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Presenting the Model of Acceptance and Use of Insurance Technologies Using the ISM-DEMATEL Method

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Abstract

This research sought to study and examine the model of acceptance and use of insurance technologies using the ISM-DEMATEL method. According to the purpose and nature of this research, in terms of method, it was a qualitative research that was conducted by interviewing research experts. The statistical population was university professors in the field of insurance and senior managers of insurance companies, beneficiaries and policyholders. In this section, sampling was done theoretically. In theoretical sampling, events are sampled, not necessarily individuals. If people are also referred to, the main and key goal is to explore events. The interviews continued until theoretical saturation was ensured. In this study, saturation happened with 12 experts (university professors in the field of insurance and senior managers of insurance companies, beneficiaries and policy holders). The results showed that based on the research findings, it can be seen that the first level includes practical factors, knowledge management, infrastructure, behavioral factors, the second level includes managerial factors, and the third level includes technology perception. Based on the findings, it can be seen that practical factors, knowledge management, infrastructure, behavioral factors are connected factors, managerial factors are autonomous factors, and technology perception is an influencing factor.

Keywords: technology adoption, insurance technology, ISM-DEMATEL method

Introduction

The insurance industry, as one of the oldest industries in the world, according to the predictions of experts in this field, will undergo extensive changes in the level of information technology and new services by 2030. Insurance technology or insurtech is the little brother of fintech

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(innovative use of technology in providing financial services); But unlike fintechs, less attention has been paid to insurtech. One of the main business components of the insurance industry is risk management; But the decision-makers of the insurance industry have been cautious about the introduction of new technologies called insuretech. This has caused the services of innovative insurance technologies to not grow properly compared to other areas of fintech (Kelley and Wang, 2021). The emergence of insurance technology companies through the easy access of digital technologies is changing the entire insurance industry and ushering in a new era of business models. Insurance technology companies are challenging the dominant position of traditional insurance institutions with digital technologies such as big data analytics, robo-advisors and mobile distribution models; Therefore, at present, the application of insurance technologies and the creation of digital transformation in the insurance industry and the use of innovative models as a strategic approach have not been accepted among insurance companies (Bahrami et al., 2023).

On the other hand, the acceptance and application of such emerging technologies in different sectors depends on different factors and various models have been presented in this field. Technology acceptance models mainly focus on behavioral intention and actual behavior. Behavioral intention is the most important determining factor of behavior (Shouqi Agcheh Mashhad et al., 2023). For example, the technology acceptance model is a model to determine how a person's beliefs and values can influence his intention to use technology. Although this topic was initially used in the field of business, since its development, the technology acceptance model has been widely used and due to its application in a wide range of disciplines, including business and education (Nurse-Clarke and Joseph , 2022).

Acceptance of technology is a multi-dimensional phenomenon that includes a wide range of key variables such as perceptions, beliefs, attitudes and characteristics of people as well as their involvement with technology. Various theories and models have been tested and modified in the field of technology acceptance, most of which originated from information systems and psychological and sociological approaches. These models help us understand the factors influencing the adoption of technology by organizations and managers and the relationships between them. Also, many researchers believe that the acceptance process affects the successful use of technology in the organization (Nouri et al., 2016).

Of course, many of these technologies and their benefits do not exist within the organization and are provided through other cooperating or competing organizations. In this case, such innovations are classified as open innovations.

Open innovation refers to the purposeful commercialization and absorption of internally developed ideas in the organization's external environment (Lyu et al., 2020).

In economic systems, open innovation shapes the dynamics of the system and becomes the driving force of growth and development (Yun et al., 2020). The main idea of open innovation is that an organization opens the innovation process to other companies, individuals, research

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institutions, universities, customers and suppliers to ensure the flow of ideas inside and outside the organization. In this way, the organization can gain benefits from the exploration of external resources and the exploitation of internal resources (Pustovrh et al., 2020).

To measure the variable of open innovation, three components of organizational readiness, collaborative capabilities and absorption capacity have been used. Organizational readiness refers to factors that exist in innovative organizations and are related to dynamic capabilities for change, design of specific processes, and technology improvement. Collaborative capabilities are the main core of the discussion of open innovation and can be described as the ability to integrate and use organizational factors to create organizational capacity and capacity for open innovation (Kalabi, 2023).

- Research Methodology

According to the purpose and nature of this research, in terms of method, it was a qualitative research that was conducted by interviewing research experts. The study approach has been grounded theory. The statistical population was university professors in the field of insurance and senior managers of insurance companies, beneficiaries and policyholders. In this section, sampling was done theoretically. In theoretical sampling, events are sampled, not necessarily people. If people are also referred to, the main and key goal is to explore events. Although there is no specific rule for sample size in qualitative strategy, 6 to 8 units for homogeneous groups and 12 to 20 units for heterogeneous groups are suggested. The interviews continued until theoretical saturation was ensured. In this study, saturation happened with 12 experts (university professors in the field of insurance and senior managers of insurance companies, beneficiaries and policy holders).

Sampling was done in the framework of the logic of the qualitative method and purposefully. Two methods of targeted and snowball sampling were used in sampling. Usually, in qualitative researches, in order to obtain the most information, purpose-based sampling is used, so the researcher chose the participants who were so-called "rich in information". It means that based on the principle of qualitative research, samples were selected that presented a strong picture of the phenomenon under study. The participants were selected based on the sampling method of university professors in the field of management and senior managers of construction companies who were also willing to be interviewed.

The combined method of ISM-DEMATEL was used to level and rank the factors and determine the type of variables, as well as check the relationships between the variables of the model, determine the intensity of the relationships and identify the influence and effectiveness of the criteria. The combined ISM-DEMATEL method is an approach to modeling the criteria relationships based on the interpretation paradigm that uses the DEMATEL capability as an input**.**

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- Research results

DIMATEL combination and interpretive structural modeling (ISM_DIMATEL)

The identified final factors of the model of acceptance and application of insurance technologies in domestic insurance companies with an emphasis on open innovations after the qualitative stage and data analysis, finally 6 factors as the final factors of the model of acceptance and application of insurance technologies in domestic insurance companies By emphasizing open innovations, they were identified as the main components of the research and entered this phase of the research.

normalization of judgment matrix;

The normalized matrix is obtained from the judgment matrix. For this purpose, the value of Y is first. To calculate this number, he first calculated the sum of the values of each row of the matrix of experts' opinions. The average of these numbers is then calculated and the value of Y is determined in this way. After calculating it, all elements of the judgment matrix are divided by this number. In this way, each row of the judgment matrix is normalized and finally the normalized matrix is obtained. The purpose of this step is to make the obstacles in the direction of the analysis non-dimensional. Because the types of factors are different from each other and in order to perform the analysis, the factors must be made dimensionless so that their comparison is meaningful. In simple words, this task is achieved by dividing each row of the assembled judgment matrix by the largest row sum of the third rows.

In the following, the direction of fuzzification of the identified components was calculated according to the fuzzification formula for the research components. First, the matrix of the first, second and third columns is presented separately until the fuzzy stages of implementation. to be In the next step, the numbers prepared by hand in the tables of the previous step reach the power of -1 and the basis for obtaining the final matrices is provided, and in other words, the formula 1-(h-L) is created in all three tables.

In the next step, the final fuzzification formula is performed and the final fuzzification is performed by multiplying the initial components by the obtained matrix components. In the following, by using defuzzification of experts' opinions, the normalized matrix is out of the fuzzy state and the research databases are out of the fuzzy state with the defuzzification formula.

Table 1: The de-phased matrix of experts' opinions

	Functional factors	knowledge management	Management factors	Technology perception	Infrastructure	Behavioral factors
Functional factors	1.60	1.66	1.37	1.45	1.63	1.72
knowledge management	1.77	1.53	1.37	1.42	1.57	1.66

Power System Technology
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Management factors	1.57	1.59	1.16	1.34	1.46	1.50
Technology perception	1.71	1.68	1.43	1.30	1.55	1.68
Infrastructure	1.72	1.61	1.30	1.34	1.40	1.65
Behavioral factors	1.79	1.78	1.37	1.44	1.64	1.56

Calculating the threshold limit and forming the occurrence matrix. After dephasing all the fuzzy numbers in the normal matrix and obtaining the dephased matrix, a threshold limit is obtained through Miankin calculation of all the elements and regions in the matrix. Based on the calculations, the arithmetic mean of the above matrix is equal to 1.54. In order to form the occurrence matrix, we compare each of the regions in the dephased judgment matrix with the specified threshold value. If the target number is greater than or equal to this threshold limit, the number 1 is placed in the corresponding number in the occurrence matrix, otherwise, the number is zero. Based on this approach, the occurrence matrix of interpretative structural modeling method is a binary matrix (zero and one). This matrix is the gateway to the final part and forming the accessibility matrix.

Table 2: Occurrence matrix

	Functional factors	knowledge management	Management factors	Technology perception	Infrastructure	Behavioral factors
Functional factors	1	1	0	0	1	1
knowledge management	1	0	0	0	1	1
Management factors	1	1	0	0	0	0
Technology perception	1	1	0	0	1	1
Infrastructure	1	1	0	0	0	1
Behavioral factors	1	1	0	0	1	1

After forming the occurrence matrix, in order to build an interpretive structural model, the primary accessibility matrix should be formed based on this matrix. The primary accessibility

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matrix is equal to the matrix sum of the occurrence matrix and the identity matrix. In other words, the primary accessibility matrix is the occurrence matrix with elements on the main diagonal of one. In this way, the primary accessibility matrix is formed.

Table 3: Primary access matrix

	Functional factors	knowledge management	Management factors	Technology perception	Infrastructure	Behavioral factors
Functional factors	1	1	0	0	1	1
knowledge management	1	1	0	0	1	1
Management factors	1	1	1	0	0	0
Technology perception	1	1	0	1	1	1
Infrastructure	1	1	0	0	1	1
Behavioral factors	1	1	0	0	1	1

formation of input, output, joint and leveling sets; In this step, using the final accessibility matrix, the set of input, output and joint is obtained. The input set for each factor is the column of that factor and the output set for each factor is the row of that factor. In other words, the set of factors influencing the factor of the output set and the set of factors affecting the factor form the input set. This step is implemented based on the explanations presented in the third chapter.

Table 4: Leveling of components identified in the research

Row	factors	input	output	Common	level
1	Functional factors	1,2,3,4,5,6	1,2,5,6	1,2,5,6	First level
2	knowledge management	1,2,4,3,5,6	1,2,5,6	1,2,5,6	First level
3	Management factors	3	1,2,3	3	Second level

Power System Technology
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4	Technology perception	4	1,2,4,5,6	4	third level
5	Behavioral factors	1,2,4,5,6	1,2,5,6	1,2,5,6	First level
6	Infrastructure	1,2,4,5,6	1,2,5,6	1,2,5,6	First level

Based on the research findings, it can be seen that the first level includes practical factors, knowledge management, infrastructure, behavioral factors, the second level includes managerial factors, and the third level includes technology perception.

After performing the calculations related to the fuzzy interpretive structural modeling and obtaining the final access matrix and the leveled model of obstacles in the context of the level of effectiveness of these obstacles and the direct and indirect effects between them, the next step as a complementary step for psychological structural modeling, The classification of factors is in the form of their effect and their internal effectiveness on each other.

The purpose of this analysis is to draw a graph of penetration power - dependence of factors, based on the final accessibility matrix and its analysis. At this stage, the factors are classified into four groups: autonomous, linked, dependent, and intrusive factors. As mentioned in the third chapter, the factors are classified in the form of these four categories according to the level of their effectiveness and effectiveness, and in this way, a more comprehensive view of the direct and indirect internal effects of these factors can be obtained. For this purpose, in this analysis, the final accessibility matrix, which includes the direct and indirect effects of obstacles on each other, has been used.

Table 5: influence and dependency matrix

Functional factors	Functional factors	knowledge management	Management factors	Technology perception	Infrastructure	Behavioral factors	infiltrate
knowledge management	1	1	0	0	1	1	4
Management factors	1	1	0	0	1	1	4
Technology perception	1	1	1	0	0	0	3
Infrastructure	1	1	0	1	1	1	5

Power System Technology
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Behavioral factors	1	1	0	0	1	1	4
Functional factors	1	1	0	0	1	1	4
dependency	6	6	1	1	5	5	

In the following, the factors based on their power of influence and power of dependence can be classified into four categories: autonomous, dependent, connected and influential. Based on the results of the Meek Meek analysis, the factors can be divided into four categories, which are presented in the following table.

Table 6: Classification of factors based on Mick Mick analysis

factors	Autonomous	Autonomous	Dependent	linked
Functional factors				*
knowledge management				*
Management factors	*			
Technology perception		*		
Infrastructure				*
Behavioral factors				*

Based on the findings, it can be seen that practical factors, knowledge management, infrastructure, behavioral factors are connected factors, managerial factors are autonomous factors, and technology perception is an influencing factor.

- Discussion

Based on the research findings, it can be seen that the first level includes practical factors, knowledge management, infrastructure, behavioral factors, the second level includes managerial factors, and the third level includes technology perception. Based on the findings, it can be seen that practical factors, knowledge management, infrastructure, behavioral factors are connected factors, managerial factors are autonomous factors, and technology perception is an influencing factor. The same results were obtained by Bahrami et al. (2017) and Huang et al. (2022). Insurance technologies not only have advantages such as improving efficiency

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and effectiveness, developing and expanding products and services according to the daily needs of insurers, reducing costs and increasing customer loyalty, and as a result, creating a long-term relationship with them, but also using the latest technologies and The extensive implementation of big data analysis has been able to reduce risk and lead to timely and better detection of frauds in the insurance industry, which has been one of the main challenges of this industry for a long time (Parsamanesh et al., 2021. Insurance companies around the world and, as a result, the country's insurance industry, as they are looking for new ways to solve business challenges, create innovation and create new opportunities, are increasingly looking for the use of insuretech and cooperation with startups in order to provide new insurance services to customers.

The emergence of ecosystems is a natural consequence of digitization. Organizations that place adaptability at the core of their design and strategy can take advantage of it. Evolution has taught us that it is not the strongest species that survive, but rather those that respond best to change. In the digital era, the best response for insurance companies is to be present in the ecosystem that includes (financial institutions, manufacturers, service providers, technology partners, internet and mobile network operators).

Based on the experience of other countries, digital transformation and the use of emerging technologies is a suitable strategy to increase productivity and customer satisfaction by creating more value based on intelligence in this industry. The insurance industry needs a digital destruction to create this value that leaves the traditional structure and creates more value (Nazari et al., 1401).

Technology executives see data and analytics as a transformative force in business; Therefore, many organizations are implementing business intelligence technologies to support reporting and decision making. Traditionally, management accounting is the primary support for decision making and control in an organization. In this way, it has clear links to the use of business intelligence technologies and can benefit from it (Rikhardsson, Yigitbasiog, 2018); Therefore, business intelligence has become an essential basis for decision-making in companies. Today, it is rare for large companies to operate without a business intelligence system. Due to the implementation efforts and high costs of the complex solution, it seems that only large start-ups are using them. For a country without a business intelligence system, providing a report requires a lot of efforts (Azeroual and Theel, 2018).

Although according to the current conditions of the market, which is characterized by increased competition, rapid changes in the needs and requests of customers, the dominance of new technologies, and most importantly, the widespread fever for the digitalization of work, the need for organizations and economic enterprises in the style of insurtech has increased, and studies Numerous experiments have also confirmed the positive impact of this method on gaining competitive advantage of companies.

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References

1. Azeroual, O, & Theel, H, (2018). The Effects of Using Business Intelligence Systems on an Excell ence Management and Decision-Making Process by StartUp Companies: A Case Study. International Journal of Management Science and Business Administration, 4(3), 30-40.
2. Bahrami, Amir., Haghigi Kafash, Mehdi., Haji Karimi, Babak. (2022). Providing an insurance technology marketing model (InsureTech) for a start-up business in the insurance industry. Scientific Quarterly of Modern Marketing Research, Year 12, Issue 1, Serial (44), pp. 197-216.
3. Huang, Z.; Savita, K. S., Zhong-ji, J. (2022). The Business Intelligence impact on the financial performance of start-ups, Information Processing & Management, 59(1), 102-761.
4. Kelley, C., & Wang, K. (2021). InsurTech: A guide for the actuarial community. *Society of Actuaries*.https://www.soa.org/globalassets/assets/files/resources/researchreport/2021/insurtechguidecommunity.pdf
5. Kalabi, Amir Mohammad. (2023). Presentation of business resilience model: explaining the role of business model innovation, open innovation, organizational agility and strategic flexibility. Entrepreneurship and Innovation Research, Volume 1, Number 2.
6. Lyu, Y., Zhu, Y., Han, S., He, B., & Bao, L. (2020). Open innovation and innovation" Radicalness" effect of network embeddedness. *Technology in Society*, 62(1), 1-29.
7. https://doi.org/10.1016/j.techsoc.2020.101292
8. Nazari, Mohsen, Vedadhir, Abu Ali, Ezzati, Hamidreza, Turkman, Ahmad. (2022). Investigating the transformation process and digital strategy of the country's insurance industry. Strategic Management Studies, No. 52, pp. 141-158.
9. Nouri, Elaha and Taqwa, Mohammad Reza. (2015). Business intelligence (concepts and system design and development). Tehran: Allameh Tabatabai University.
10. Nurse-Clarke, Natasha, Joseph, Mary, (2022), An exploration of technology acceptance among nursing faculty teaching online for the first time at the onset of the COVID-19 pandemic, Journal of Professional Nursing, 41, 8-18.
11. Parsamenesh, Ali., Mehrani, Hormoz., Vahabzadeh Manshi, Shadan, Hasanmoradi, Narges. (2021). Designing an insurance technology acceptance model (Insurtech) with the structural-interpretive modeling method. Bimah Scientific Research Quarterly, 36th year, number 4, serial number 143, pages 101-134.
12. Pustovrh, A., Rangus, K., & Drnovšek, M Singh, N. K. (2020). The role of open innovation in developing an entrepreneurial ecosystem. *Technological forecasting and social change*, 152(1), 119-129. https://doi.org/10.1016/j.techfore.2019.119892

Power System Technology
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13. Rikhardsson, P., Yigitbasiog, O. (2018). Business intelligence & analytics in management accounting research: Status and future focus. International Journal of Accounting Information Systems, 29(6), 37-58.
14. Shoghi Agjah, Mashhad, Fatemeh. Farrokhbakht Fomeni, Alireza. Qolipour Soleimani, Ali. (2023). Providing a model for accepting new technology and innovations in the field of renewable energy by Iranian consumers with an economic, financial and social approach based on the foundation's data theory. Financial Economics Quarterly, Volume 17. Number 1 (Serial 62), Pages 123-146.