Exploring the role of human capital on firm's structural capital in Iranian e-business industry

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Abstract. This paper aims to empirically explore the effects of human capital on structural capital in Iranian e-business. A questionnaire-oriented survey from senior and top manager in Iranian information technology companies was utilized for regression analysis. The findings indicate that human capital significantly influences the three dimensions of structural capital which consists of relational capital, process capital and innovational capital. The study also provides empirical evidence that these three dimensions are internally correlated.

Keywords: human capital, structural capital, e-business, Iran

1. Introduction

There were so many efforts in the past decade for modeling intellectual capital and exploring its affects of dimensions of intellectual capital on firm's performance and to explore the inter-correlations that exists between the intellectual capital dimensions [1]. Namvar *et al*. tacked at exploring the impacts of intellectual property on other dimensions of intellectual capital in Iranian computer and electronic industry [2]. Nevertheless, the need of exploring the affects of human capital on other dimensions of intellectual capital is necessary especially in e-business area.

E-business is defined as commercial or administrative transaction or information exchange made available over internet [3]. In order to better implement e-business successfully, organizations need to assess their knowledge. Knowledge shapes the foundation of firm performance, and this is a topic of fundamental importance, practically for e-business that often have few physical assets. "In the past decade, academics have paid significant attention to the role of knowledge for global competitiveness in 21th century" [4], as a result knowledge is recognized as sustainable strategies to acquire and maintain companies' competitive advantage [5-7]. In the knowledge-based economy, organization's capabilities are based on knowledge and managers should understand which capabilities they need in order to maintain their competitive advantages [5], [8]. "Good understanding of the nature of intangible resources and its measurement are the first step for any strategic plan to manage these resources" [2]. These advantages include the added value of the knowledge that is processed, the learning process included in the measurement of IC [9], its strategic power [10], the optimal exploitation of limited resources and its usage as a motivational factor [11]. "Exploiting these advantages of intellectual capital measurement purportedly give companies an edge in a tight competition on the market, which should be reflected in enhanced firm performance" [12]. Therefore, "it is critically important that intellectual assets be well understood and properly managed if organizations are to compete successfully in today's word of economy" [13].

"Human capital is at the heart of intellectual capital" [14], so any e-business model would demand human capital as much as possible to perform its task in the best manner [8]. So, understanding the role of human capital and it's affects on other dimensions of intellectual capital in different industries is an important task which should be considered in the research. Unfortunately, current literature on both

intellectual capital measurement and the development of e-business models does not adequately address the many complexities facing today's e-business initiatives and the two disciplines have no where been combined. The aim of this paper is to evaluate the impacts of human capital on structural capital in Iranian e-business industry. In this study structural capital is composed of relational capital, process capital, and innovation capital. A case study is conducted in order to illustrate the impacts of human capital on these three pillars of structural capital in e-business. This study would have implications for e-business managers and strategy-makers in formulating strategies and targeting adequate structural capabilities to ensure effective e-business implementation.

2. Literature review

The concept of intellectual capital was introduced in the business and management literature so after of entrance of the human capital concepts in this arena. Many authors tackled at modeling its components in order to describe it in the best possible manner. Table 1 summarizes some of the works that have been done in recent years to identify intellectual capital and its sub-components. *Skandia Navigator* is developed a dynamic and holistic intellectual capital reporting model with five areas of focus: financial, customer, process, renewal and development, and human capital [11]. According to this model the hidden factors of human and structural capital when added together comprise intellectual capital. Consequently, structural capital includes customer capital and organizational capital, which is a combination of innovation capital and process capital. The authors considered both financial and non-financial building blocks that combine to estimate the company's market value. *Intellectual Capital Index* divides intellectual capital into human capital and structural capital [9]. Structural capital comprises of relationships, organization and R&D capitals. In this model, human capital also includes competence, attitude and intellectual agility. *Intangible Asset Monitor* proposes a conceptual framework based on three families of intangible assets: external structure, internal structure, and individual competence [15].

Table 1 dimensions of intellectual capital by different authors

Reference	Dimensions of IC	Measures
[15]	Competence	education, experience
	Internal structure	the organization management, legal structure, manual systems, attitudes, R&D, software
	External structure	brands, customer and supplier relations
[11]	Human capital	The value of knowledge, skills and experiences held by individual employee
	Structural capital	Embodiment, empowerment, and supportive infrastructure of human capital
[9]	Human capital	Includes *competence*, *attitude* and *intellectual agility* of employee
	Structural capital	Difference between non-thinking and thinking resources that use very different management methods
[14]	Human capital	Employee's capability, satisfaction and sustainability
	Structural capital	Culture, organizational process, information systems and IP
	Relational capital	Customer, partner and community
[16]	Human capital	Individual level knowledge, competence, leadership ability, risk-taking and problem solving ability, education and experience
	Organizational capital	Mission-vision, strategically values, working systems, culture, management systems, use of knowledge, data base
	Relational capital	Customer, customer's loyalty, market, shareholders, suppliers, official institutions, society
[2]	Human capital	Knowledge, experience, innovation, leadership, attitude, training
	Relational capital	Relation between employees, relations with customers, suppliers, partners and stockholders
	Structural capital	Technology, process, organizational memory, culture, absorptive capacity, protection power over IP, legal mechanism
	Intellectual property	R&D, innovative culture, amount of IP, market value of IP, IP usage

3. Theory development and hypothesis

In order to evaluate the impacts of human capital on the components of structural capital, in this study, based on [10], intellectual capital is classified into human capital, relational capital (RC), structural capital (SC) and innovational capital (InC). *Human capital* is the individual-level knowledge, such as professional skills, experience, and innovativeness that each employee possesses [17]. Argote and Ingram noted that knowledge is held in three basic "reservoirs" or elements of organizations, Members, Tools and Tasks, as well as their connections and networks [18]. *"Relational capital* is the movement of knowledge between entities, including employees, organizations or organization levels, partners, suppliers and customers" [2]. According to [19], we will describe measures of such social and personal processes, including elements of the "community" that nurtures knowledge. Referring to [14], there are three dimensions for relationship capital in the company: customers, partners and communities, but based on [19] relationships between employees must, also, be considered to visualize company's flow of knowledge. *Process capital* is investments, processes, structures and activities established by organizations aimed at changing or maintaining human capital, or influencing relational capital. *Innovational capital* is the ability of firm to create and execute new ideas. This innovation is about identifying and using opportunities to create new products, services, or work practices [2]. Dimensions and indices of intellectual capital are categorized in the table 2.

In the study, the relationship between human capital (HC), relational capital (RC), process capital (PC), and innovational capital (InC) is explored:

H1: companies with more concern on HC will exhibit superior RC, PC and InC.

H1a: companies with more concern on HC will exhibit superior RC.

H1b: companies with more concern on HC will exhibit superior PC.

H1c: companies with more concern on HC will exhibit superior InC.

H2: Elements of structural capital (RC, PC and InC) influence each other.

H2a: companies with greater RC and PC tend to have better InC too.

H2b: companies with greater RC and InC tend to have better PC too.

H2c: companies with greater PC and InC tend to have better RC too.

Table 2 components of intellectual capital

Dimensions of IC	indices
Human capital	*Knowledge of employees, Experience of employees, Innovation capabilities of employees, Skills of employees, Leadership power of employees, Attitude of employees*
Relational capital	*Customer relations with employees, Customer retention and churn management, Customer attraction and new market entrance, Market share, Customer satisfaction level, Comprehensive data system of customer profile and transactions, Level of cooperative relations between Employee, Level of relations with Partners, Level of relations with Suppliers, Level of relations with Stockholders*
Process capital	*Data systems, Communications systems, Cost optimized process, Time optimized process, Error free services or products*
Innovational capital	*Innovative products or service, Management support for innovation, Innovative culture, Level of use of innovation, Educational programs*

4. Empirical results

Based on literature review, as mentioned in previous section, there are ten questions in the questionnaire which evaluate relational capital within organizations to cover employees, customers, partners, suppliers and owner relationships. Consequently, regarding process capital in company five questions are embodied in the questionnaire. Finally, dimensions dealing with innovational capital are evaluated by five questions.

Totally, six questions referred to human capital. Three first questions, respecting human creation in the questionnaire, are related to knowledge, experience and skill. The fourth item is concentrated on the innovation capability of employees. The two next questions aim to measure the leadership power and motivations of employee.

4.1. Sample design

First, in the survey, participants were required to fill-in personal information. Furthermore, the participants were asked to fill-in company's information for the purpose of examining their intellectual capital, indicating response to positively worded in questions five-point Likert scale from 1-strongly disagree to 5-strongly agree. Finally, a data analysis including reliability, and regression was designed.

Primary data was gathered from top and senior managers from companies which have added some functions and application of e-commerce to their traditional brick and mortal business, at least one web site. These managers tend to have a good level of organizational knowledge and working experience. In this study, which is a part of bigger study, we decided to interview with managers directly. 42 questionnaires were gathered and, consequently, analyzed. 26.5% of them had PhD, 52% Msc., and 21.5% had Bsc. The research used Cronbach's α to investigate the reliability of each construct. First of all, all of the coefficients were at least 0.716; thus, the resulting scales are acceptable and sufficiently reliable. Furthermore, the overall Cronbach's α was 0.956. Besides, all the components of the survey have been statically validated in previous researches. Finally, regarding content validity, the questions of the questionnaire were based on previous research and theories. The correlation between the human capital and another variables was very significant (p<0.01). Hence, based on the results of Cronbach's α analysis, content validity and Pearson's correlation analysis, all the factors in the research should be taken in consideration for regression analysis.

All variables that remain after the reliability analysis have to be reduced and summarized in order to make interpretation of the regression analysis easier [10]. Building scale values helps us to do that, however, due to acceptable results of the reliability analysis none of the variables were deleted. Therefore, in order to construct scale values for human capital, the mean of the variables measuring it is taken. Consequently, to calculate scales of relational capital, process capital, and innovational capital the same procedure is applied. Therefore four new variables (scales) each composed of 42 observations were resulted. As a result, the input to the regression analysis which will be described in the following section will be these new scales.

4.2. Regression analysis

To analyze the statistical relationship between the scales for human capital, relational capital, process capital, and innovational capital regression analysis was used. The coefficient of determination (R^2) indicates the goodness of the fit of the model. Higher values of these two indicators signify the better explanation of the independent variables on the variation in the dependent variable. The significance of the relationships found is indicated by the *t-value*.

First, the scale of human capital is regressed against each of the scales for relational capital, process capital and innovational capital. This analysis should provide further insight into the relationship between relational capital and process capital, and innovational capital on the one hand and innovational capital on the other hand. The best relationship in terms of R^2 (%52) and t-value (5.31 significant at α = 1 percent) is found for the relation between human capital and process capital.

Second, the relationship between relational capital, process capital and innovational capital is analyzed. At first, the scale innovational capital is taken as dependent variable and the scales relational capital and process capital are used as independent ones. Then, the scale process capital is taken as dependant one and two other scales are used as independent ones. Finally, the scale relational capital is taken as dependant one, and two other ones are used as independent ones. (See table 3)

Table 3 Results of regression analysis

Hypothesis	Independent variable	Dependant variables	R^2	t-value	p-value
H1.a	HC	RC	38.5%	4.03	0.000
H1.b	HC	PC	52.1%	5.31	0.000
H1.c	HC	InC	4.87%	4.96	0.000
H2.a	RC,PC	InC	58.9%	3.05, 1.10	0.005, 0.282
H2.b	RC, PC	InC	58.4%	2.99, 1.10	0.006, 0.282

H2.c	PC, InC	PC	68.2%	3.05, 2.99	0.005, 0.006

Table 3 summarizes the results of the regression analysis. In the first step, impacts of human capital on the other dependant variables of structural capital; relational capital, process capital and innovational capital are presented. These scales show significant relationship when regressed separately. The second part of the analysis approves that the scales relational capital and process capital have relations with innovational capital, the scales relational capital and innovational capital with process capital and the scales process capital and innovational capital with relational capital. This indicates that relational capital enhances the influence of process capital on innovational capital and the other way around. The same applies to the regression of relational capital and innovational capital on process capital and regression of process capital and innovational capital on relational capital. It follows that the scale relational capital, process capital and innovational capital positively influence each other. To sum up, regarding above notes, the following conclusions considering the hypothesis could be drawn. First, H1.a, H1.b and H1.c predict significant relationship between human capital and three components of structural capital; relational capital, process capital and innovational capital. Second, H2.a, H2.b and H2.c state that the components of structural capital are all interrelated.

5. Conclusion

Propping the role of human capital, this study investigate, firstly, to extract relations between human capital and three dimensions of structural capital. Not only, the goal of was the research aimed at pointing out importance of human capital as valuable asset of companies, but also, does it increase the awareness among management for having an employee-centric view to improve indices of structural capital.

Questions referring to all other components of structural capital as well as human capital were included too. Statistical analysis showed three parts of structural capital (relational capital, process capital and innovational capital), not only, strengthen each other, but also, are influenced strongly by human capital.

Several practical implications have been resulted from this study that can be tentatively generalized to other developing countries. In order to achieve the optimal procedure for e-business industry firms should assign importance to those aspects included in the scales for each of those components. To begin with, three lessons can be drawn from the Iranian account examined here. First, reformation in relational capital regarding human capital in Iranian e-business is necessary. Employees should be motivated to create customer-centric culture within the organization. E-business more than anything is dependent on relationship especially with customers. So managers should establish especial programs for training their employees in order to strengthen their relational capital and then enter e-business environment. Second, human capital with the respect to process capital would be revised to satisfy the new process in the e-business environment. E-business with its new process and procedures needs more attention from managers to train employees who are able to handle these new processes. Finally, concerning innovational capital, human resources should be aware of need for innovation in the e-business, and employees should be motivated to create new ideas and solution for customer attraction and process refinement.

Further research could be done to eliminate limitation of this research: First, Future research on the effects of human capital on company performance could be directed. Besides, some other improvement should also be done by integrating possible quantitative external financial and economic data.

6. References

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