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The Effect of Intellectual Capital on Innovative Performance with the Mediating Role of Qazvin Health Staff's Empowerment: A Path Analysis

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ABSTRACT

Background: Nowadays, since many health care organizations are facing a crisis of declining productivity and labor force stagnation, productivity can be improved through identifying and strengthening the components affecting the labor force productivity and performance. Thus, the present study was aimed at determining the effect of intellectual capital on innovative performance with the mediating role of health staff's empowerment in Qazvin University of Medical Sciences.

Methods: This is a descriptive-analytical cross-sectional study carried out in 2021. Three hundred and four staff of the Health Department and Health Networks participated in the research by the available sampling method. The Bontis questionnaire was employed for measuring the intellectual capital, the Spritzer questionnaire for measuring staff's empowerment, and the Huang and Li questionnaire for measuring innovative performance. Moreover, for preliminary data analysis, $SPSS_{25}$ Software was used as well as AMOS software for structural equation modeling at a significance level of 0.050 %.

Results: The results of the path coefficient among the model variables on each path, corresponding to the research hypotheses, are positive, revealing a positive relationship among the research variables. The path coefficient of the direct relationship between intellectual capital and innovative performance was equal to 0.767 (P-value < 0.001). Moreover, the relationship between intellectual capital and empowerment was equal to 0.306, and between empowerment and innovative performance was equal to 0.153, both of which were significant ($p < 0.001$). Furthermore, indices of fit including NFI = 0.652, RMSEA = 0.064, GFI = 0.710, and CFI = 0.769 exhibited a relatively good fit of the final model.

Conclusion: Given the direct relationship between model variables, the University of Medical Sciences' managers and health officials should provide the bed for improving the capacity of human resources and innovative performance through developing intellectual capital besides creating a platform to play an effective role in the organization. Accordingly, effective and innovative performance based on responding to the human resources' changing needs in all sectors may be imagined.

Key words: Intellectual capital, Empowerment, Innovative performance, Health, Qazvin.

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Introduction

Nowadays, simultaneous with the evolution of Information Technology (IT), the economic growth pattern has altered, followed by the substitution of the financial and physical capital in the global economy with knowledge as the key capital. In other words, industrial economics has been replaced by knowledge-based economy and as a major factor in wealth production, knowledge and intellectual capital has a special place compared to other tangible assets (1). The most famous intellectual capital classification has been made by Sveiby in three areas, including human, structural, and communication capital. Human capital refers to the property of individuals' knowledge in an organization (2). Structural capital refers to all non-human resources of knowledge in an organization, including databases, organizational charts, process executive instructions, strategies, and executive programs (3). Communication capital consists of all the relationships existing between the organization and any other individual or organization that may include customers, intermediaries, staff, suppliers, legal authorities, communities, creditors, and investors (4). Moreover, the most prevalent empowerment model, particularly in the health sector, is the individual's perception of his/her ability (5). Thus, the appropriate organizational and individual contexts are required to establish the empowerment process in the organization, so that staff employees feel empowered by the possibility of applying control over their work environment (6). Hence, organizational goals may be achieved by empowering human resources and through all employees' participation in the decision-making process, regardless of their job position (7). Accordingly, three vital factors of planning, organizational culture, and organizational structure are assessed for creating creativity and innovation in the organization. Compared to the non-innovative organizations, those with the capacity to innovate are able to overcome the challenges around them faster and better, in turn increasing the performance of the organization (8). Innovation is defined by Rogers as an idea, product or process, a system or device perceived by individuals, groups, or organizations, even an industry and society as a new subject (9). Furthermore, performance may be defined as the acceptable results to the organization's customers receiving functional products, services, information, and decisions or events. Thus, innovative performance is often specified by investigating the number of new achievements, reports, and projects that are being developed by the organization in its organizational goals (10). Nowadays, most research results have pointed to the role of intellectual capital in empowerment and staff performance issues directly and indirectly related to these variables. In this regard, We a study in Tehran Military Hospital (11), nurses of Khatam Al-Anbia hospital in Zahedan (12), Jordan General Hospital (13) and in Ilam University of Medical Sciences (14) can be referred to, each showing the relationships regarding the different dimensions of these three concepts, particularly in the health care sector. Many health care organizations are today facing the crisis of declining productivity and human force stagnation; this may be because of the lack of optimal use of organizational resources. Hence, productivity can be improved through identifying and strengthening the components affecting the human force productivity and performance. Besides, in health care organizations, the optimal performance of human resources is of paramount importance since in addition to their daily affairs, the staff must be prepared and able to deal with the crisis (15). Hence, the present study was aimed at determining the association between intellectual capital and innovative performance with the mediating role of health staff's empowerment in Qazvin University of Medical Sciences, the results of which may first determine each variable's status and secondly explain the causal relationship among them. Consequently, solutions can be provided to enhance the staff's ability through developing their intellectual capital to improve innovative performance.

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Materials and Methods

Type of study and participants

This is a descriptive-analytical and cross-sectional study conducted in 2021 in the field of health of Qazvin University of Medical Sciences. The studied population included all health staff of Qazvin University of Medical Sciences. This deputy included three parts: the deputy headquarters, city health networks, and their affiliated health centers. Given the type of study, the sampling method in down structural equation modeling studies was employed to explain and analyze the causal path among the research variables. In this method, the number of components is multiplied by 5 until the number of samples is obtained (16). According to the number of components, the present study had a sample of 304 people, 10 of which from the health deputy, 60 from the city health networks, and 234 people from the health centers participated in the study based on the proportion of staff in each department. According to the studied sections, available sampling was used. In addition, the inclusion criteria were having sufficient experience, work experience, and sufficient interest and motivation to participate in the research.

Data Collection Tools

Bontis Intellectual Capital Questionnaire

With 42 closed-ended questions, Intellectual Capital Assessment Questionnaire was developed by Bontis (1998). This structure has three dimensions of human capital, structural capital, and communication capital of staff. It is in accordance with the Likert scale (strongly disagree 1= disagree ; 2= neutral ; 3= agree ; 4= strongly agree 5). In case that the questionnaire scores are between 42 and 84, the rate of intellectual capital in the society is weak. Questionnaire scores of between 84 and 126 show the moderate level of the intellectual capital. The scores above 126 indicate very good level of intellectual capital. Aghajanzadeh (2011) calculated the reliability of this questionnaire with Cronbach's alpha of 0.820 (17).

Spritzer Empowerment Questionnaire

With 12 questions, Psychological Empowerment Questionnaire was developed by Spritzer (1995). It examines the four dimensions of feeling of significance of job, the feeling of competence, the feeling of being effective, and the feeling of having the right to choose, and measures psychological empowerment based on the Likert scale (strongly low =1; low = 2; to some extent: 3 = high = 4, strongly high = 5). The minimum and maximum possible scores are 12 and 60, respectively. Score between 12 and 20 shows the low level of psychological empowerment. Score between 20 and 40 shows the moderate level of psychological empowerment. Score above 40 shows the high level of psychological empowerment. In the study by Ahmadi (18), this questionnaire's content and face validity and reliability were assessed as appropriate and its Cronbach's alpha coefficient was estimated above 0.700 (18).

Huang and Li innovative performance questionnaire

Huang and Li (2009) presented a questionnaire with seven items and two dimensions of executive innovation (questions 1 to 4) and technical innovation (questions 5 to 7) to measure innovative performance. This questionnaire is based on the Likert scale (strongly disagree, 1; disagree, 2; neutral, 3; agree, 4; strongly agree, 5). In the study conducted by Manteghi et al. (10) in order to determine the validity of the questionnaire, the content validity method and then the Average Variance Extracted (AVE) method with a value of 0.504were employed. The composite (construct) reliability method with a value of 0.664 besides Cronbach's alpha with a value of 0.732 were used .

Data Collection and Analysis

The self-administered method was employed for completing the questionnaires and based on the coordination, the researcher initially referred to the centers and explained the research objectives, and structure of the questionnaire to the individuals, and the sample was then completed by allocating the required time. In order to summarize descriptive data in the form of mean and standard

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deviation, descriptive statistics were employed. Moreover, the structural equation modeling technique was applied to coherently examine the causal relationships between the variables and present the final model. This technique has five steps as 1) model statement: (including construction of the initial model), 2) model estimation: (including data collection and construction of variable matrices), 3) fit assessment: (including general examination of the model fit and its testability and assessing the need to adjustment), 4) model adjustment, and 5) model interpretation. Fit indices used in this study included: X2/d, Goodness Of Fit Index (GFI), Root Mean Square Error Of Approximation (RMSEA), adjusted Comparative Fit Index (CFI), and Normal Fit Index (NFI). The above steps were performed by AMOS software at a significance level of 0.05 %.

This study was the result of a part of the master's thesis of the Faculty of Health, which has been conducted by obtaining the needed licenses from Qazvin University of Medical Sciences. (Ethics Code: IR.QUMS.REC.1399.294)

Results

In the current study, the highest number of samples related to women (83 %). Besides, 77 % were married, the highest number of individuals had a bachelor's (BA) degree (57.200 %), and the highest number of individuals (69 %) worked in expert organizational positions. Moreover, in terms of age, most people (42.800 %) were in the age group of 25-30 years and the highest number of people had a work experience of 11-15 years (25 %) (Table 1).

The mean scores of intellectual capital, empowerment, and innovative performance of the studied individuals were (3.254), (3.915), and (3.010), respectively. Among the intellectual capital dimensions, communication capital had the highest mean (3.318) and human capital had the lowest mean (3.107). Among the dimensions of empowerment, the feeling of significance of job had the highest average score (4.275) and the dimension of feeling the right to choose had the lowest average score (3.366); and among the dimensions of the Innovative Performance Questionnaire, technical innovation had the highest average score (3.162) (Table 2).

Pearson correlation coefficient between intellectual capital and innovative performance was 0.638. (P -value < 0.010), while this coefficient between empowerment and innovative performance was 0.314 (P –value < 0.010). On the other hand, this coefficient between intellectual capital and empowerment was estimated 0.291 (P -value < 0.010). Regarding the mean dimensions and components, there was no statistically significant difference in terms of intellectual capital among the studied centers; however, there was a statistically significant difference among the studied centers in terms of intellectual capital and human capital dimensions (P-value < 0.050). Besides, there was no statistically significant difference among the studied centers.in terms of innovative performance and empowerment (Figure 1). Represents the path coefficient among the model variables on each path corresponding to the research hypotheses. This standard path coefficient is a number between 1 and -1 whose positive sign in the above model indicates the positive relationship among the research variables. The path coefficient of the direct relationship between intellectual capital and innovative performance was 0.767 (P-value < 0.001), revealing a strong relationship between these two variables. Furthermore, the relationship between intellectual capital and empowerment, and empowerment and innovative performance were Significant (P-value < 0.001) (Table 3).

Regarding the fit of the factor analysis obtained from the previous step, the chi-square index, goodness of fit index (GFI), root mean square error of approximation (RMSEA), adjusted comparative fit index (CFI) and normal fit index (NFI) were employed. The values obtained for the indicators: Chi-square, GFI, and RMSEA are in the defined range; however, CFI and NFI values are not in the defined range. Thus, it was concluded that at this stage, the model had a moderate fit; then it was necessary to make changes in the model for

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achieving a better fit according to the software suggestions. In the next step, to enhance the fit indices, the model improvement indices were examined. In this regard, the software identified and suggested relationship, by establishing which the model had better fit indices (Figure 2).

Finally, by performing two adjustment stages in the Software, the fit indices of the adjusted model were in the acceptable range and the estimation of the second model resulted in the improvement of the indices, GFI, RMSEA, CFI, and NFI, showing a relatively good fit of the model (Table 4).

Table 1. Frequency distribution of participants' demographic characteristics

Variable name		N	Percentage
Gender	Male	52	17.000
	Female	252	83.000
Age	< 25	18	5.900
	25-35	130	42.800
	36-45	113	37.200
	> 45	43	14.100
Marital status	Single	70	23.000
	Married	234	77.000
Work experience	Below 5	72	23.700
	5-10	68	22.400
	11-15	76	25.000
	16-20	26	8.500
	More than 20	62	20.400
Education	Below diploma	8	2.600
	Diploma	34	11.200
	Associate degree	28	9.200
	BA	174	57.200
	MA	27	8.900
	PhD	33	10.900
Organizational position	Physician	31	10.000
	Expert	210	69.000
	Nurse	1	0.300
	Health worker	60	20.000
	Administrative and financial staff	2	0.700

Table 2. Mean and Standard Deviation (SD) of participants' responses

Dimensions	Components	Mean	Standard Deviation (SD)
Empowerment		3.910	0.670
	Feeling of significance of job	4.270	0.760
	Feeling of competence	4.150	0.730
	Feeling of being effective	3.770	0.850
	Feeling of having the right to choose	3.360	0.870
Innovative performance		3.010	0.870
	Executive innovation	2.890	0.960
	Technical innovation	3.160	0.920
Intellectual capital		3.250	0.480
	Human capital	3.100	0.550
	Structural capital	3.110	0.470
	Communication capital	3.310	0.540

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Table 3. Standardized path coefficients between the model's main variables

Hypothesis result	Path coefficient	T statistic (significance level)	Hypotheses	Hypothesis symbol
Confirmed	0.300	P* < 0.001	Intellectual capital → Empowerment	H_1
Confirmed	0.150	P < 0.001	Empowerment → Innovative performance	H_2
Confirmed	0.760	P < 0.001	Intellectual capital → Innovative performance	H_3

*** P-value≤0.05 is significant.**

Table 4. Fit Indices of the Second Model

Index name	Permissible limit	Obtained value
$\frac{\chi^2}{df}$ (Chi-Square)	< 3.000	2.256
Goodness of Fit Index (GFI)	> 0.900	0.710
Root Mean Square Error of Approximation (RMSEA)	< 0.080	0.064
Adjusted Comparative Fit Index (CFI)	> 0.900	0.769
Normal Fit Index (NFI)	> 0.900	0.652

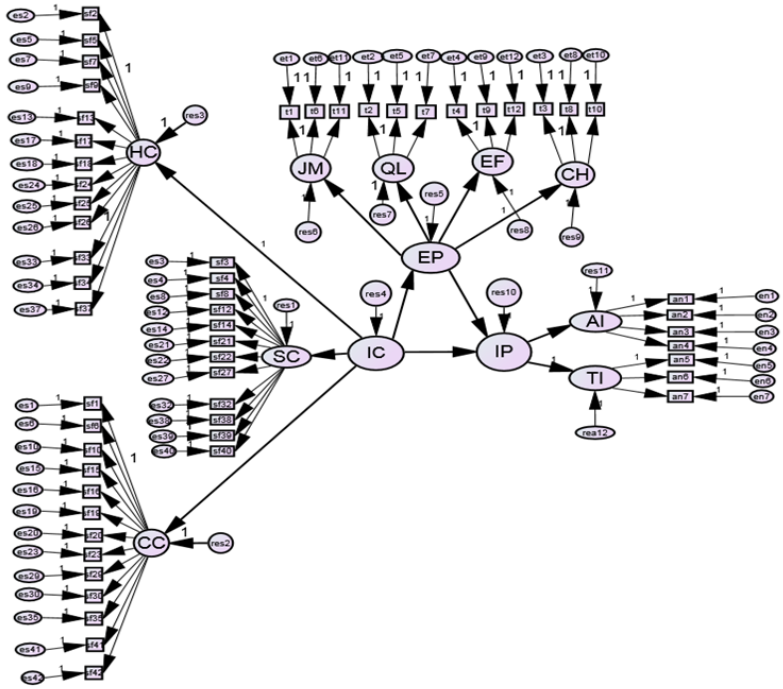

Figure 1. Estimation of unadjusted research model

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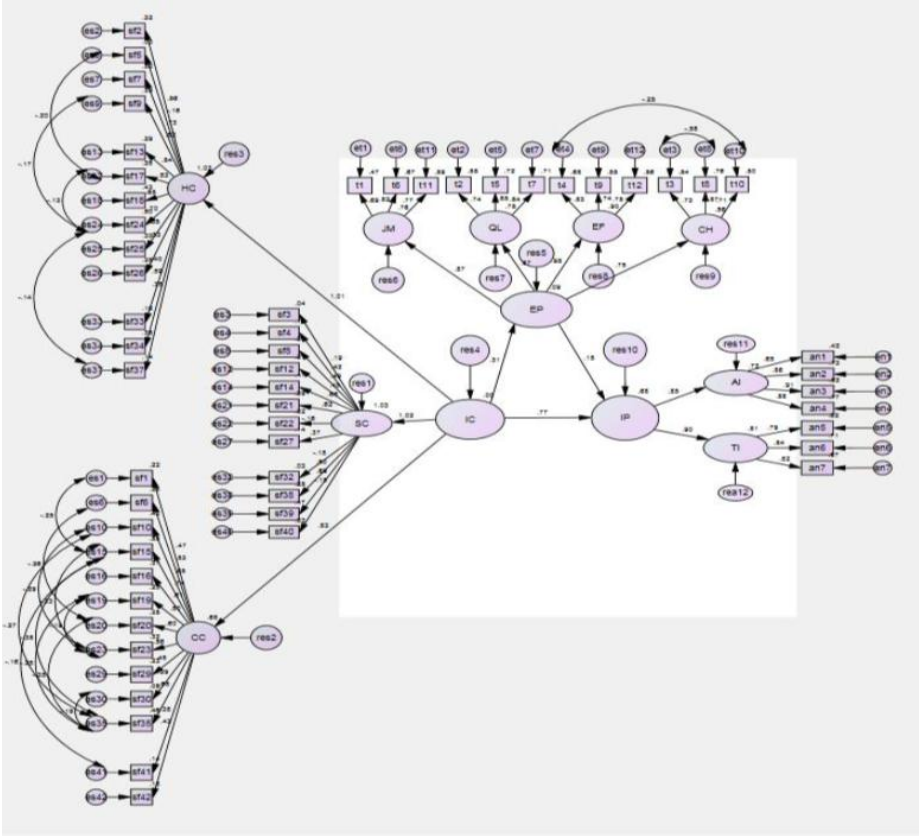

Figure 2. Adjusted research model

Discussion

This study was mainly aimed at fitting the pattern of the relationship among intellectual capital, innovative performance, and empowerment of health staff in Qazvin University of Medical Sciences. In this research, based on the results of factor analysis and path diagram, it may be stated that the employed model has a relatively good fit. In explaining the first hypothesis, path coefficients between variables besides the level of significance reveal a direct relationship between intellectual capital and empowerment. In this regard, many organizational changes are made around the empowerment axis. As a key factor, empowerment of staff may play a vital role in the organization's innovation and effectiveness. Hence, as factors like knowledge, skills, employees' capabilities and attitudes, i.e. the human capital rate in the organization is higher and better, the staff will have better performance. In their research, Shihaki et al. (12) argued that through the intellectual capital variable, social capital positively and significantly affect the nurses' empowerment in Khatam Al-Anbia Hospital in Zahedan. Moreover, in their study on the relationship between intellectual capital and empowerment and staff's professional commitment, Jamshidi et al. (19) indicated the positive effect of these two variables. Thus, in explaining this finding, Ghaleei et al. (20) in their study on the structural relationship among intellectual capital, empowerment, organizational learning, and performance in the staff of Tehran University of Medical Sciences revealed the positive and significant effect of intellectual capital on empowerment (20). In explaining the second hypothesis, the strong relationship between these two variables is shown by the path coefficient of the direct relationship between empowerment and innovative performance. Empowerment refers to a process promoting the staff's growth and capable staff can find appropriate solutions to problems. Accordingly, they will often have more power for

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their independence, decision-making, and performance to spend more time and energy to learn, challenge new things, and share their knowledge with other employees. This process may in turn create more creative designs, i.e. when employees feel competent, independent, effectiveness, significance at their duties and work, and trust in their colleagues, their teamwork and efforts will increase to enhance their competencies. This will improve their performance. Therefore, the this hypothesis' result are in line with those of the research by Spiegelaere et al. (21) on job design and innovative performance through activating innovation in jobs with low work pressure, the research by Khorakian et al. (22) on the affect of empowerment on innovative behavior given job motivation, as well as the research by Naami et al. (23) that in their study on the role of job passion in the psychological atmosphere and central self-evaluations with task performance revealed the direct and indirect relationship between organizational culture and innovative behaviors through psychological empowerment. Moreover, in explaining the third hypothesis, a strong relationship between intellectual capital and innovative performance is shown by the path coefficient of the direct relationship between these two variables. In this regard, since the management of intellectual capital in terms of capital, leads to the growth and development of organizational competencies, and since organizational competencies are obtained based on the intellectual capital, these competencies' improvement relies on the effective management of intellectual capital, as a result of which the staff's performance will improve and value will be created. Thus, it may be claimed that organizations' intellectual capital can enhance the staff's creativity and innovation. Since innovation and proposing new ideas and opinions are among the inherent characteristics of all individuals that may grow and flourish under suitable conditions, high intellectual capital will result in the staff's increased creativity and innovation in the organization and in case of provision of a suitable platform for creativity, the organizational performance process will be improved, too. Therefore, the result of this hypothesis was consistent with those of the research by Jahanian et al. (24) on the study of the relationship among intellectual capital and innovation and human resources creativity in the organization, and the study by Isfahani et al. (11) on the relationship among intellectual capital and human resources productivity and job performance from the viewpoint of hospital staff. Nevertheless, it was not in line with the research by Hoseyni et al. (8) on the study of the effect of intellectual capital on innovative performance with the mediating role of organizational learning.

Conclusion

Given the results of the present study, it may be stated that intellectual capital is one of the effective key factors in the research sample and the organization managers are seeking to enhance the level of intellectual capital, ability, and performance of their staff. Conducting this study revealed that efforts to enhance intellectual capital may result in more empowerment of employees and consequently help increase their efficiency and effectiveness. Naturally, more efficiency leads to more loyalty and consequently enhanced innovative performance of experts. Health managers and officials of the University of Medical Sciences can establish the appropriate bed and the required capacities in employees for them to fulfill their responsibilities in the organization. Managers can also provide the bed for improving the human resources capacity and innovative performance that will eventually result in the effectiveness and efficiency. Furthermore, empowerment alters the staff's attitude and behavior and through changing the type of human resources attitude and behavior, it may be associated with job motivation and reduced stress, as well as declined indifference to the organization. Our study had two restrictions. First, this study was carried out only on the health staff of Qazvin University of Medical Sciences. Hence, its results cannot be generalized to other branches of the university. Second, cross-sectional data was employed. Thus, it did not consider the dynamics

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of the studied variables. Since the relationship among the three studied variables is yet debatable, researchers are recommended to provide stronger evidence for the relationship among these three variables through reviewing the literature.

Since the intellectual capital and innovative performance are in a significant relationship, HR managers are recommended to provide the required opportunities for staff's professional development in their field of work and to encourage and support employees to participate in retraining courses for them to acquire the necessary skills. Moreover, senior managers are recommended to consider rewards for new ideas and provide the facilities and conditions needed for the implementation of the ideas. Furthermore, the research hypothesis result indicated the effect of empowerment on the staff's innovative performance. Accordingly, since empowering the staff in the organization can be effective in their creative and innovative thinking, it is recommended to try to grow creative and innovative employees through improving the organization's internal conditions, such as holding meetings as group thinking and brainstorming.

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Conflict of interests

The authors declared no conflict of interests.

Authors' contributions

Khosravizadeh O designed research; Sheikh BS conducted research; Ahadinezhad B analyzed data; and All authors read and approved the final manuscript.

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