accepted: 2 Aug 2020

Abstract

Background: The purpose of this study was to prevent the prevalence of infectious diseases in vulnerable groups by anticipating the role of actors in implementing decision-making models in conditions of uncertainty in medical universities.

Methods: This research is an applied research by combining qualitative and quantitative methods based on the foundation data theory (Grand Theory). To determine the dimensions of the model, the statistical population included crisis management managers and faculty members of Mazandaran University of Medical Sciences. The data collection was done through targeted sampling and interviews, semi-structured interviews, analysis and coding methods. The statistical population to present the model includes senior and middle managers of Mazandaran University of Medical Sciences. The simple random sampling method based on the sample size was determined by Cochran's method, and the collected data from the researcher's questionnaire were analyzed through nonparametric statistical experiments, Kolmogorov test Smirnov, SPSS SMARTPLS, Excel and the method of modeling structural equations with the least squares approach has been partial.

Results: The path coefficient of each dimension in explaining the decision model in uncertainty conditions based on T statistic and p value and SRMR value was 0.137, which was a good value and the main actors in implementing the model were policymakers, managers and staff.

Conclusion: The implementation of this model will lead to a change in the decisions made by health system authorities in conditions of uncertainty, and will increase the ability of Head of medical universities and the resilience of the health system.

Keywords: Covid-19, Decision making Model, Uncertainty, Grand Theory, University of Medical Sciences, vulnerable groups

Citation:
Hashemi Amree M, Enayati T,Salehi M. Preventing the frequency of infectious diseases in vulnerable groups - by anticipating the role of actors in implementing the decision-making model in conditions of uncertainty pandemic experience Covid-19. Caspian J Intern Med 2020; 11(Suppl 1): S501-511.

With the onset of 19 COVID in China and its spread to all continents of the world, the World Health Organization (WHO) announced a pandemic over the years (1). The Corona epidemic has had far-reaching implications for human safety and public health around the world, and has deeply shaken the global system. The Corona epidemic has disrupted two key systems, such as the global economy and global security. The shaking of these two pillars can directly affect the future formation of the world system. The first individual-level resistance will be experienced through national economies. Thanks to the preventive measures, strong economies will not have a shortage of money, but fluctuations in the global economy will deepen the great economic damage in the future.

Weak economies, however, will not have much to lose. The second test will be in the field of social and individual psychology. With increasing fear in the community and the damage caused by the outbreak of corona disease, social unrest and political crises will arise, which can lead to chaos. The third test will be based on the resilience of governments. Countries that have been institutionalized, have strong standard procedures, and have a sturdy and rapid decision-making mechanization that will help them to face less damage during this period; But weak countries will be further weakened and may even become helpless (2). This disease goes beyond a health crisis. One of the characteristics of this disease, which distinguishes it from the previous disasters, is the uncertainty and instability of the condition of this disease (3).

Decision makers in this situation do not usually have access to all the information about the options ahead, and are often under time pressure (4). At any stage of the decision-making process, misconceptions, deviations, and thinking traps can affect the choices made (5). The educational and research institutes with new paradigms and procedures can in fact change the destiny of all human beings in the world community. The core of this destiny is usually set by the universities, as the engine of science; research and technology have created new expectations of academics as theorists, current makers, globalizers, and accelerators of new sciences and programs (6).

Mazandaran University of Medical Sciences and Health Services, in line with the macro policies of the Ministry of Health, is the main custodian of the health of the population, covering from Ramsar in the west to Galogah in the east of the province. This academic center attempts to take steps to achieve its ultimate goal, which is the highest level of health of the people of the province, by relying on scientific justice, technical experience, honesty, and perseverance and diligence of its employees, believing in justice-oriented and satisfied stakeholders.

The issue of efficiency in using existing resources along with achieving maximum results and work is of paramount importance, and this will not be achieved without reforming and improving the various processes of the university and thus meeting the expectations of customers and stakeholders and creating value through this path (7). That is why decision making has become the most important and complex management knowledge (8). Due to the complexity and sensitivity of the goals set and the growing expectations of society from managers in this field in various management categories, Medical Sciences universities and Health services in line with the macro policies of the Ministry of Health must constantly seek to find ways to make decisions. We have to assure their accuracy as decision-making and choice of ways to meet basic human needs is complex in terms of health, nutrition, and education (10). For this reason, conceptual models are used to make decisions in medicine in the field of thematic critique and analysis (11).

Such decisions are also a structured, ongoing, and evolving process, and significant research is being done to understand the best decision-making processes (12). Now, considering the inherent duties of universities as a vital and important lever in providing health services in the region, and the importance of decision-making methods of managers in advancing programs, the researcher seeks to answer the following questions:

-What are the dimensions, components and decision indicators of managers in the face of uncertainty to prevent the frequency of infectious diseases in vulnerable groups?

-What is the model of each dimension of managers' decision-making in conditions of uncertainty to prevent the frequency of infectious internal diseases in vulnerable groups?

-What is the general decision-making model of managers in uncertain situations to prevent the frequency of infectious diseases in vulnerable groups?

-Who are the actors in implementing decision-making in uncertain situations to prevent the prevalence of infectious internal diseases in vulnerable groups?

-What is the role of actors in implementing the decision-making model in uncertain situations to prevent the prevalence of infectious internal diseases in vulnerable groups?

Methods

This research, in terms of practical purpose and method, is a combination of qualitative methods based on foundation data theory and quantitative method, descriptive analytical (non-experimental) research method (IR.IAU.SARI.REC.1399.003). The first stage of this research is in the framework of a qualitative approach using the Foundation's data theory (Grand Theory), which is both a tool for creating theory and a method for conducting qualitative research; and indicators, components, and dimensions of managers' decision-making in situations of

uncertainty through semi-structured and purposeful interviews that were the basis for compiling the questionnaire for the second phase of the research. To determine the position for model implementation, the prevailing beliefs, assumptions, crisis trends, and possible outcomes in the organization's work environment and the actors who play roles in situations were identified based on upstream documents and development indicators.

Statistical population and sample size: In the qualitative section, including the deputies and heads of the General Directorate of Crisis Management, the faculty members of the universities of Medical Sciences were interviewed using targeted and non-random sampling methods to reach saturation and information enrichment. In a short period of time, the statistical population of managers of the central headquarters of the university, managers of health and medical networks, heads and managers of Mazandaran medical sciences hospitals were determined as 185 people. Using Cochran's sampling method, the sample size was 125 people, and the questionnaire was completed by random sampling.

To determine the position, the research community included university administrators, faculty members, and health policy makers who were randomly selected for interviews with 10 members. At the stage of determining the role of actors, managers, faculty members, staff and executive experts, clients, NGO groups, policy makers and the university's board of trustees, 62 people were appointed. They were randomly assigned to complete the questionnaire. Data collection tools in the qualitative section were semi-structured interviews. To measure the reliability from the total number of interviews, 5 interviews were randomly selected and coded by another coder within 20 days. The codes were then compared in two-time intervals for each of the interviews, and through the amount of agreements and disagreements in the two coding stages, the stability index was calculated for it and confirmed with 64 reliability (13).

In the quantitative section, based on the dimensions, components and indicators extracted from the qualitative section, and according to the theoretical foundations, the researcher-made questionnaire contains 6 demographic questions. Out of 28 questions related to 6 components of organizational readiness, 13 questions were based on 4 components of the second dimension of environmental analysis, 13 questions were based on 3 components of the third dimension, and 15 questions were based on 4 components of the fourth dimension and closed type, on a 5-option Likert scale. Qualitative analysis of content validity and formal validity were performed based on the opinion of management experts (14). Content validation was performed quantitatively using the relative content validity Ratio (CVR). To determine this coefficient, 13 experts in the field of medical sciences were asked to validate the questionnaire and 10 questionnaires were prepared. According to the Lowshe table, the CVR for each question must be greater than 0.62 to validate the content validity (15). Except for three questions, the rest got 0.8. The CVI content validity index was determined, which should be higher than 0.79 for each item to confirm the validity of the scale content. In this study, 0.79 was obtained and approved for each question (16).

Statistical analysis: In the qualitative part, open coding was used to convert data into concepts and central coding to link between categories, development of main categories and determination and allocation of sub-categories. In a small section of the tables, frequency distribution, mean, percentage, standard deviation were used to describe the data, and the Kalmogorov-Smirnov test was used to determine whether the data distribution was normal. Based on the significance level of 0.05, nonparametric tests were used in this study. Inferential analysis was used by modeling structural equations with partial least squares approach Partial Least Squares-Structural Equation Modeling (PLS-SEM). According to the measurement models, the fits of the structural model and the general model were performed. To fit the measurement models, three criteria of PLS reliability (17) using factor load coefficients (criterion of suitability of factor load factors 0.4), Cronbach's alpha coefficients and combined reliability (CR) (combined reliability value more than 0.7) were measured (18).

Then, convergent validity was measured by the mean of extraction variances (more than 0.5) and convergent validity was measured by comparing the AVE square with the correlation between latent variables. Then, the structural model of the research was adjusted based on the use of T coefficients (this coefficient was more than 1.96 or the equivalent of p value less than 0.05). Using SMART PLS, the verification of hidden variables was performed, and finally, the overall model survey, in which the SRMR value of the root mean of the remaining standard squares was standardized; it was an approximate value of the model fit. To predict the role of actors, the situations designed based on frequency distribution were determined.

Results

In the qualitative section on the nominal gender variable, all 23 interviewees were males. Five people between the ages of 41 and 50 (21.73%), six graduates (26.1), 17 (71/91) subjects with doctorate, and all 23 (100%) with more than 20 years of service. In a small section to confirm the dimensions, out of 120 respondents, 103(85.83%) were males and 17(14.17%) were females. In this study, age was classified into 56 people aged 31 to 40 years (46.67%), 51 between 41 and 50 years (42.50 %) and 13 (10.83%) over 50 years. In connection with education, 15 people had masters degree (12.50%) and 105 (87.50%) had doctoral degree. And in relation to service experience, 28 (33.33%) individuals had 11 to 15 years of service, 65(54.17%) with 16 to 20 years and 27(22.550%) with more than 20 years of service experience. In the position determination section, all 10 men were 41 to 50 years old, and had a doctoral degree with more than 20 years of service. In the section determining the role of actors, out of 62 participants in the survey, in 34(54.83%)men and 26 (41.93%)women, 38 (61.3%)received doctoral degree, 18 (29.03) got masters degree while 4(6.45%)people had a bachelor's degree. The first question of the research: What are the dimensions, components and decision-making indicators in situations of uncertainty to prevent the frequency of infectious internal diseases in vulnerable groups?

Using the data coding method, the interviews were extracted in two steps: 4 Dimentions, 28 components and 69 indicators are as follows.

The first dimension, organizational readiness with 6 components and 28 indicators, the second dimension, environmental analysis with 4 components and 13 indicators, the third dimension, creating a scenario with 3 components and 13 indicators, the fourth dimension, moving from scenario to decision and updating scenario with 4 components and 15 indicators were extracted to make managers' decisions in uncertainty.

Table 1: Dimensions and Components of Managers' Decision Making in Uncertainty

Dimensions	Component	Indicators
Organizational readiness	Develop and describe a topic to be addressed in the organization	Indicators of row1 Table 2
	Gain manager understanding, support and involvement	Indicators of row 2 Table 2
	Focus on thinking about the future	Indicators of row 3 Table 2
	Process design	Indicators of row 4 Table 2
	Facilitator Selection (Ongoing guidance on the possibility of a future event)	Indicators of row 5 Table 2
	Shaping scenarios	Indicators of row 6 Table 2
Environmental Analysis	Monitoring (careful tracking of events that occur and observing guides and warnings)	Indicators of row 7 Table 2
	Early warning system scan (discover and track new trends)	Indicators of row 8 Table 2
	Strategy Development	Indicators of row 9 Table 2
	Planning for Caution fully situations	Indicators of row 10 Table 2
Creating scenarios	Assess the importance and predictability of propulsion forces	Indicators of row 12 Table 2
	Scenario writing	Indicators of row 13 Table 2
	Scenario logic	Indicators of row 14 Table 2
Moving from scenario to decision and Updating scenarios	Achieve decision recommendations	Indicators of row 15 Table 2
	Identifying guides to monitor decisions	Indicators of row 16 Table 2
	Promote decision outcomes	Indicators of row 17 Table 2
	Targeting and customizing scenarios	Indicators of row 18 Table 2

Table 2: Indicators of Managers' Decision Making in Uncertainty

row	Indicators
1	Expressing the needs of dealing with uncertainty in the external environment, identifying the consequences of a crisis for the organization, identifying and expressing the costs of underdevelopment, better understanding the potential of the organization, communicating open and open debate in the organization, expressing assumptions, forecasts, Most likely, express the impact of losing the opportunity window
2	Focus on the project, professional competencies in the area of responsibility, acceptance of responsibility, correction of misconceptions of the decision-making process, experience sharing
3	Investigating and analyzing trends, imagining, communicating with the imagination, giving time to the imagination (scenario)
4	Strengthening the abilities of the human mind, fast processing within different data sets, discovering patterns through the volume of information, providing a powerful and effective tool for combining the different perspectives needed
5	The continuity and dynamics of the process, the development of new approaches when faced with deadlock, the continuing challenge of causal logic, the embarrassment and incitement of controversial issues.
6	Define uncertainties, strategic implications of scenarios, develop a set of future scenarios
7	Collecting field information, searching for published or unpublished sources, analyzing, comparing, publishing results
8	Search for signs of new developments from any source (threats to powers, threats to alternative products or services), identify patterns, and view links between seemingly unrelated developments
9	Save actions, learn more about how events happen
10	The flexibility of strategies, the development of options and alternatives, the likelihood of scenarios
11	The magnitude of the impact of each force in shaping the future of decision-makers, the extent of its importance in determining the difference between scenarios Determining the level of uncertainty (high, medium, low) in the future estimation of each force
12	Including all or most of the forces impacting the high uncertainty environment, addressing the uncertainty set in a way that distinguishes scenarios, naming scenarios
13	Accurate and up-to-date scenario adjustment, scenario correction or adjustment steps, re-decision, re-release decision-making
14	Scenario believability (following logical boundaries, logical coherence, usefulness of scenarios, challenging the future (idea for thought), encouraging future decision making, comparing scenarios promoting decision outcomes
15	Revealing progress toward goals, presenting plans and decisions, identifying tools of success using current tools and identifying gaps, reviewing resources (how to use people, money, and time), how to develop organizational capabilities to build resources.
16	Examine decision timeframe, evaluate information trust, estimate system cost for decision making in each scenario
17	Prepare staff for promotion, review urgency for decision, promote and exchange decisions
18	Accurate and up-to-date adjustment of scenarios, steps for correcting or adjusting scenarios, re-decision, re-publication of decision-making

Out of 69 designated indicators, 3 indicators of raising awareness in terms of organizational readiness, stakeholder behavior prediction index in terms of environmental analysis and index of employee participation in terms of creating CVR scenario gained less than 0.62 and were eliminated.

The second question of the research: What is the model of each dimension of decision making in situations of uncertainty to prevent the frequency of infectious internal diseases in vulnerable groups?

Based on the first step of fitting the model, that is, fitting the measurement model, the reliability of each dimension was performed in the PLS method. For the first dimension (organizational readiness), the 4 indicators from 27 indicators were as follows; consequences of a crisis, professional competencies, open discussion in the organizational environment and the design of new approach. For the second dimension (environmental analysis), 4 indicators out of 12 indicators were as follows: The third dimension was focused on the need to search for published or undisclosed information sources, the need to compare the results of the analysis, identifying the pattern, and observing the relationships between seemingly unrelated developments (Creating a scenario). One of the 12 indicators were as follows: scenario comparison table for the fourth dimension (moving from decision to scenario). The explanation from 15 indicators were as follows: the re-decision showed that these criteria were inappropriate based on reliable results which were discarded from the original models. Then convergent validity and divergence were measured and the components of each dimension were confirmed. In the last step, based on the fit of the structural model and the verification of the hidden variables, all 4 models were confirmed. In the organization's readiness model, this value is equal to 0.154, in the environmental analysis model, it is 0.105, in the scenario creation model, the approximate value of the fit, the model is equal to 0.119, and in the movement model, the approximate value of the fit of the model was 0.151, which was a reasonable and acceptable amount.

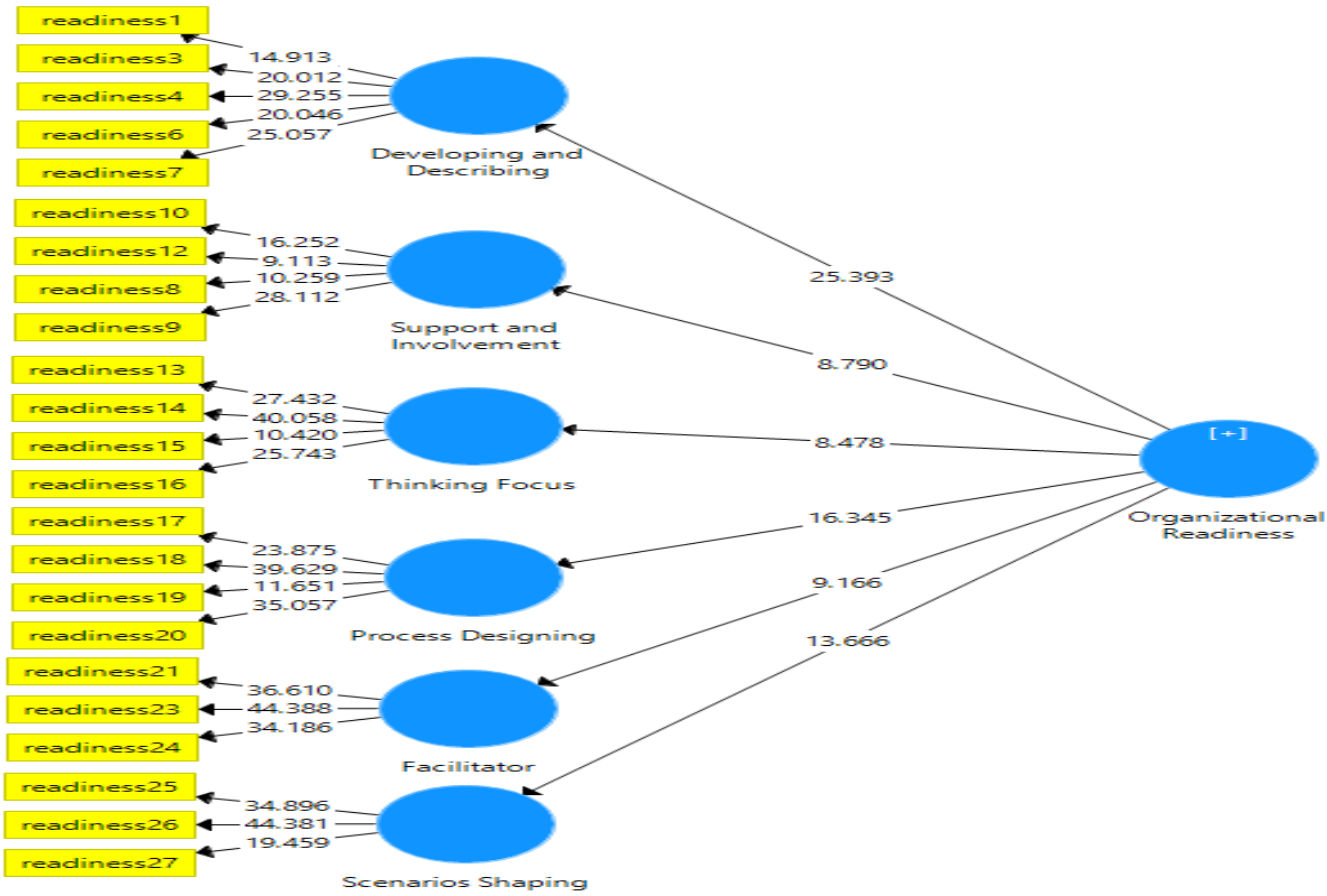

Figure 1- Organizational readiness model in terms of significance coefficients

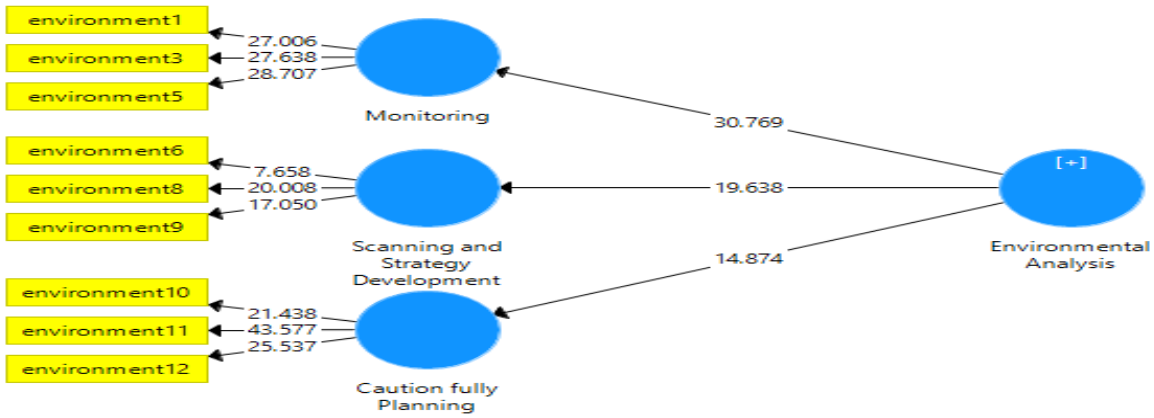

Figure 2- Environmental analysis model in terms of significance coefficients

Figure 3- Models of creating scenarios in terms of significance coefficients

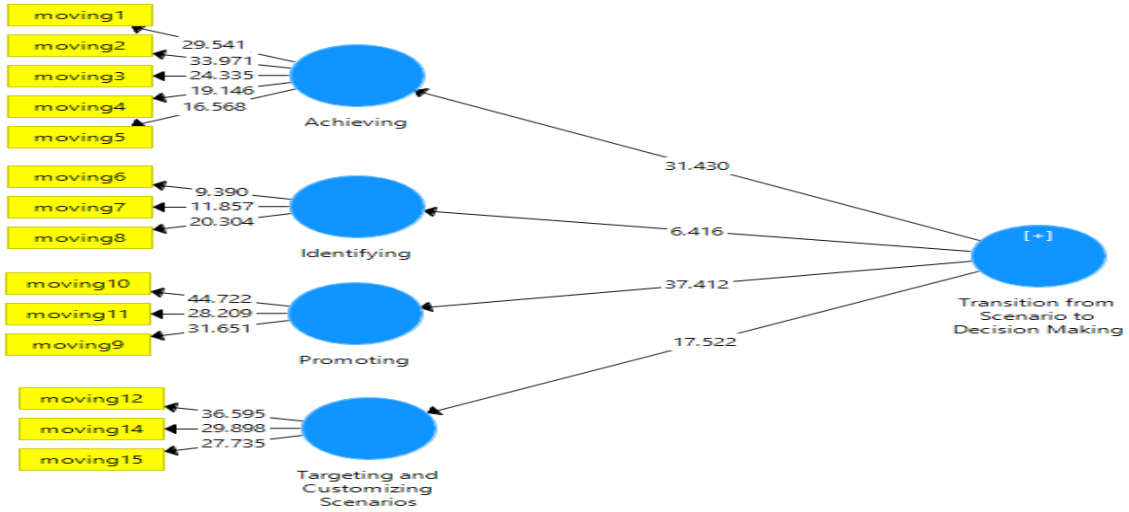

Figure 4- Models of movement from scenario to decision and update in terms of meaning coefficients

The third question of the research: -What is the general decision-making model of managers in conditions of uncertainty to prevent the frequency of infectious diseases in vulnerable groups?

After confirming and presenting each of the models, the effects of hidden variables in the main model were investigated based on table 2.

Table 3 - Path coefficients and significant coefficients of the main research model after correction

The path between variables	Path coefficients	Statistics t	p-value	Result
decision making - Organizational readiness	0.892	37.601	0.0009	It makes sense
decision making - Environmental analysis	0.723	13.167	0.0009	It makes sense
decision making - Move from scenario to decision	0.848	23.624	0.0009	It makes sense
decision making - Create scenarios	0.821	20.737	0.0009	It makes sense

The results of table 3 show that the path coefficient of organizational readiness index in explaining decision making is equal to 0.892 and t statistic is equal to 37/601 and the value of p value was less than 0.05 With 0.723 and t statistics equal to 13.167 and p value less than 0.05, the path coefficient index for creating scenarios in explaining decision is equal to 0.821 ,and t statistic is equal to 20.737 ,and p value is less than 0.05, and the path coefficient of the movement index from the scenario to the decision and the update in explaining the decision was equal to 0.848 and t statistics was equal to 23.624, the P value was less than 0.05 As a result, all four dimensions were instrumental in explaining decision-making in situations of uncertainty. In the general study of the model, the value of SRMR root of the average of the remaining squares is standardized, which is an approximate value of the fit of the model.

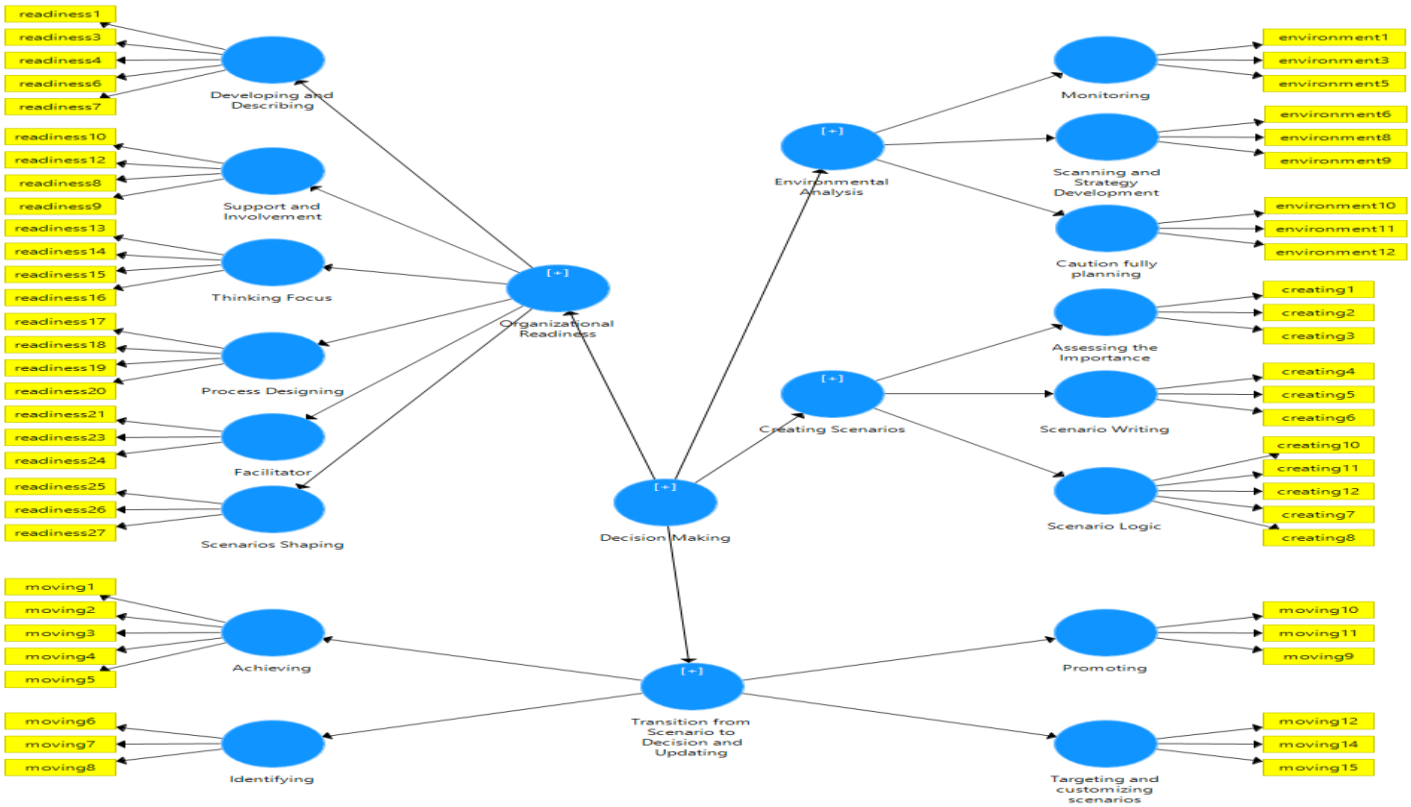

Figure 5- Final model of managers' decisions in conditions of uncertainty

The fourth question of the research: Who are the actors in implementing the decision-making model in conditions of uncertainty to prevent the prevalence of infectious internal diseases in vulnerable groups?

Based on structural studies, the study of documents, assumptions, crises and possible consequences, and given that disasters increase inequalities, they cause more damage to vulnerable groups, which are also vulnerable in normal situations. First, vulnerable groups were identified as follows. The first group maintains the mental and physical health of pregnant mothers. The second condition is maintaining the mental and physical health of children. The third group is maintaining the mental and physical health of the elderly. Based on the dimensions specified in the decision model and on interviews with 10 faculty members, managers and policy makers of the actors in implementing the decision model were identified as follows: policymakers, clients, staff and executive staff, managers of Mazandaran University of Medical Sciences and non-governmental organizations. The fifth question of the research: What is the role of actors in implementing the decision-making model in situations of uncertainty to prevent the frequency of infectious diseases in vulnerable groups?

The three selected situations were given to the participants in the survey to announce the role of each of the actors to express their opinion. The results of the survey were extracted as described in table 4.

Table 4- shows the role of actors in implementing the decision-making model in conditions of uncertainty in the three reported situations

	Organizational readiness		Environmental analysis		Create a scenario		Move from Scenario to Scenario Update Decision	
	mode	percent	mode	percent	mode	percent	mode	percent
Faculty	2	3.2	٠	٠	٠	٠	3	4.8
Policy makers	33	53.2	10	16.1	14	22.5	8	12.9
staff	٠	٠	6	6/10	23	37	3	4/08
Executive staff	٠	٠	٠	٠	2	3.2	٠	٠
University administrators	19	30.6	44	70/9	22	35.5	41	66
Clients	٠	٠	٠	٠	٠	٠	٠	٠
NGO groups	3	4.8	٠	٠	٠	٠	2	3.2
No answer	5	8.1	2	3.2	1	1.6	5	8

According to table 4, in relation to the implementation of the organizational readiness model, the highest frequency with 53.2 was related to policymakers. In relation to environmental analysis, the highest frequency with 70.1% was related to university administrators. In terms of creating scenarios, the highest frequency with 37% was given to staff. Regarding the dimension of moving from the scenario to the decision and updating the research findings, it is stated that university administrators with 66% had the highest frequency in the movement of the scenario to the decision and updating of the scenario.

Discussion

This research is an attempt for the future architecture of decision-making methods in conditions of uncertainty and epidemics, which was done by identifying the dimensions, components and indicators of decision-making, presenting the model and determining the role of actors in implementing the decision-making model according to internal and external issues. And there is a ground for uncertainty. This research with some dimensions, components and indicators was obtained from Rajabi Asadabadi's research (2018) as a multi-purpose decision-making method (18), Toghyani et al's study (2016) entitled Designing a Decision Model in Uncertainty in Investigating the Optimal Decision Model of Social Decision-Based Decision Making in Government Organizations (19), Scott Man's (2019) As a decision-making support method in the event of a catastrophe (20), with the research of Akinik and Sadler's (2019) As the Consequences of Improving Decision Making and Organizational Learning Collective Intuition, Individual Intuition and Counseling in Decision Making (21), with Plato and Asplund's Research (2019) entitled Management Arguments for Investing in Uncertainty (22), Kakel, Hasnout, and Walker's (2016) As a comparison of strong decision-making values and policies of compatible dynamic policies for decision support (23), it is consistent and shows the correct process of conducting research and extracting findings based on qualitative and quantitative interviews. Given the purpose of this study, to prevent the

prevalence of infectious diseases in vulnerable groups - by predicting the role of actors in implementing the decision-making model in conditions of uncertainty, after approving the model for implementation in the first stage to implement the organization's readiness model, health and treatment policy makers with development and description of the issue in the organization, gaining understanding, support and participation of managers, focusing on future thinking, process design, facilitator selection Continuous guidance on the possibility of an event in the future creates readiness in the organization and plays the most important role. University administrators are the best option in implementing the second step of the decision model, namely creating a scenario, monitoring, scanning and planning the ability to implement programs. At this point, managers need to anticipate what is sustainable and what is transient. This is one of the most important steps you can take to begin the process of preparation for mediation.

The monitoring index, which is very important in this model, is the exact tracking of the events that occur, and the need for this tracking to collect information in the field from various published or unpublished sources. Analyze this information and compare the results with each other and publish the results. Careful monitoring leads to pattern recognition, finding a link between seemingly unrelated developments, and discovering new trends and developing options and alternatives.

In the third stage, the implementation of the decision model to create the scenario of staff has the ability and valuable role in evaluating the capability of driving forces and logic. In terms of creating a scenario, according to its components, staff members have the ability to evaluate the capabilities of propulsion and logic forces. At this stage, managers must use the experience of staff to formulate decisions in the face of uncertainty towards creating a scenario according to the calculated indicators and considering the set of uncertainties, to depict different futures. To implement the model of movement from the scenario to the decision and update the university administrators are the main actors implementing this process will prevent managers in the healthcare world from making erroneous mistakes and traps that will lead to misjudgment by regulating the decision-making process in a world where events are unpredictable. Based on the results of correct decision making in conditions of uncertainty to maintain vulnerable groups, the organization's readiness to policymakers, environmental analysis to managers, scenario creation to staff and moving towards decision-making and updating should be left to managers.

With the help of statistics and epidemiology groups, health in accidents and disasters can be used to analyze data and make appropriate and timely, efficient and effective decisions. No one is safe as long as everyone is safe. Neither epidemics nor weather disasters pay attention to national borders with the peace of nations. And so, cooperation can play a significant role in making the international community stronger and greener than these disasters. (3)

Based on the above, it is suggested that considering the importance and position of the University of Medical Sciences to make managerial decisions in the fields of education development, research and service delivery, it is necessary to formulate an emergency scenario based on the knowledge approach of the project management of Knowledge And use the two methods presented in ISO 22398. To implement the decision-making model of managers in conditions of uncertainty, it is suggested that feasibility studies be carried out to establish learning and knowledge management in the organization.

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