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Investigating the dimensions of measuring the maturity of customer knowledge management in Iran's rail transportation industry with a partial least squares approach

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Abstract

The purpose of this study was to design a model for measuring the maturity of customer knowledge management in the rail transportation industry (Railway Company). The present research is descriptive-correlative in terms of applied purpose and terms of research method. The statistical sample size was 355 people and was selected by stratified random sampling. Data collection tools were the study of literature, articles, dissertations, etc. in the field and in line with the research. From the results of these studies, a questionnaire was designed that measures the maturity of customer knowledge management in the rail transport industry emphasising three factors (organizational, process, and instrumental) and 64 items whose validity is confirmed by content validity and their reliability is confirmed by Cronbach's alpha. Structural equation modeling (SEM), and partial least squares (Smart PLS 3.3) were used to test the hypotheses. In this section, the indices of mean, extracted variance, Cronbach's alpha, combined reliability, convergent validity, coefficient R^2, t were used. The results of the partial least squares test indicate the confirmation of the research hypotheses, and based on this, the measurement model and the structural model had a statistically appropriate fit. The results showed that the dimensions of customer knowledge management maturity include (process, organizational and instrumental) and have been implemented in the Railway Company of the Islamic Republic of Iran and according to the results of this research, suggestions for its development were provided to managers, specialists and experts.

Keywords: customer knowledge management maturity model, structural equation modeling, partial least squares, rail transportation industry
2020 MSC: 68V30

1 Introduction

Today, organizations operate in the era of a customer-oriented economy, in which the customer is the real ruler of the market. Therefore, organizations should learn how to switch from focusing on products or services to focusing on customers. They should consider customers as an asset and this matter needs to be more managed to the most production. By combining the two concepts of knowledge management and customer relationship management, a new

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concept has arisen customer knowledge management [26]. The concept of customer knowledge management is new, but many studies have expressed its importance and benefits. All these studies have created motivations in different businesses to apply this concept consciously or unconsciously.

The customer knowledge management is defined as a set of processes that an organization uses to manage processes related to customer knowledge such as identification, acquisition, creation and exploitation [18]. Currently, many companies are using new and electronic tools in addition to the traditional tools of acquiring customer knowledge, and the purpose of all of them is to take advantage of the benefits of customer knowledge through the approach of customer knowledge management [38]. The use of knowledge management capabilities leads to the profitability of customer knowledge in customer relationship management processes; Customer knowledge management means acquiring, sharing and promoting the knowledge in the customer's mind for the benefit of the company and the benefit of the customer [2]. In today's world, transportation is like the foundation of a bridge that divides various social, economic and even political issues of the societies move on it. Accordingly, paying attention to the capabilities and problems in the transportation of the country and the necessity of macro-viewing and comprehensive planning for the balanced development of the sub-sectors, different types of transportation and removing the existing obstacles are unavoidable. The railway system is a purposeful system that can move a large volume of cargo and passengers with a high security and safety factor. It can connect economic, political, social, agricultural, industrial, etc. [38].

In fact, railways can play an important role in meeting the future growing needs for transportation in a potentially more energy-efficient and cleaner way than the other ways. In line with the realization of the viewpoint document of rail transportation in the horizon of 2025, the rail transport industry as the best rail transport system in the region, by using new technologies and the maximum participation of the non-governmental sector, while meeting the needs of the stakeholders, has a constructive and effective interaction with international communications. One of the major goals of rail transportation in the horizon of 2025 is the development of customer-oriented transportation using scheduled freight trains, combined transportation, and high-speed passenger trains. It can benefit the country, such as less environmental pollution, higher safety compared to other transporting sectors, less land occupation and less fuel consumption; It provides higher social benefits to the society, which most countries give special support to. Today, it can be found few companies or organizations are unaware of using electronic tools such as the Internet, websites, databases, short messages or emails to communicate with customers most companies and organizations use these tools in their business processes, but the important thing here is how far companies and organizations have been able to use this approach, and at what level of maturity are they? Answering these questions requires having a tool to measure customer knowledge management. In the literature on customer relationship management and knowledge management, we can see many studies that have addressed this issue, but customer knowledge management is less studied. This shortcoming in the literature of customer knowledge management prompted the present researchers to try to develop the maturity model of customer knowledge management by in-depth examination of data and information. In this study, we aimed to measure the status of customer knowledge management in one of the organizations according to the developed maturity model. Among these companies or organizations, perhaps Iran Railway Company can be considered as a suitable case for studying customer-oriented and information systems due to its extensive presence in all parts of the country and having international business relations, as well as having many customers and a lot of competition issues.

2 Theoretical foundations and research background

Customer knowledge is a dynamic combination of values, insights, and experiences that emerge when a company interacts with its customers [15]. Customer knowledge management means knowing customers, their needs, desires and goals. The concept of knowledge management has expanded over time and now includes the concept of customer knowledge. In fact, the term customer knowledge management (CKM) means the management of knowledge acquired from customers, or in other words, the knowledge that is institutionalized in customers. Customer knowledge management means identifying and organizing customers' perceptions, mindsets and preferences. This field includes knowledge management and customer relationship management [37]. The maturity stages of knowledge management are formed over time, in other words, knowledge management should mature and turn from a stagnant state into an interdepartmental function that is firmly established in the organization [20]. Many organizations, focusing on knowledge management and extensive investment in the field of information technology, are looking for access to the benefits of knowledge management [11]. To target the use of knowledge management, it is necessary to conduct a deep analysis of the maturity level of the organization in the field of customer knowledge management. The maturity of the organization in customer knowledge management is the extent of the capabilities and potentials of an organization in different dimensions affecting the management of customer knowledge. Each organization, according to the activities

it has performed in the field of customer knowledge management, is placed in a level of maturity, which shows the current status of the organization in the field of customer knowledge management.

Customer knowledge management is the application of knowledge management tools and methods to support the exchange of knowledge between the organization and customers and to make appropriate decisions. Customer knowledge includes three different types of knowledge, which are: knowledge for the customer, knowledge from the customer, and knowledge about the customer [22].

Among the benefits that have been presented for customer knowledge management are identifying competitive advantage, making the organization flexible and facilitating market adaptation, meeting customer needs [17], delivering customer's voice to the top of the organization, creating better relationships with customers [7], improving innovation, sensitizing the organization to emerging opportunities in the market [29], supporting research and development [9], fulfilling customer satisfaction and facilitating role modelling [25] can be pointed.

The maturity of the organization in customer knowledge management is the level of capabilities and capabilities of an organization in different dimensions that is effective on knowledge management [21]. Every organization, according to the activities carried out in the field of knowledge management, is placed at a level of maturity, which indicates the current status of the organization in the field of knowledge management [27].

Because maturity models gradually and continuously lead the organization towards maturity through a step-by-step structure, and knowledge management is not a category that the organization can improve at once, therefore, the application of maturity models in the field of improving knowledge management performance is considered a suitable and tested method. In the literature on customer knowledge management, several studies have presented models related to customer knowledge management, such as Gebert et al.'s process model of customer knowledge management [16], Su et al.'s electronic customer knowledge management model [35], a conceptual model of Shami Zanjani et al. [32] paid attention to customer knowledge management.

2.1 Research background

By reviewing the research background, several researches that are related to the topic in some ways, or are related to the research variables in a combined way, are mentioned:

Bidgholi et al. [3] investigated the modelling research of the impact of customer knowledge on new product development and company performance with a system dynamics approach and came to the conclusion that customer knowledge affects new product development and also on performance. It affects financial performance, number of ideas, customer loyalty, number of customers, personalized products, idea-to-product time, and internal processes. Also, to have a better effect on customer knowledge on performance, there is a need for knowledge maturity in the company. Therefore, with knowledge management, it is possible to create suitable growth in new product development. This research can be used in different fields of engineering, both in terms of research methods and results.

Talai Fard et al. [36] have concluded that customer knowledge management on business performance with the role of the mediator of innovativeness has an effect.

Faizi Khazaei et al. [12] stated the purpose of their research as follows; The purpose of this research is to evaluate the maturity level of Kurdistan Gas Company to develop the knowledge management system based in the company and also to examine the existing knowledge processes based on the Asian productivity model. The research method is a survey and its type is practical. The research method is a survey and its type is practical. To collect the data, the standard questionnaire of the Asian Productivity Organization and supplementary questions were used, and its reliability was confirmed according to the average value of Cronbach's alpha coefficient (%86).

Nikookar [23] in his research entitled Compilation of the maturity evaluation model of customer knowledge management in private banks of Mazandaran province identified the factors affecting the success of customer knowledge management to expand the developed model to the private banking industry, first customer processes in the bank industry private banks have been reviewed in general and then the maturity model of customer knowledge management in the private banking industry has been developed. In this research, the researcher proposed the use of the Analytical Hierarchy (AHP) method to rank banks and evaluated 18 private banks in Mazandaran province using questionnaires and determine their maturity level.

Ranjbarfard [28], measures the development process of customer knowledge management in insurance companies and helps insurance managers in measuring the situation Maturity of customer knowledge management and taking corrective actions helps. To measure the maturity level of insurance companies on a broad level, a 24-question questionnaire was designed based on the model. Using this tool, the maturity level of 11 private insurance companies and 1 government insurance company was measured through a survey of 5 to 15 managers and experts of the issuing,

information technology, research and development and marketing units in each company. Analyzing the results using descriptive statistics showed that most insurance companies are at level 1 of maturity in terms of customer knowledge management. It means that they are not aware of customer knowledge management and therefore there is no intention to use customer knowledge in these companies.

Haji-Haydari and Amoui Ojaghi [18] the maturity model which had three dimensions of organization, tool and process and the maturity of customer knowledge management in 5 levels of complete, defined, managed, enhanced and optimal lack of awareness. The results of the bank data also showed that the maturity level of customer knowledge management in Iranian banks is lower than the average level, and most of the banks that participated in this study were "acquiring knowledge from the customer", which indicates the active role of the customer in business they pay very little attention.

Farmani [13] which is developmental in terms of purpose and descriptive in terms of method, which used a mixed quantitative and qualitative strategy. In the qualitative part, the variables and dimensions of customer knowledge management in Iranian banks have been identified from the literature and interviews with experts, and in the quantitative part, the relationship between them has been identified using Dimtel, and the resulting model has been explained and tested using structural equations. The results of the research show that the customer knowledge management model in Iranian banks has three variables: knowledge management capabilities, types of customer knowledge, and results.

Haji Karimi and Mansourian [19] presented a model to determine the relationship between the components of customer knowledge management with improving organizational performance and customer relationship management. In this regard, 10 hypotheses have been proposed, each of which tests one of the relationships of the variables in the model. Multivariate regression analysis and SPSS software were used to test the hypotheses and conceptual model of the research. The results of the research showed that receiving data, developing knowledge and managing customer relations affect the improvement of organizational performance. Also, receiving data, processing data and developing customer knowledge affect customer relationship management. On the other hand, data processing affects the development of customer knowledge and the development of knowledge on receiving data.

Amrollahi [1] in his research using regression analysis, statistical test and Pearson's correlation coefficient, concluded that there is a relationship between employee satisfaction and maturity of customer knowledge management. There is a significant relationship.

Saatchian et al. [30] using Pearson correlation and multiple regression methods concluded that between customer knowledge management and organizational commitment, there is a positive and significant relationship with the quality of internal services.

Soleimanizadeh [34], deals with the mediating role of customer knowledge in the effect of knowledge management measures on the organizational performance of Bank Sina. The research method used is descriptive, survey and correlation type. Also, the statistical population of this research includes senior managers, deputy and middle managers and related experts in Sina Bank in Tehran province.

Chaithanapat et al. [5] based on the literature on knowledge management, leadership and innovation, investigate possible relationships between customer knowledge management, knowledge-based leadership, quality of innovation and firm performance in 283 small and medium enterprises (SMEs) in Thailand and the mediating roles of customer knowledge management and knowledge-based leadership among these relationships are highlighted in SMEs where human resources and invested capital are limited. Therefore, the findings contribute to the existing literature by providing empirical evidence to support that customer knowledge management mediates the relationship between knowledge-based leadership and innovation quality. Furthermore, the result supports the moderating effect of competition intensity on the relationship between customer knowledge management and innovation quality. Finally, theoretical implications for academics and managerial implications for managers of small and medium enterprises are discussed.

Chaithanapat and Rakthin [6] stated that customer knowledge is one of the most significant assets of companies to manage to improve their products and gain a competitive advantage while meeting customer needs. Customer knowledge management (CKM) arises when companies see the importance of customers as a source of company knowledge. More importantly, customers are transformed from passive product receivers to active knowledge partners, generating co-created knowledge with firms. However, despite the popularity of promoting entrepreneurship and small and medium enterprises (SMEs) for economic development, research studies examining CKM in the context of SMEs are relatively small and varied. In this paper, the authors discuss the concept of CKM with other related concepts predicted to be related to CKM in SMEs, namely, knowledge-based leadership (KOL), trust in management, and firm performance.

Danesh Zand et al. [8] investigated the impact of customer knowledge management on organizational performance and concluded that the constructed criteria show key psychometric properties, including reliability and validity. They also show the mediating role of CKM processes and CKM capabilities in the relationship between CKM and organizational performance. This means that companies with improved CKM process capabilities have better organizational performance.

Ode and Ayavoo [24] investigated the relationship between knowledge management measures and innovation of service companies in developing countries empirically. By reviewing the literature, this research has presented a conceptual model whose hypothesis is the existence of a positive and meaningful relationship between knowledge production, knowledge storage, knowledge dissemination, knowledge application and company innovation. The DOPU technique has been used to collect data. Data has been analyzed using the Structural Equation Model (SEM). The findings show that knowledge management practices directly and indirectly contribute to company innovation.

Castagna et al. [4] in a research titled "Customer Knowledge Management in Small and Medium Enterprises with Digital Transformation" showed that the problems of small and medium enterprises operating in creative industries, against rapid technological changes that affect CKM and also the lack of support from information technology vendors in the decision-making process for choosing appropriate digital systems is responsible.

Di Vaio et al. [10], in an article entitled The Role of digital innovation in Knowledge Management Systems: a systematic literature review examine the set of theoretical foundations related to digital innovation in knowledge management systems (KMS) to understand its role in business management and it works. This study analyzes the existing literature on KMS, to investigate the role of KMS in the era of digital transformation, especially in terms of corporate governance. The results showed that tools such as IOT and BD improve the current world economy by increasing the competitiveness of companies, ensuring access to big data and information processed through powerful software, and developing correlation capacities between useful knowledge in different parts of the company. They empower significantly.

This analysis aims to answer two basic questions that are the mental concern of many managers and leaders of organizations:

- What are the dimensions of measuring the maturity of customer knowledge management in the rail transportation industry?
- What should be done to improve and upgrade the current situation of the organization in the field of customer knowledge management?

3 Materials and methods

According to the background of the research, the conceptual model of the research was designed and drawn in the format of Figure 1.

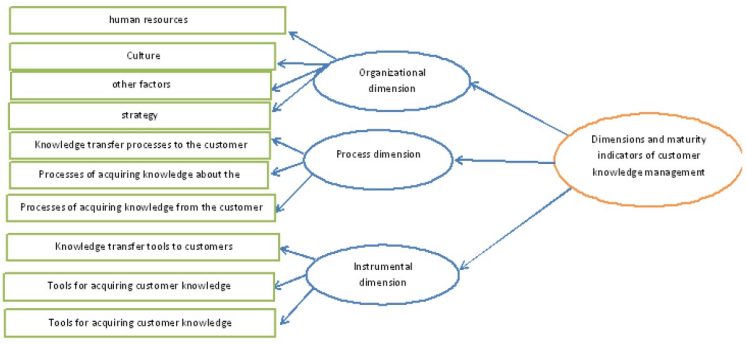

Figure 1: Conceptual model of the research taken from the research [18].

The method of this research was practical, correlational and a survey based on structural equation modelling. This research has three statistical populations; The first population is related to documents and studies in the literature of knowledge-oriented and customer-oriented information systems, which was obtained and analyzed using the meta-analysis approach. The second population consisted of railway specialists and experts who were surveyed in the field of

marketing, customer orientation and related knowledge to confirm the dimensions and maturity indicators of customer knowledge management and to determine the level of maturity indicators of customer knowledge management and a total of 19 interviews were conducted with experts and specialists using an objective judicial sampling method.

The third population was the employees and experts of different departments and units of the 21 regions of the Iran Railways, who filed a questionnaire according to the level of methodology, tools and functions used and informed people in each unit and department were invited to answer. The statistical population of the research was the employees, managers, experts and specialists in the field of rail transportation industry, whose number is (n=7100) people based on the statistics obtained from the statistical units. The size of the statistical sample was determined 355 people based on Cochran's unlimited formula and it was selected by stratified random sampling. The extraction of the dimensions, components and maturity indicators of customer knowledge management was done using the meta-analysis method. Meta-analysis is a study method which combines the data and results of previous studies (related and similar to the subject of the research) and gives a new overall result [33]. To achieve this approach, the seven-step method of Sandelowski et al. [31] was used by searching and checking databases, journals, magazines, publications and various search engines using the related keywords and then, 156 studies were found.

After examining and identifying theses, articles and related research, they were reviewed based on the parameters of the title, abstract, content and details of the articles [14] and these were not appropriate and coordinated with the goals of this research were excluded, and finally, the total number of researches used in this research was 46. After reviewing and identifying approved articles, the program of critical evaluation skills was used to measure and evaluate the quality, after measuring and evaluating the quality of selected research and studies, the indicators and the identified components were obtained from the findings. The obtained indicators and components are the main window for measuring the maturity of customer knowledge management.

A questionnaire was used to collect data. The questionnaire for measuring the maturity of customer knowledge management in the rail transportation industry includes 3 factors organizational (human resources, culture, strategy, other factors), process (processes of knowledge transfer to the customer, processes of acquiring knowledge about the customer, processes of acquiring knowledge from the customer) and tools (tools for transferring knowledge to the customer, tools for acquiring knowledge from the customer, tools for acquiring knowledge from the customer) and they include 64 items.

The questionnaires were confirmed by calculating the Cronbach's alpha coefficient, using the content validity of the formal content by asking the opinions of university professors, and it was used for reliability analysis. The reliability analysis of the organizational, process and instrumental dimensions shows the appropriate measurement of the research variables with the selected items. The results are shown in table 1. Structural equation modelling with PLS software was used for data analysis. In PLS models, after implementing the model, the appropriateness of the estimated model should be checked through Cronbach's alpha indices, composite reliability and average explained variance. Cronbach's alpha is calculated as follows equation:

$$\alpha = \frac{k}{k-1}\left[1 - \frac{\sum S_i^2}{S_x^2}\right] \tag{3.1}$$

in this relation, k is the number of obvious variables, S_i^2 is the variance of the sum of scores of each subject and S_x^2 is the variance of the scores related to the i-th obvious variable. Composite reliability is calculated as follows equation:

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + (\sum \varepsilon_2)} \tag{3.2}$$

in this regard, CR indicates composite reliability, λ indicating the factor load of each factor and ε is the error sentence. The average variance explained is calculated through following equation:

$$AVE = \frac{\sum \lambda_i^2}{n} \tag{3.3}$$

in this relation, AVE represents the average explained variance, λ represents the factor load of each factor and n represents the number of obvious variables.

Finally, the coefficient of determination and the adjusted coefficient of determination are calculated to check the quality of the structural model. It can be said that the coefficient of determination shows how many percent of changes in the dependent variables in a regression model are explained by the independent variable. In other words, the detection coefficient or R^2 shows how much of the change in the dependent variable of the problem was influenced by the independent variable of the problem. Also, to what extent the remaining changes in the dependent variable of

the problem are related to other factors in the problem? R^2 is calculated through the following equation:

$$R^2 = \frac{\sum(\hat{Y}_t - \overline{Y})^2}{\sum(Y_t - \overline{Y})^2} \tag{3.4}$$

R^2 is a value between 0 and 1, where the number 0 indicates that the model does not show any relationship with the dependent and independent variables around its mean, and the number 1 indicates that the model shows all the variability of the response data in the surrounding average. The adjusted value of the determination coefficient adjusts and corrects the amount of R^2 according to the independent variables added to the regression line and according to the width of the new origins. The smaller difference between R^2 and the adjusted R^2 indicates that the independent variables that are added to the model have been selected correctly. The adjusted coefficient of determination is calculated through the following equation:

$$AdjustedR^2 = 1 - \frac{(1 - R^2)(N - 1)}{N - p - 1} \tag{3.5}$$

in this regard, N indicates the number of observations and p indicates the number of independent variables. The results of reliability checking of study variables are shown in table 1.

Table 1: Reliability of research variables.

Factors	**Variable**	**Measurement scale**	**Alpha value**
Organizational factors	human resources	Ranking	0.883
	Culture		0.786
	Other factors		0.876
	Strategy		0.821
Process factors	Knowledge transfer processes to the customer		0.92
	Processes of acquiring knowledge from customer		0.808
	Processes of acquiring knowledge about customer		0.906
Instrumental factors	Knowledge transfer tools to customers		0.915
	Tools for acquiring knowledge from customers		0.907
	Tools for acquiring knowledge about customers		0.789

To identify the demographic characteristics of the statistical sample, 5 variables of gender, marital status, age, education level and service history were used. Table 2 shows the demographic variables of the research participants, which were collected from 355 questionnaires.

Table 2: Demographic information of the respondents.

variable	**Sex/age**	**n/percentage**	**Variable**	**Level**	**n/percentage**
Sex	Man	335 (86%)	Education	Diploma	0
	Woman	53 (14%)		Associate	70 (27%)
Marital status	Single	49 (13%)		Bachelor	277 (69%)
	Married	336 (87%)		Masters and higher	38 (11%)
Age (year)	< 25	35 (10%)	Work history	< 10	39 (10%)
	25-35	83 (22%)		10-20	288 (75%)
	36-45	7%		> 25	58 (15%)
	46-55	36 (9%)			
	> 55	46 (12%)			
Sum		355			

In structural equation models, it is necessary to test two models. The first model includes the measurement model for each latent variable, which was tested for all variables. After testing the existing measurement models, it is necessary to provide a structural model that shows the relationship between the existing research variables. By using the structural model, it is possible to examine the research questions. The structural model of the research was done using structural equations. The model in standard estimation mode (standard coefficients) and significant coefficients (significant number) is shown in figures 2 and 3.

The criterion value for the appropriateness of factor load coefficients is 0.4. According to figure 3, the coefficients of the factor loadings are more than 0.4, which indicates the appropriateness of this criterion.

According to figure 3, all significant z coefficients are greater than 1.96, which shows the significance of all questions or items and relationships between variables at the 95% confidence level. Therefore, hypotheses H1 to H3 are confirmed and it can be concluded that the maturity measurement dimensions of customer knowledge management, which include

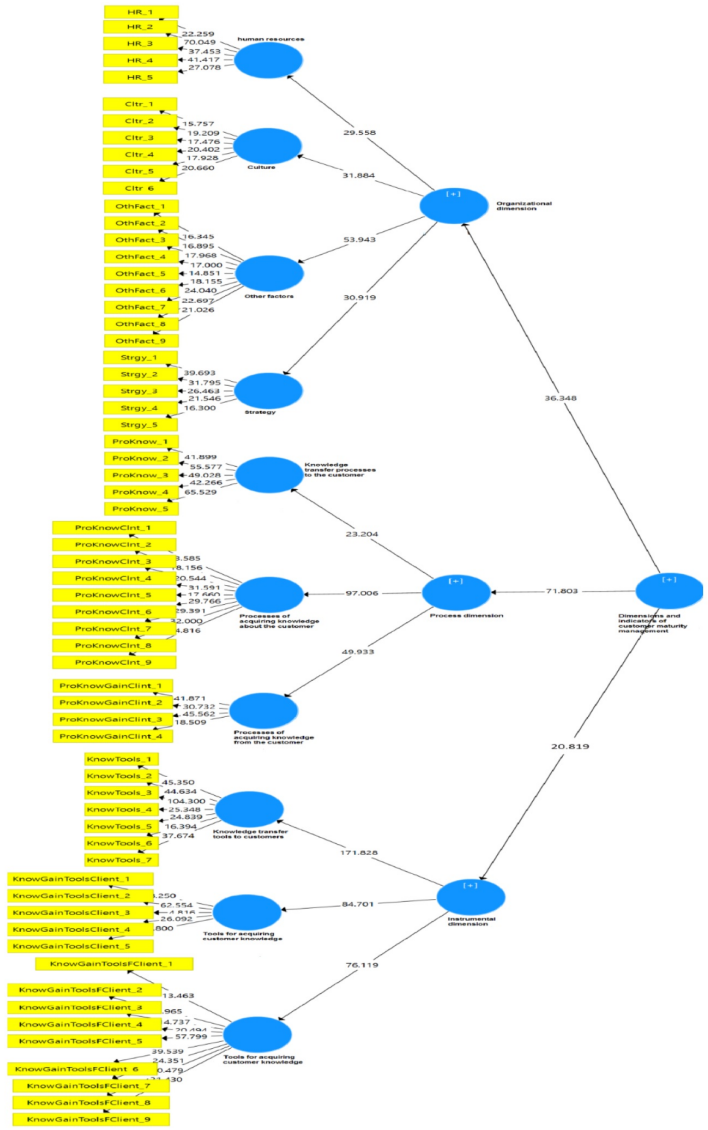

Figure 2: Research model with path coefficients and external loads.

(organizational, process and instrumental), have an impact on the rail transport industry and have been implemented in IR Railway Company.

Considering that the suitable value for Cronbach's alpha and composite reliability is 0.7 and AVE is 0.5, and according to the findings of the table 4, these criteria have adopted a suitable value for the variables of Maknon, it can be suitable, so, the reliability and convergent validity of the research can be confirmed.

To check the fit of the structural model in research, R^2 coefficients are related to hidden endogenous (dependent) variables of the model. R^2 is a measure that shows the effect of an exogenous variable on an endogenous variable, and three values of 0.19, 0.33 and 0.67 are considered as the criteria for weak, medium and strong values of R^2.

According to the findings of table 5, the value of the coefficient effect for all the above relationships is higher than the value of 0.35, which indicates that the effect sizes are strong.

4 Discussion

The first question: What are the effects of dimensions of measuring the maturity of customer knowledge management in the rail transportation industry?

Identifying and extracting dimensions and effective indicators for measuring the maturity level of customer knowl-

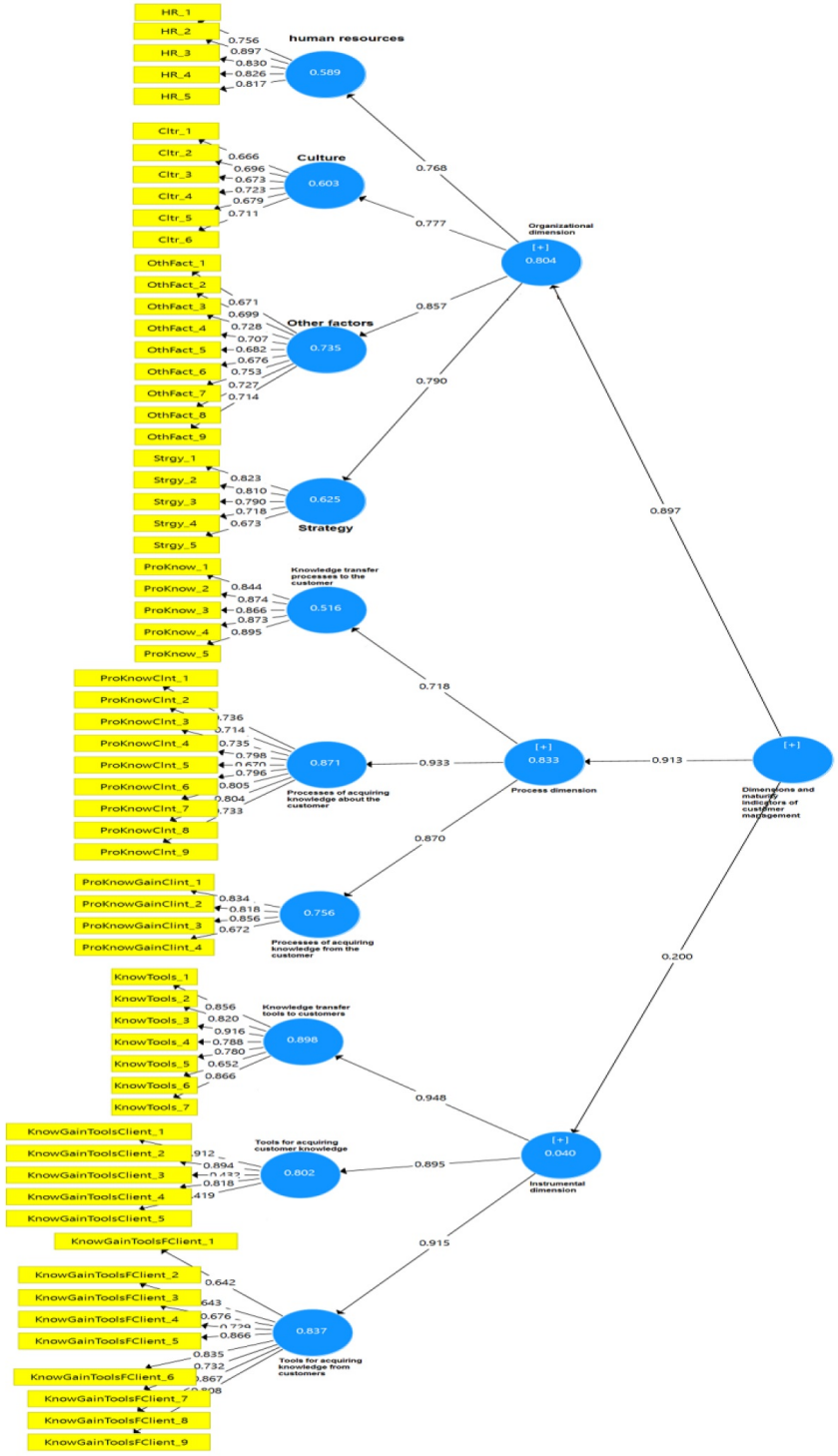

Figure 3: Study model with val

edge management in organizations is based on these factors (organizational, process and instrumental). According to the results obtained from the current study, the maturity components of customer knowledge management have key effects on the rail transport industry.

According to the structural model, the significance coefficient was t=36.348 (more than the absolute value of 1.96), which shows that this relationship is significant and it can be concluded that organizational factors have an effect on customer knowledge management in the rail transportation industry. Human resource activities affect the

Table 3: The results of Cronbach's alpha criterion and the combined reliability of the hidden variables of the research

Variables	**Composite reliability above 0.7**	**Cronbach's alpha coefficient above 0.7**	**Average Variance Extracted (AVE) criterion above 0.5**
Knowledge transfer tools to customers	0.915	0.932	0.646
Knowledge acquiring tools from customers	0.907	0.924	0.578
Knowledge acquiring tools about customers	0.789	0.838	0.532
Dimensions, components and maturity indicators of customer management	0.932	0.902	0.528
Strategy	0.821	0.875	0.585
Instrumental dimension	0.945	0.952	0.504
Organizational dimension	0.922	0.93	0.552
Process dimension	0.922	0.933	0.540
Other factors	0.876	0.9	0.500
Knowledge transfer processes to the customer	0.92	0.94	0.875
Processes of acquiring knowledge from the customer	0.808	0.875	0.638
Processes of acquiring knowledge about the customer	0.906	0.923	0.572
Culture	0.786	0.846	0.579
Human resources	0.833	0.915	0.683

Table 4: Coefficient of determining the endogenous structure of the research model

Dependent structures	R^2	**Adjusted** R^2
Knowledge transfer tools to customers	0.898	0.898
Knowledge acquiring tools from customers	0.837	0.836
Knowledge acquiring tools about customers	0.802	0.801
Strategy	0.625	0.624
Instrumental dimension	0.24	0.237
Organizational dimension	0.804	0.804
Process dimension	0.833	0.832
Other factors	0.735	0.734
Knowledge transfer processes to the customer	0.516	0.514
Processes of acquiring knowledge from the customer	0.756	0.756
Processes of acquiring knowledge about the customer	0.871	0.870
Culture	0.603	0.602
Human resources	0.589	0.588

Table 5: The effect size of the exogenous structures on the endogenous structure of research.

Research structures	**Dimensions, components and maturity indicators of customer knowledge management**	**Tool dimension**	**Organizational dimension**	**Process dimension**
Knowledge transfer tools to customers		815.8		
Knowledge acquiring tools from customers		125.5		
Knowledge acquiring tools about customers		4.04		
Strategy			1.664	
Instrumental dimension	130.4			
Organizational dimension	104.4			
Process dimension	984.4			
Other factors			2.769	
Knowledge transfer processes to the customer				1.064
Processes of acquiring knowledge from the customer				3.107
Processes of acquiring knowledge about the customer				6.722
Culture			1.521	
Human resources			1.435	

performance of the organization. People who work for an organization are one of its main assets and one of the main factors in determining its performance. Human resources develop the knowledge and skills of employees; therefore, it

helps to improve organization productivity. Because recruitment leads to the employment of capable employees for the organization's goals. In the process of education, employees can acquire specific knowledge needed by the organization. In addition, education increases the expertise of employees in their careers, therefore, it leads to the participation of employees in management decisions. The result of this hypothesis is consistent with the findings of Talai Fard et al. [36], and Bidgholi et al. [3].

Regarding the effect of process factors on customer knowledge management in the rail transportation industry, the coefficient of significance between these two variables was t = 71.803 (more than the absolute value of 1.96), which shows that this relationship is statistically significant and it can be concluded that process factors have an effect on customer knowledge management in the rail transportation industry. The result of this research is in line with the results of Badri [2], Nikookar [23] and Haji-Haydari and Amoui Ojaghi [18].

Regarding the effect of instrumental factors on customer knowledge management in the rail transportation industry, the coefficient of significance between these two variables was t=20.819 (more than the absolute value of 1.196), which shows that this relationship is statistically significant and it can be concluded that instrumental factors have an effect on customer knowledge management in the rail transportation industry. Customers' knowledge is more about products, suppliers and markets. This knowledge can couple with customers interaction for continuous improvement of services and development of new products. This knowledge belongs to the customer and organizations should pay more attention to this knowledge. This knowledge contains customer information about the organization's services and products, competitors' products and services, customers' entry for product development and innovation, and their desired communication channels with the organization. The result of this research is in line with the results of the research by Nikookar [23] and Haji-Haydari and Amoui Ojaghi [18].

This question asks: what should be done to improve and upgrade the current situation of the organization in the field of customer knowledge management? it can be said that the activity and performance of the railway are carried out in two sectors: cargo transportation and passenger movement. Because Iran Railway Company's services to customers of both cargo and passenger sectors are different; As a result, it is necessary to establish and implement the maturity model of customer knowledge management to develop and improve the status of the organization in the field of customer knowledge management.

Based on the Islamic Republic of Iran's leader, developing and switching rail transportation and goods transferring from road to rail is a necessity. Also, in clauses 24 and 25 of the notification of Iran's leader regarding the general policies of the 6th development plan, he emphasized the priority of the railway sector in the development of transportation and creating a competitive advantage for it. Furthermore, in clause 25, he has emphasized on development of freight rail transportation with the priority of equipping the network and cargo terminals and connecting the network to large economic, commercial and industrial centers and important entry and exit points of the country and regional and global rail networks, especially the north-south corridor, to develop exports and load transit.

According to the 20-year document of future perspective and by the 2025, the share of suburban rail transport in passenger transportation should reach from 4% to at least 18% and the share of cargo transportation from 10% to at least 30% of the country's total transportation in order to achieve the goals of this document, it is necessary to pay more attention to the development of participation and investment attraction of the non-governmental sector in infrastructure and fleet development projects of Iran Railway Company, in which the role of knowledge management and management of customer's knowledge in realizing the vision of the railway, which becomes an efficient, safe and competitive transportation system in the region, with a quality that determines the maximum satisfaction of the stakeholders, including reducing accidents and increasing safety, increasing development and modernization of the fleet by using the knowledge of experts, identifying the optimal state of knowledge of manpower and customers to realize the vision, institutionalizing the culture of sharing knowledge of manpower and customers and collective learning, creating an atmosphere of knowledge competition between the 21 regions of the railway and the maximum use of the existing knowledge of human resources and customers in order to creation of new knowledge.

The continuation of establishing a comprehensive system of knowledge management and customer knowledge management in IR Railways should consider the development and completion of the following items in its plan:

- Knowing the organization and evaluating the current state of knowledge and identifying key knowledge areas
- Converting the organization's selected processes to knowledge-oriented processes
- Designing the structure, roles and drafting of knowledge management guidelines
- Cultivation, education and motivation of knowledge management

- Implementation of the structure and formation and management of knowledge networks
- Establishing a comprehensive knowledge management software system
- Measuring the effectiveness of knowledge management in the organization.

Findings from the present study must be interpreted in light of its limitations. First, the findings of this research may be limited by the environment in which the research was conducted. On the other hand, the results of this study are limited to establishing and measuring the maturity of customer knowledge management. Although the validity and reliability of the criteria and metrics used have been confirmed and their selection for this research is defensible, but in future research, additional and deeper investigations and studies may be accepted. New criteria that show a new approach to research variables will lead. Also, the generalizability of the results of this research may be reduced due to the presence of intervening variables that have influenced relationships in the research process but have been hidden from the researcher's view. Second, the conservatism of some managers and employees of the IR Railway Company affected their answers to the questionnaire questions and made it difficult to analyze the information. Third, lack of access to several more specialized studies at higher scientific levels in the field of the research topic to increase the generalization of the results. Finally, due to the vastness of the RA railway area in the whole country, which includes 21 regions, the researcher did not have access to all regions, and despite the use of an online questionnaire, the ambiguous points of the questionnaire questions were not informed accurately.

5 Conclusion

As the results of the structural equation section showed, knowledge management capabilities have an effect on customer knowledge management and its results, so it is suggested that researchers identify the factors influencing these capabilities in future studies. and to obtain their effect on customer knowledge and the results of the subgroups of the IR Railway Company. It is also suggested that the process presented in this study be implemented for other types of knowledge, such as knowledge of suppliers, knowledge of competitors, etc., in IR Railway Company. It is suggested to the managers of IR Railway Company to re-examine and review the organizational structure and technology of J.A. Railway from the perspective of a knowledge organization and the structures and technologies that interact It facilitates IR between different departments inside and outside the railway to review and revise. In other words, create structures and technologies in which attention to customer knowledge is a priority and these structures and technologies encourage the preference of individual behaviour over collective behaviour and facilitate the discovery of new knowledge. That is, in the design of the new structure, these components, indicators, dimensions and their location should be determined exactly.

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