Print ISSN:2717-0454
Online ISSN:2783-2856
Quarterly Journal of Innovation and Entrepreneurship
Http://journalie.ir

Investigating The Different Dimensions of The Theme Network of Innovation Capacity Model in Iran`s Cement Industrt by Sem

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Received: 24.12.2023 Accepted: 17.02.2025

Abstract

Innovation plays a crucial role in development and progress in various industries. This research uses the qualitative research method of thematic analysis and the quantitative method of surveying with structural equations in order to investigate the innovation capacity model in Iran's cement production companies with a mixed approach. In the first step, with the help of qualitative research method and thematic analysis research method, the main model was extracted from the data obtained from the semi-structured interview. Finally, the network of themes of innovation capacity in Iran's cement production companies is presented and its dimensions are examined. In this paradigmatic model, idea generation and idea cultivation in the cement industry as causal factors, improvement of management skills, growth and excellence of human resources as foundational factors and two-way communication factors of innovation policy and company strategies, two-way interaction with external organizations, attention to Business trends, monitoring and adaptation to environmental changes as well as alignment and movement according to growth Information technology to the development of information technology are the intervening factors of the model. Also, the two main strategies derived from this model, one is to implement fundamental changes and the other is innovation in the production of ideas, products and services in the cement industry. as a result of proper and integrated investment on these two strategies, we can see functional results and Examples of innovation were in the model.
Examining this model showed that the model of innovation capacity of Iranian cement production companies based on confirmatory factor analysis test as well as convergent and divergent validity has acceptable validity and all structures have suitable validity and reliability. The results of this study will help the managers and active experts in cement industry to take advantage of innovation and subsequently improving the processes

Keywords: Innovation Capacity-Iran Cement-Cement-Network of Themes-Structural equation modeling.

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Introduction

The cement industry is one of the industries that always faces numerous challenges. On the one hand, the lifespan of the industry and equipment affects production, and on the other hand, the increase in production costs has created an unstable and complex environment for this industry. Developing creativity and innovation in the cement industry can provide a knowledge-based basis for this industry and, as a result, gain competitive advantages for exports (Jamal-Omid, Bozorgmehr 2023). Also, since technological change in the cement industry is very expensive and innovation through technology purchase is easily imitated, it is necessary to pay attention to other dimensions of innovation capacity in the form of a comprehensive model (Kolak, Selajgeh 2023). In the cement industry of the country, due to market imbalance, the intensity of competition in the market has increased, and therefore has become doubly important (Golshanimanesh et al. 1402). A review of the research conducted indicates that the focus has been on conceptualizing and examining the relationship between two or more themes related to the network of innovation capacity themes, and that this has been done in the form of a limited case study in one or more factories, and the construction of a comprehensive local model with a qualitative and exploratory approach to evaluate the innovation capacity of these companies has not been considered, while the aforementioned comprehensive model has been examined and presented locally in the geographical scope of the country's cement industry.

Literature review

Table 1. The concept and dimensions of innovation capacity in previous research

Researcher/year	Research title	Extractive factors related to innovation capacity
Jamal Omidi and Bozorgmehr (2023)	Examining the role and position of creativity and innovation in knowledge-based companies - related to cement companies	Attention to innovation Level of innovativeness Innovation Climate Level of support for innovation Motivation of the department for job innovation
Mahmoudpour (2021)	Measuring the importance of innovation capacity components based on fuzzy AHP	Strategic knowledge management Systematization of processes and internal and external communications Leadership of innovation activities Generation of new ideas Innovation-oriented human resource management
Barzegar et al. (2021)	Presenting a model for creating innovation capacities in Iranian academic management	Organization and organizational structure Organizational processes Resources and equipment Organizational culture Human capital management Leadership and strategic management of

Researcher/year	Research title	Extractive factors related to innovation capacity
		knowledge, education and scientific promotion Research and technology
Taturat et al. (2023)	Innovation Directions for Decarbonizing Cement and Steel Production - An Analysis Based on Topic Modeling. Cleaner Production Journal	Innovation directions
Lopez et al. (2021)	Business dynamism and innovation capacity, a global perspective on entrepreneurship.	Study and learn more about innovation methods Business Dynamics
Park (2021)	The impact of exploration and exploitation activities on innovation capacity: The mediating effect of absorptive capacity and innovation power	Technological innovation capacity Innovation power

Methodology

Firstly, this research is a developmental research in terms of its purpose. Secondly, this research is a mixed research in terms of its nature. The statistical population of cement industry experts is from about 60 cement factories in the country, of which 75 people have been selected as a sample according to the Cochran formula. This research seeks to answer the following questions: What is the innovation capacity model in Iranian cement production companies? What is the concept and dimensions of innovation capacity in previous domestic and foreign research? What is the network of innovation capacity themes in Iranian cement production companies (basic, organizing and comprehensive themes)? What are the dimensions of innovation capacity in Iranian cement production companies? What is the level of validity of the innovation capacity model of Iranian cement production companies in these companies? In order to answer these questions, the following steps have been considered in the process of this study:

1. Systematic review and search for all factors affecting the creation of innovation absorption capacity, relying on the theme analysis method.
2. Qualitative research using the theme analysis method with the help of interviews with experts on the factors affecting the phenomenon of innovation capacity, the results of which led to the creation of a network of themes (basic, organizing and comprehensive themes).
3. Based on the model presented as a network of themes, the innovation capacity scale was designed and set up in the form of a questionnaire to be reviewed by experts for the final assessment of their content. This stage is the Delphi analysis method.
4. Validation or structural validity, that is, determining how well the extracted factors and their number are consistent with the state of the industry in question and the literature review. This is done with SmartPlS and confirmatory factor analysis (CFA) test and is a statistical and quantitative phase.

Data analysis

What are the dimensions of innovation capacity in Iranian cement production companies? These dimensions are the result of extraction from the network of themes developed for the innovation capacity of cement companies.

1. KMO data adequacy test

This test is performed to determine whether the sample size is sufficient. The adequacy index should be above 0.7. In this study, the KMO index value is 0.701, indicating that 75 samples are sufficient for factor analysis and the Bartlett test significance value is less than 0.05

2. Normality test

In this study, the Kolmogorov-Smirnov test was used to examine the assumption of normality of the research data. The significance level for some variables was less than 0.05, which means that the data were not normally distributed. However, for the total score of innovation capacity, the significance level was 0.561, which is greater than 0.05, so the distribution is normal.

3. Testing the research measurement model

3.1 Measuring the validity and reliability criteria of the measurement model

These criteria include Average Variance Extracted (AVE), composite reliability (CR), and Cronbach's alpha (α), and the results show that all variables have criterion limits.

3.2 Tests of index reliability and convergent validity

Composite validity (CR) and Cronbach's alpha (α) values, as reliability tests, are greater than 0.7 for all variables, so the variables are reliable. Average variance extracted (AVE) values are greater than 0.5 for all variables, so the variables also have convergent validity.

4. Confirmatory factor analysis

The results of the factor loading of the items on the research constructs show that all indicators were approved at this stage because they met the criterion level, i.e., above 0.4, and were not eliminated in the hypothesis testing stage.

It is worth noting that the cross-loadings of the indicator related to each of the organizing variables are higher for the variable in question than for the other variables. This means that divergent validity is established based on the cross-loadings test criterion.

Generalized Model Fitting (GoF)

The overall model includes both the measurement and structural model parts, and by confirming its fit, the fit check in a model is complete. In this model, the GoF value is 0.673 and is strong.

5. Findings

What is the innovation capacity model like in Iranian cement production companies?

After conducting interviews and coding the responses using the content analysis method and model validation, the innovation capacity model in Iranian cement production companies was extracted, and based on confirmatory factor analysis and convergent and divergent validity, this model has acceptable validity.

6. Discussion and Conclusion

Using the theme analysis method, semi-structured interviews, and questionnaires, after creating theoretical saturation, by extracting, categorizing, and classifying codes through qualitative research and survey, the network of themes of innovation capacity in Iranian cement production companies was finally presented. Then, these dimensions were surveyed and tested, and the routes specified in the model were monitored and confirmed.

In this regard, based on the research findings, experts, decision-makers, and innovation managers of cement companies are advised to plan and take necessary actions regarding implementing fundamental changes in the company's agile structure, innovation in generating ideas to improve products, innovation in product production, production with the lowest percentage of carbon and environmental pollution, conducting research and producing nano-cements, establishing incentive systems for personnel, improving mobile sales applications, creating databases, and finally, recording sensitive events and recording company issues and problems.

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