
EFFECT OF INTELLECTUAL CAPITAL ON COMPANY INNOVATION: A RESEARCH FOR HEALTH ADMINISTRATION

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ABSTRACT

The main purpose of this study is to determine the effect of intellectual capital accumulation on innovative practices in today's health care businesses.

Answers have been searched for the questions of "Is there any relationship between intellectual capital accumulation and innovative practices in health care businesses?" and "If so, what is the direction of this relationship and interaction?"

245 employees from two hospitals operating in Istanbul have constituted the sample mass of this research, which has been performed with a combination of qualitative and quantitative research methods, and the opinion of the respondents has been measured by means of a conceptual model.

As a result of the research, it has been concluded that the sub-dimensions of intellectual capital as human capital, relationship capital and organizational capital in health care businesses positively impact innovation activities.

INTRODUCTION

Today, the dizzying developments in entire production processes, especially in communication and information technologies, have transformed the industry-based economies which have been established to transform goods or services into knowledge economies.

Especially in today's information society, people have begun to widely prefer people oriented, competitive, innovative businesses which hold extremely high brand value and produce high quality health care services. Therefore, intellectual capital accumulation in healthcare sector has become the most important factor affecting innovative initiatives (Kanter, 2006:79).

In fact, the concept of intellectual capital was first introduced at the end of 1960s, and at that time it was defined as "a mental movement beyond static and intangible value" (Harrison and Sullivan, 2000:33). In the coming years, intellectual capital concept has begun to be defined in the meaning used today with the development of knowledge economy (Ross et al., 1998).

Stewart has defined the intellectual capital in the vernacular of the day as "obtained experimented knowledge" and evaluated every kind of intellectual input, information, intellectual property and experience which would be used to create wealth in this concept (Stewart, 1997). Similarly, Youndt stated that intellectual capital actually comprises of all kinds of information inside or outside the business, and businesses should effectively manage their intellectual capital in the globalizing world to get competitive advantage (Youndt, 2004:337).

In the literature, intellectual capital is handled and measured in three dimensions as “human capital”, “organizational capital” and “relationship capital” (Sveiby, 1997; Stewart, 1997; Tsang et al., 2005; Ross and Ross, 1997; Ross et al., 1998; Chu et al., 2006).

Human capital dimension of intellectual capital is defined as the sum of knowledge, skills, abilities, experiences and all other information stocks of employees in organization (Brooking, 1996; Edvinsson and Malone 1997; Stewart, 1997; Huang et al., 2002). This kind of intellectual capital consists of genetic inheritance, vocational education, job experiences, ideas and attitudes towards workplace of employees in a business (Bontis and Fitzenz, 2002).

The second dimension of intellectual capital is the organizational capital, and in the simplest way, it can be defined as all kind of knowledge, organizational processes and technological infrastructure which belong to an organization. (Narvekar and Jain, 2006). In a broader meaning, organizational capital consists of organizational vision, culture, mission, management philosophy, processes, information technologies/systems, patents, copyright ts, trademarks/secrets, logos, databases, R&D and innovation facilities of a business (Hsu et Fang 2009; Solitand and Tidström, 2010).

Relationship capital, the third sub-dimension of intellectual capital, includes relations between all parties who are capable to create added value for production processes, internal and external customer satisfaction of a business (Das et al., 2003). In fact, relationship capital which has a perceptual process feature in a sense is defined by linking the brand value of businesses in the literature. Such capital accumulation is shaped with mutual relationship of a business with external and internal customers (Stewart, 1997).

The concept of business innovativeness is defined as all activities which contribute added value in technological infrastructure, production processes and presentation of new goods and services of businesses aiming to create or develop a new idea or product in the literature (Dess and Lumpkin, 1997; Knight, 1997).

Indeed, a company must discover new marketing methods, create new products, acquire new supplier sources, create new forms of production or become open to innovation to be known as innovative today. (Thakur et al, 2012:565). An innovative company is starting to be mentioned with the intensification of continuous innovative investments and efforts in knowledge economy (Chang and Tseng, 2005).

Finally, it should be noted that innovation practices are classified in various ways according to occurrence frequency, innovation degree of company and level of meeting customer expectations in literature (Damanpour et al., 2009). However, innovation is grouped in a simple manner as product and process innovation (Burgelman et al., 1995; Kanter, 2006).

Some researchers separate innovation into two groups as technological and product-market innovation (Miller and Friesen, 1978). On the other hand, other researchers define it as radical (revolutionary, discontinuous) or gradual (evolutionary, incremental, continuous) according to its occurrence (Tidd et al., 1997:24).

LITERATURE REVIEW

When the literature is examined, it is seen that lots of research have been done in recent times about knowledge management, intellectual capital and innovation practices in health care businesses (Bontis, 2002; Gallup, 2002; Van Beveren, 2003; Habersam and Piber, 2003; Hermansson et al., 2004; Chen et al., 2005; Lee et al., 2007; Peng et al., 2007; Bontis and Serenko, 2009).

For instance, Bontis (2002) has studied knowledge management differences affecting health care businesses, and Van Beveren (2003) has concluded that knowledge management requires privileged and special techniques specific to general and healthcare public businesses. Both of these studies declare that organizational performance of healthcare businesses focusing on effective management of intellectual capital could be increased with innovativeness (Thakur et al., 2012: 564).

Habersam and Piber (2003) have compared brand values and effectiveness in serving healthcare services of two hospitals in Italy and Austria according to their intellectual capital capacity. As a result of this research; they have made several suggestions concerning the relationship between intellectual capital and innovative practices. Hermansson et al. (2004) have contributed to the literature by modeling intellectual capital in healthcare businesses.

Likewise, Lee et al. (2007) have completed their research by aiming to make intellectual capital measurable from an uncertain state of annual activity report which is prepared to minimize the uncertainty of intellectual capital in healthcare businesses. In this context, researchers have categorized intellectual capital as human capital, patient capital, information technology capital, process capital, innovation capital and strategic capital (Lev et al., 2007).

Chen et al., (2005) have inspected the intellectual capital structures and the advantages of those structures for 35 healthcare companies with their special measurement method, and concluded innovation, customer and human capital to be more valuable for healthcare businesses in creating intellectual capital.

Bontis and Serenko (2009) have outlined that healthcare businesses supply significant benefits to intellectual capital on knowledge management, and stated healthcare employees are actually the best examples for “knowledge workers”. About this point, Fitzgerald, (2002) who has given a new perspective of innovation particularly in health, states that innovativeness which spread all processes of a healthcare organization would be more successful when healthcare employees believe the interaction among themselves.

In the light of this literature review, it is possible to say that employing talented workers, becoming a learning organization, and successfully managing the intellectual capital in today’s knowledge economies are the main sources of becoming innovative, creating value and making difference in competition in healthcare businesses (Bontis, 2002; Huang and Liu, 2005; Guthrie et al. 2002; Hsu and Fang, 2009). Thus, all sub-dimensions of intellectual capital, mainly human capital that consists of talent and knowledge accumulation of employees, have a positive contribution to innovation practices of companies (Subramaniam and Youndt, 2005).

Also, literature review findings show that the research which focuses on the relationship between intellectual capital and company innovativeness implicated the relationship of those concepts according to the measurement of three sub-dimensions of intellectual capital into

research models (Covin and Slevin, 1991; Bontis, 1998; McAdam, 2000; Nonaka and Treece, 2001; Youndt et al., 2004; Subramaniam and Youndt, 2005; Bosworth and Webster, 2006).

For example, McAdam, who has inspected the effects of human capital, a sub dimension of intellectual capital, on company innovativeness in empirical aspects has concluded in his research that effective and systematic knowledge management affects innovativeness in key fields for increasing employee benefits (McAdam, 2000). Similarly, Covin and Slevin (1991) Bontis (1998), Nonaka and Treece (2001), Youndt, et al., (2004), Subramaniam and Youndt, (2005) and Bosworth and Webster (2006) have concluded that human capital increases company innovativeness.

According to the literature, it is possible to claim there is positive and obvious interaction between organizational capital and firm innovativeness according to the studies which examine and explain the relationship between these two concepts in empirical aspects (Covin and Slevin, 1991; Nonaka and Takeuchi, 1995; Bontis, 1998; Youndt et al., 2004; Youndt and Subramaniam, 2005).

For instance, Nonaka and Takeuchi (1995) have concluded that the innovations in knowledge production and business infrastructure provide competitive advantages to firms; and Bontis (1998) has argued in his research that organizational capital contributes to the innovation performance of business. Also, Youndt et al. (2004) and Subramaniam and Youndt (2005) proved that organizational capital has positive effects on innovative performance of business.

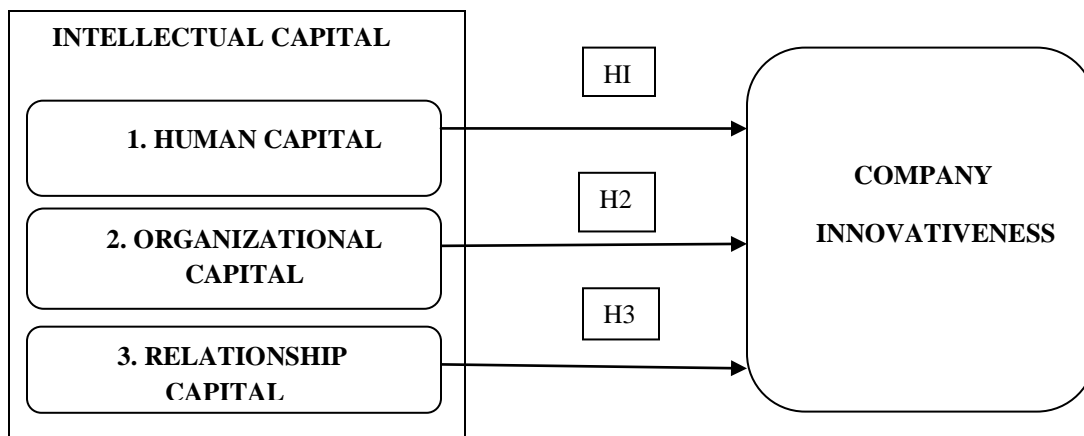
When the studies conducted on the relationship between company innovativeness and relationship capital, the most strategic component of intellectual capital, is examined, a positive and mutual interaction between these two concepts is observed (Bontis, 1998; Phillips, 1999; Gray et al., 2000; Agarwal et al., 2003, Youndt and Snell, 2004; and Youndt Subramaniam, 2005; Ottenbacher and Gnoth, 2005).

METHODOLOGY

Participants from two leading hospitals in Turkey who have been selected with the of convenience sampling constitute the population of this research. 245 health workers in various positions such as doctor, nurse, emergency medical technician, hospital manager, hospital logistic, and quality, human resources and patient consultant from the mentioned healthcare businesses have been included in the study.

The main mass of employees surveyed corresponds to 25% of the total employees. The following research model has been developed for measuring the effect of intellectual capital which consists of three sub-components on company innovativeness on the basis of proposed research hypothesis in the concept of this research, which has been carried out with both qualitative and quantitative research methods.

Figure 1
MODEL OF THE RESEARCH



Arrows shown in the figure above indicate the relationship between basic concepts of this research, direction of the interactions and research hypotheses. The research hypotheses indicated with arrows are those below:

- H₁ There is a positive relationship between company innovativeness and human resources of companies.*
- H₂ There is a positive relationship between company innovativeness and organizational capital of companies.*
- H₃ There is a positive relationship between company innovativeness and relationship capital of companies.*

Furthermore, the subscales of “human capital”, “organizational capital” and “relationship capital” defining intellectual capital in parallel with the hypothesis of this research have been taken from the studies of Bontis (1998), Subramaniam and Youndt (2005), Hsu and Fang (2009), Ling (2011), Longo and Mura (2011) and Hsu and Sabherwal (2011); and “Business Innovativeness Scale” has been taken from the studies of Subramaniam and Youndt (2005), Ling (2011), Hsu and Sabherwal (2011).

Eventually, it should be noted that SPSS 20.0 and AMOS 4 computer programs have been used for the analysis of data gathered through survey forms in scope of this research. The consistency of the hypotheses shown in the research model has been investigated with reliability and validity analysis, then correlation analysis and lastly regression analysis.

First of all, demographic features of participants have been examined in the context of research. Demographic features such as company name, professional title, gender, age range, education and job duration have been collected and shown on the table below:

| | | Frequency | Percentile | Cumulative P |
|--------------------|--------------------------|-----------|------------|--------------|
| Business | Public | 133 | 54.2 | 54.2 |
| | Private | 112 | 45.8 | 100 |
| | TOTAL | 245 | 100 | |
| Title | Administrative Personnel | 103 | 42 | 42 |
| | Medical Personnel | 142 | 58 | 100 |
| | TOTAL | 245 | 100,0 | |
| Gender | Female | 141 | 57.5 | 57.5 |
| | Male | 104 | 42.5 | 100 |
| | TOTAL | 245 | 100,0 | |
| Educational Status | High school Graduate | 59 | 24.1 | 24.1 |
| | Associate Degree | 55 | 22.4 | 46.5 |
| | Bachelor | 85 | 34.7 | 81.2 |
| | Post-graduation | 46 | 18.8 | 100 |
| | TOTAL | 245 | 100 | |
| Age Range | 20-25 years | 63 | 25.71 | 25.71 |
| | 26-35 years | 110 | 44.90 | 70.61 |
| | 36-40 years | 46 | 18.78 | 89.39 |
| | More than 40 years | 26 | 10.61 | 100.00 |
| | TOTAL | 245 | 100 | |
| Job Duration | 0-5 years | 143 | 58.37 | 58.37 |
| | 06-10 years | 75 | 30.61 | 88.98 |
| | 11-15 years | 19 | 7.76 | 96.73 |
| | More than 16 years | 8 | 3.27 | 100.00 |
| | TOTAL | 245 | 100 | |

As an overall evaluation of demographics of participants shown in the figure, both physiological features of participants such as gender and age, and vocational education, professional title and experience levels of participants illustrate a wide sample of overall health sector. In other words, the demographic findings have been found sufficient enough to reach meaningful results in the scope of the survey.

Secondly, reliability and validity analysis have been conducted for data set variables in the context of the research. Primarily, average value of proficiency has been calculated with Kaiser- Meyer-Olkin (KMO) sample test. KMO sample proficiency value (0.90) has been observed to be higher than the proposed value (0.50) in the literature (Stoel and Muhanna, 2009).

Then, Bartlett Sphericity Test have been conducted and the findings of this test has shown to be statistically significant at 5% ($X^2(153) = 840.26, p < 0.5$). Therefore, it has been concluded each statement (communalities) in the survey is above 0.30 and each indicator has common variance with other indicators (Field, 2005).

“Explanatory Factors” test has been conducted in the third stage of the reliability and validity analysis and findings have been shown in the table below.

| | Human Capital | Relationship Capital | Organization Capital | Innovativeness | Coefficient of Communalities |
|--------|---------------|----------------------|----------------------|----------------|------------------------------|
| HC2 | 0.88 | | | | 0.83 |
| HC3 | 0.84 | | | | 0.79 |
| HC1 | 0.84 | | | | 0.77 |
| HC5 | 0.83 | | | | 0.79 |
| HC4 | 0.81 | | | | 0.73 |
| HC6 | 0.79 | | | | 0.73 |
| HC8 | 0.79 | | | | 0.69 |
| HC7 | 0.78 | | | | 0.71 |
| RC2 | | 0.76 | | | 0.71 |
| RC4 | | 0.75 | | | 0.72 |
| RC3 | | 0.74 | | | 0.67 |
| RC5 | | 0.67 | | | 0.64 |
| RC6 | | 0.67 | | | 0.66 |
| RC1 | | 0.57 | | | 0.52 |
| OC4 | | | 0.80 | | 0.74 |
| OC5 | | | 0.80 | | 0.76 |
| OC2 | | | 0.59 | | 0.61 |
| OC3 | | | 0.58 | | 0.59 |
| Inno.4 | | | | 0.79 | 0.77 |
| Inno.2 | | | | 0.78 | 0.72 |
| Inno.1 | | | | 0.77 | 0.76 |
| Inno.5 | | | | 0.76 | 0.71 |
| Inno.6 | | | | 0.63 | 0.58 |

*Principle Component Analysis and Varimax Rotation are used. Total Variance Explained: 68.80%

As observed in the table above, a total of 3 indicators have been eliminated on account of not attaching to a factor and not fulfilling the criteria of being equal or higher than 0.50 or attaching to more than one factor (factor load in another factors-cross load) equals or more than 0.40 (Stoel and Muhanna, 2009). Thus, the number of questionnaires has been reduced to 32 from 35 questions.

All statements in the data set have been subjected to “Confirmatory Factor Analysis” in order to realize that the scales are reliable and valid; and the findings of this analysis have shown that AVE value correlation coefficients of each factor are smaller than squares.

In the final step, Cronbach Alfa reliability coefficient and composite reliability coefficients of all indicators in survey form have been determined to be higher than standard threshold value (0.70). This finding has proved the reliability of the scales applied in survey to be high.

Correlation and regression analysis have been used to test the research hypothesis in the third and last stage of the study and the correlation analysis findings are shown in the table below:

| Variables | Average | Standard Deviation | 1 | 2 | 3 | 4 | 5 |
|---------------------------------------|---------|--------------------|--------|--------|--------|------|------|
| 1.Human Capital | 3.66 | 0.94 | - | | | | |
| 2. Relationship Capital | 3.64 | 0.91 | 0.63** | - | | | |
| 3.Organization Capital | 3.53 | 0.87 | 0.57** | 0.58** | - | | |
| 4. Innovativeness | 3.18 | 0.88 | 0.21** | 0.37** | 0.38** | - | |
| Cronbach Alfa Reliability Coefficient | | | 0.95 | 0.88 | 0.83 | 0.89 | 0.92 |
| Composite Reliability(CR) | | | 0.95 | 0.88 | 0.81 | 0.89 | 0.92 |
| Average Variance Extracted(AVE) | | | 0.69 | 0.56 | 0.51 | 0.61 | 0.57 |

(*) p<0.05, (**) p<0.01

As seen in the table, the correlation coefficients which show the linear relationships between variables indicate a relationship between some variables at 0.05 significance level (p<0, 05), but 0.01 significance level between others.

Then, multiple regression analysis has been conducted in order to test the hypothesis in research model. In this context, firm innovativeness as dependent variable, and human capital, relationship capital and organizational capital, sub dimensions of intellectual capital, as independent variables have been subjected to regression analysis.

The findings of the regression analysis held with SPSS 20.0 program have been illustrated and reviewed below in terms of research hypothesis:

| Independent Variables | Dependent Variable | | | |
|--------------------------|------------------------|---------|---------|-----------|
| | Company Innovativeness | | | |
| | Standard Beta (β) | t value | p-value | VIF value |
| 1.Human Capital | .298** | 4.448 | .000 | 1.418 |
| 2.Organizational Capital | .097 | 1.312 | .191 | 1.744 |
| 3.Relationship Capital | .196** | 2.809 | .005 | 1.548 |
| R ² = 0,239 | | | | |
| F = 25.185 | | | | |
| p-value = 0.000 | | | | |

* p < 0.05; ** p < 0.01

According to the regression analysis findings shown in the figure, the relationship between company innovativeness and human capital, a sub dimension of intellectual capital, is statistically significant and this sub dimension of intellectual capital has positive impact on company innovativeness ($\beta = 0.298$, $p < 0.01$). In addition, these findings support the hypothesis (H₁), which assumes human capital positively effects company innovativeness.

In contrast, organizational capital does not have a statistically significant effect

on company innovativeness in terms of regression analysis findings of the hypothesis (H₂), which assumes that organizational capital positively affects company innovativeness ($\beta = 0.097$ $p > 0.01$).

This result does not positively affect H₂ hypothesis which assumes organizational capital has positive effects on company innovativeness.

Finally, the H₃ hypothesis, which is based on the assumption that relationship capital, a sub dimension of intellectual capital, has a positive effect on company innovativeness, has been tested. There is a positive and significant interaction between relationship capital and company innovativeness according to the regression analysis findings held for this purpose ($\beta = 0.196$ $p < 0.01$). This result supports the hypothesis (H₃) which assumes relationship capital positively effects company innovativeness.

| Hypothesis | Suggestion of the Hypothesis | Consequence |
|-------------------|--|--------------------|
| H ₁ | There is a positive relationship between company innovativeness and human resources of the companies. | APPROVED |
| H ₂ | There is a positive relationship between company innovativeness and organizational capital of companies. | REJECTED |
| H ₃ | There is a positive relationship between company innovativeness and relationship capital of companies. | APPROVED |

CONCLUSION AND DISCUSSION

As a result of the research, the human capital and relationship capital as sub dimensions of intellectual capital of healthcare businesses have been evaluated to have positive effects on company innovativeness.

McAdam's results from a 2000 research support the results of this research; that is, the effective and systematic knowledge management increases employee benefits and have positive effect at innovation in critical areas. Similarly, Youndt, et al., (2004), Youndt and Subramaniam (2005), and Bosworth and Webster (2006) concluded that human capital increases the innovation of the firm. Youndt and Snell, (2004), Subramaniam ve Youndt, (2005); and Ottenbacher ve Gnoth, (2005) have done research on the relationship between the relationship capital and firm innovation. When examined, the research findings show that there is a positive and mutual relationship between the two concepts.

It is possible to say the investments in both these two dimensions of intellectual capital and successful practices would provide significant contributions to the ongoing innovative practices in businesses according to these findings. Interestingly, the survey results have not justified the assumption that the organizational capital sub dimension of intellectual capital does not have positive impact on company innovativeness. However, many research findings on this subject in the literature have reached the conclusion which confirms this assumption. For example Nonaka and Takeuchi (1995)'s research results concluded that knowledge creation and innovation in business infrastructure provides a competitive advantage to firms. Similarly, results of Bontis (1998)'s research showed that the innovation performance of the company has positive effects on organizational capital.

Furthermore, when looked from the perspective of daily business life, the new investments of organizational capital accumulation and new practices in this context are generally thought to be the most concrete indicators of company innovativeness by healthcare employees.

Thus, this finding of the research could be explained as mismanagement of the organizational capital in healthcare businesses or the failure in the measurement of correlation and regression relationship between these two concepts.

As a result of the research, it has been concluded that the managers in healthcare businesses should effectively manage all three dimensions of intellectual capital, while increasing the efforts to enrich the intellectual capital in healthcare businesses. Moreover, only organizational or technological investments would be insufficient to provide high company performance, the basic production of which is human factor, so the investments on human capital and relationship capital must be increased in parallel with those investments.

Particularly, the complexity in healthcare services, overuse of technology and the entity of human interaction make the adaptation of healthcare businesses to external environment difficult and cause administrative problems. At this point, it has been observed that healthcare businesses could be successful only by training the staff with leadership skills, including them in management processes, and creating a new organization culture and climate suitable for innovation and creativity.

Eventually, it must be said with regard to future research, detection of the effects of the mentioned factor on intellectual capital will be possible if the “company innovativeness factor” held as independent variable in this research is examined as a “moderator variable” with its sub- scales in a similar model with this research.

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