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An Investigation of Contingency Factors Influencing Intellectual Capital Information

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Abstract

The purpose of this study was to determine the contingency factors influencing the companies' intellectual capital information operating in Yazd industrial city. The study model was formed using intellectual capital as dependent variable and environmental uncertainty, technology advancement and business strategy as independent variables. For purpose of the present study, the applied and correlational methods were used. Data collection was conducted using questionnaires and survey methods. The statistical population of the study included food and textile plants of Yazd industrial city. Simple random sampling method was used to determine the number of samples. 125 acceptable questionnaires were collected among the sent questionnaires. LISREL Software and structural equation modeling were used for data analysis. Results of the study showed that there is a direct significant relationship between technology advancement and intellectual capital.

Keywords: intellectual capital, environmental uncertainty, business strategy, technology advancement.

1- Introduction

In the current economic environment and business market, the topic of intellectual capital and its undeniable impact on management reports caused it to be considered in a special way. Since intellectual capital is much more valuable than physical capital and due the inability to measure intellectual capital and its impact on the activities and performance of the company by the traditional accounting system, it is attempted for more accurate understanding of the impact of intellectual capital on firm performance. In the today's leading organizations and companies, the knowledge contribution is increasing day by day compared to other sources so that sustainable operations and profitability of most organizations and companies are dependent on the knowledge. Therefore, more rich organizations and companies in terms of intangible assets of intellectual capital can better and faster obtain high levels of development and growth. A major challenge in this field is the conceptualization, understanding and evaluating the intellectual capital. Knowledge management helps organizations to be able to use their capabilities to identify and acquire the knowledge-based economy.

In the industrial era, the cost of property, machinery, equipment and raw materials was considered as efficient elements of business units while in the era of information, efficient use of intellectual capital often determines the success or failure of the business unit. (Sonnier et al, 2007). The most important component of companies resources are not physical and tangible assets rather intangible assets are considered important because they are scarce, valuable and inimitable in nature. In the process of finding a method for measurement and evaluation of intangible assets, intellectual capital can provide a completely new model to observe the time value. Intellectual capital can be a new tool for hidden observation of the organization. Intellectual capital also can be a considered as a leading asset. Therefore, it is expected that intellectual capital can create competitive advantage and superior financial performance. On the other hand, the intellectual capital is more important than any other asset categories. Today, intellectual capital can play a role in creating added value and GDP(gross domestic product) in terms of knowledge and information production and thereby wealth creation in the knowledge-based economy. That's why at level of economic firms, the businesses financial performance could be affected by intellectual and human capital.

The present study examines the contingency factors affecting the internal intellectual capital information due to importance of intellectual capital and more demand for domestic financial reports. Meanwhile, numerous studies are conducted on intellectual capital and related factors. This study examines the contingency factors influencing the companies' intellectual capital information operating in Yazd industrial city.

2- Theoretical background and hypotheses

2-1- Intellectual capital

John Kenz Galberes (1969) used the term intellectual capital for the first time. Since beginning of studies on intellectual capital in early 1980s, numerous definitions of intellectual capital were presented, all of which representing the general concepts because it is not easily possible to provides a precise definition of intellectual capital. Therefore, despite the efforts of many researchers in this regard, there is not a general accepted definition of intellectual capital and all the definitions are more or less similar. Barney suggested that intellectual capital is

intangible in nature that is considered generally as a strategic asset in the organization (Barney, 1991). Valman believed that intellectual capital is an asset with a zero value at the balance sheet valuation and includes individuals mental strength, trade names, trademarks and assets that are recorded in the books at the cost of history but its value increases over time. McConnachie suggested that intellectual capital is the knowledge used for value creation. Stewart defines intellectual capital as intellectual components knowledge, knowledge of information and intellectual capital that its use can lead to wealth creation (Stewart, 1997). According to Roos et al, intellectual capital included all processes and assets usually are not shown on the balance sheet and also included all intangible assets not considered in the new accounting methods (Roos, et al, 1997). There are various opinions presented by scientist on the components of intellectual capital, but they are more based on three models: human capital, structural capital and customer capital.

Villiams' study entitled" intellectual capital disclosure in the England showed that when the performance of a company's intellectual capital is very high, it will have a negative impact on the value of intellectual capital disclosure. The main suggested reason for this negative relationship was fear of losing competitive advantage by disclosing too much information.

Shiue findings of the investigation of relationship between intellectual capital (intellectual added value coefficient) indicates that there is a positive correlation between intellectual added value coefficient, profitability (Rate of return on assets) and market value (the ratio of market value to book value). However, there is a negative correlation between intellectual added value coefficient and efficiency (asset turnover ratio) (SHIUE, 2006).

Han Pew Tan et al. examined the relationship between intellectual capital and performance of 150 firms operating in Singapore Stock Exchange and concluded that there is a positive correlation between intellectual capital and efficiency (Han pew tan et al, 2008). Moreover, results of Nik study indicate that intellectual capital has the greatest impact on the performance of banking institutions compared with credit and insurance institutions. Zeghal study on added value analysis as an indicator of intellectual capital and its impact on the performance of companies found that corporate intellectual capital has a positive impact on financial and economic performance and but there is a significant relationship between intellectual capital and stock market performance only in high-tech industries (Zeghal, 2010). Kank used four criteria for performance evaluation in an investigation of the relationship between intellectual capital and performance of manufacturing companies in Thailand (ROE, ROA, GR, EP). Results of his study showed that intellectual capital has a positive and significant impact on the performance of manufacturing firms. In this study, intellectual capital has an impact on 4 indices of company performance.

Mention and Bonties conducted a study entitled "Intellectual capital and performance in the banking sector in Luxembourg and Belgium" to investigate the effects of intellectual capital and its components on the performance of banking institutions in 200 banks in Luxembourg and Belgium. The study results indicated that human capital directly or indirectly helps the performance of the banking sector. Structural and relational capital are positively related to bank performance, though obtained statistical results do not show a significant relationship. Joshi et al. conducted a study to investigated the performance of intellectual capital in the

Australian financial sector as well as the relationship between the intellectual capital and financial performance in the financial sector. Palyk intellectual capital added value coefficient was used to determine the performance of the intellectual capital of the Australian financial sector. Results showed that the ability of value creation in the financial sector was severely affected by human capital. About two-thirds of the sample companies had a very low level of intellectual capital sufficiency.

2-2 Business strategy

Cost pressures, the need for production of different goods and services at the lowest prices will force companies to adopt a suitable strategy. A strategy can be defined as the process of determining the long-term fundamental goals, adaptation of the method of working and allocation of resources necessary to fulfill these purposes. Strategy means actions designed by organizations to respond to or anticipate changes in the external environment. Michael Purter defines business strategy or market strategy as: Answers to questions such as why companies act differently. How companies choose their targets? How companies are managed? Answer to all these questions requires an insight into a single concept, i.e. "strategy". According to the above mentioned points, the following hypothesis is proposed:

H1: business strategy has a direct impact on intellectual capital.

2-3- Environmental uncertainty

When a decision maker does not have complete and accurate knowledge and information or understanding of the suggested possible outcomes, it is referred as uncertainty conditions. Environmental uncertainty is a kind of inability to assign probabilities to the events that may be happened in the near future. In other words, environmental uncertainty is the lack of information about causal relationships. Moreover, environmental uncertainty is an inability to predict the possible outcomes of a decision. Environmental uncertainty is the result of three conditions: First, when there is the lack of information about environmental factors related to decision-making condition. Second, the inability to determine the probabilities, with any degree of certainty, about how environmental factors affect the success or failure of a particular organizational decision-making unit. Third, the lack of information regarding the cost of a wrong decision or activity. Considering such a situation in an organization can be proposed the following hypothesis:

H2: Environmental uncertainty has a direct impact on intellectual capital.

2-4- Technology advancement

Technology can be defined as identification method, creation of methods, embedding and applying scientific, operational and facility methods in productions, services, movements and communications. Today, technology is considered as one of the most powerful agents of change and development in the developing and developed countries. Technology changes can provide new solutions and tools for community development. Atly (1980) stated that the production technology will affect the type of accounting information that must be provided and intangible information have been more affected than the rapid technological changes. This also suggest that more investment should be conducted on the role of intellectual capital in economies of developing countries where different technological advancements have led to

many different applications for the value of intellectual capital (due to the need for intellectual capital information). So it can be said that:

H3: Technological advancement has a direct impact on intellectual capital.

3- The research design and methodology

The applied, non experimental and correlational research method was used in study in terms of purpose, performance method and research type, respectively. Data collection was conducted in 2013 from Industrial Complex Factories of Yazd Province.

Sample size and sampling method

The study sample included food and textile industries factories of Yazd city. Selected sample size included the group of food manufacturer and textile factories. This sample based on Cochran's formula included 125 companies. Moreover, simple random probability method of sampling was used.

Content analysis

Data collection methods in this study are generally divided into two categories: required data for literature review of this study was collected from professional journals and articles (Library method). In data collection, field survey method was used to confirm or reject the study hypotheses.

In this study, data analysis conducted using SPSS 18 software. Confirmed or rejected relationships between variables and factors were investigated through confirmatory factor analysis and structural equation modeling techniques. LISREL 8.72 software was used as one of the most popular methods for this type of model in order to test the hypothesis with the aim of evaluating simultaneous, direct or indirect relationships between variables.

Evaluation of variables

In order to perform the related analysis, three independent variables of business strategy, environmental uncertainty and technology advancement were used. Intellectual capital was the dependent variable in this study. Questionnaire was used to measure each of the variables. The validity of the questionnaire was confirmed using comments of university supervisors and advisors. Cronbach's alpha was used to determine the reliability of the questionnaire. TABLE 1 represents Cronbach's alpha, the number of questions in the entire questionnaire and questionnaire variables. Since the value of the Cronbach's alpha in the entire questionnaire and variables is greater than 0.7, this test includes an acceptable reliability.

Table 1: Calculation of the reliability of questionnaire questions

Cronbach's alpha	Number of Questions	Variable
0.964	35	Intellectual capital (IC)
0.839	3	Technology advancement(TA)
0.824	6	Environmental uncertainty (EU)
0.884	9	Business strategy (BS)
0.970	53	Total questionnaire

4- Results and findings

4-1- Confirmatory factor analysis of the study variables

Confirmatory factor analysis test was conducted for intellectual capital variables and business strategy that its results are presented as follows. Measurement equation is presented for number of observed variables. Every equation includes a variable path coefficient between observed and latent variables, measurement error of observed variables, with significancy tests based on t characteristic and R^2 value, i.e. the coefficient of determination or proportion of variance explained by the latent variable.

Confirmatory factor analysis of intellectual capital variable

The comparison between the observed variables explaining the latent variables is possible only in the standard estimation state. The standard model indicated that how much of the variance of the variables related to the latent variable is explained by the observed variable. In investigation of each of the models, adequate and good fit of the measurement model should be ensured before approval of the structural relations. Therefore, χ^2 statistics and other criteria for suitability of the model fit should be investigated. For example, χ^2 value to degree of freedom must be smaller than 3 and less is better, because the test shows the difference between data and model. Table 2 represents model fit indices and the values of each of them. Output of confirmatory analysis of intellectual capital variable indicates appropriate fit of the model.

Table 2: Indices of fit evaluation

Indices	Reported value
Chi-square to degrees of freedom	1.74
GFI	0.80
NFI	0.93
NNFI	0.96
IFI	0.96
CFI	0.96

Table 3 indicates coefficient of determination and test statistic of each causal relationships in the equations. Obtained results in table 3 showed that the absolute value of t statistic for all equations was above 1.96 and the amount of explained variance of each variable by each latent variable is an acceptable value. Therefore, the model fit was acceptable and no question was removed.

Table 3: Coefficient of determination and the value of t test statistic in the measurement model of intellectual capital variable

Causal relationship	The coefficient of determination (R^2)	t-value	Causal relationship	The coefficient of determination (R^2)	t-value	Causal relationship	The coefficient of determination (R^2)	t-value
HC-Q 1	0.44	8.14	HC-Q 13	0.45	8.21	RC-Q 25	0.56	9.61
HC-Q 2	0.16	4.49	SC-Q 14	0.46	8.42	RC-Q 26	0.39	7.52
HC-Q 3	0.56	9.44	SC-Q 15	0.48	8.67	RC-Q 27	0.56	9.61
HC-Q 4	0.35	6.94	SC-Q 16	0.40	7.70	RC-Q 28	0.69	11:19
HC-Q	0.37	7.20	SC-Q	0.37	7.26	RC-Q	0.55	9.45

5			17			29		
HC-Q 6	0.38	7.35	SC-Q 18	0.14	4.22	RC-Q 30	0.56	9.60
HC-Q 7	0.44	8.05	SC-Q 19	0.38	7.38	RC-Q 31	0.45	8.27
HC-Q 8	0.49	8.67	SC-Q 20	0.50	8.94	RC-Q 32	0.66	10.86
HC-Q 9	0.55	9.40	SC-Q 21	0.71	11:38	RC-Q 33	0.67	10.93
HC-Q 10	0.36	7.09	SC-Q 22	0.72	11:55	RC-Q 34	0.55	9.46
HC-Q 11	0.25	5.71	SC-Q 23	0.53	9.11	RC-Q 35	0.44	8.20
HC-Q 12	0.27	6.03	RC-Q 24	0.48	8.65			

Confirmatory factor analysis of business strategy variable

Table 4 indicates fit indices of the model and values of each of them. Output of confirmatory analysis of business strategy variable indicates appropriate fit of the model.

Table 4: Indices of fit evaluation

Indicators	Value reported
Chi-square to degrees of freedom	2.05
GFI	0.92
NFI	0.94
NNFI	0.95
IFI	0.97
CFI	0.97

Coefficient of determination and test statistic for business strategy variable is shown in table 5. Obtained results in table 5 showed that the absolute value of t statistic for all equations was

above 1.96 and the amount of explained variance of each variable by each latent variable is an acceptable value. Therefore, the model fit was acceptable and no question was removed.

Table 5: Coefficient of determination and the value of t test statistic in the measurement model of business strategy variable.

Causal relationship	Coefficient of determination (R^2)	t-value	Causal relationship	Coefficient of determination (R^2)	t-value
DS-Q 45	0.54	9.05	CLS-Q 50	0.37	6.95
DS-Q 46	0.52	8.82	CLS-Q 51	0.22	5.12
DS-Q 47	0.58	9.56	CLS-Q 52	0.37	7.00
DS-Q 48	0.63	10.12	CLS-Q 53	0.33	6.42
CLS-Q 49	0.59	9.33			

4-2- Main model

Confirmatory factor analysis

Accuracy of the measurement model should be ensured before entering the first stage of testing hypotheses for each model. If the model criteria do not provide a good fit, some modifications should be conducted in the model using output related to the model modification and then the modified model should be used to investigate the questions and hypotheses in the model. Tables 6, 7, 8 and 9 represent test statistic, standardized coefficient and error values for each variable of technology advancement, environmental uncertainty, business strategy and intellectual capital, respectively. All variables had a t-statistic value greater than 1/96 and appropriate value of the coefficient of determination. Thus, none of the items are removed from the model and study will be continued with all variables to evaluate the model. Based on standardized coefficients (factor loadings), an index with the highest load factor has a greater share in measuring the relevant variables and an index with smaller coefficient has less contribution of measuring the corresponding structures.

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Table 6: Evaluation of the coefficients and t values for technology advancement (TA)

Items	Standardized coefficient	T-statistics	Coefficient of determination	Error
Q 36	0.85	11.66	0.72	0.072
Q 37	0.81	10.70	0.66	0.074
Q 38	0.73	9.19	0.53	0.068

Table 7: Evaluation of coefficients and t values for environmental uncertainty index (EU)

Items	Standardized coefficient	T-statistics	Coefficient of determination	Error
Q 39	0.60	7.29	0.36	0.068
Q 40	0.86	10.83	0.74	0.081
Q 41	0.77	9.90	00:59	0.069
Q 42	0.62	7.59	0.39	0.075
Q 43	0.77	9.52	0.60	0.073
Q 44	0.55	6.06	0.30	0.088

Table 8: Evaluation of coefficients and t values for business strategies index (BS)

Items		Standardized coefficient	T-statistics	Coefficient of determination	Error
Differentiation strategy	DS	0.85	10.88	0.72	0.061
Cost leadership strategy	CLS	0.79	9.95	0.63	0.058

Table 9: Evaluation of coefficients and t values for intellectual capital index (IC)

Items		Standardized coefficient	T-statistics	Coefficient of determination	Error
Human Capital	HC	0.85	-	0.72	-
Structural capital	SC	0.88	13:00	0.78	0.052
Relational capital	RC	0.92	14:02	0.85	0.052

Figures 1 and 2 represent the main model output in the standard estimation state and t-values, respectively. The numbers on the paths indicate the t-value for each pathway. If this value is not significant at the output of the software is shown in red. In this analysis, t-statistics for one of the paths is above 1.96(significant) but not significant for the two paths. Figure 1 shows the general model in the standard estimation state. The comparison between the observed variables explaining the latent variables is possible only in the standard estimation state. The standard model indicates that how much of the variance of the variables related to the latent variable is explained by the observed variable

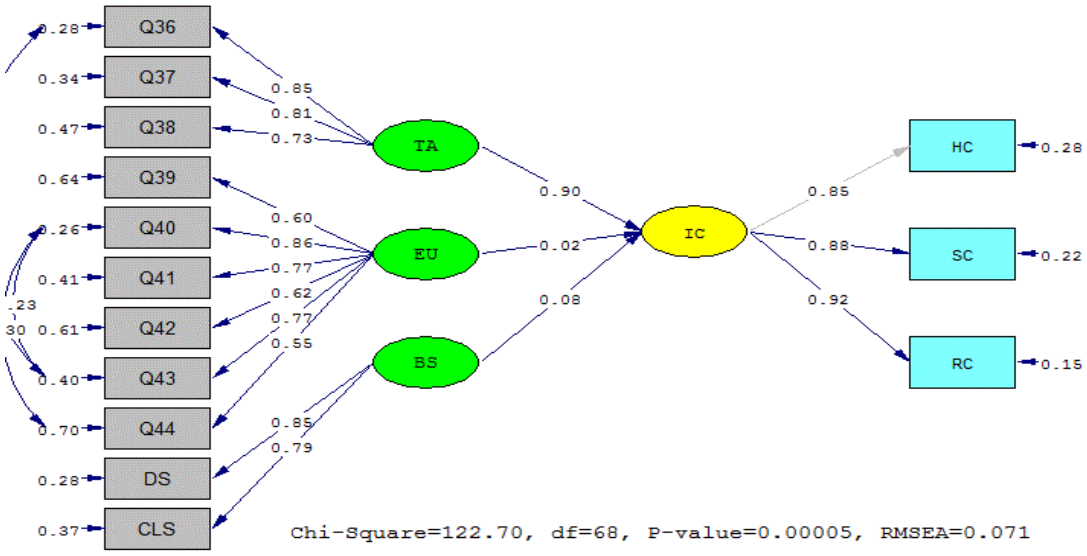

Figure 1: The model in the standard estimation state

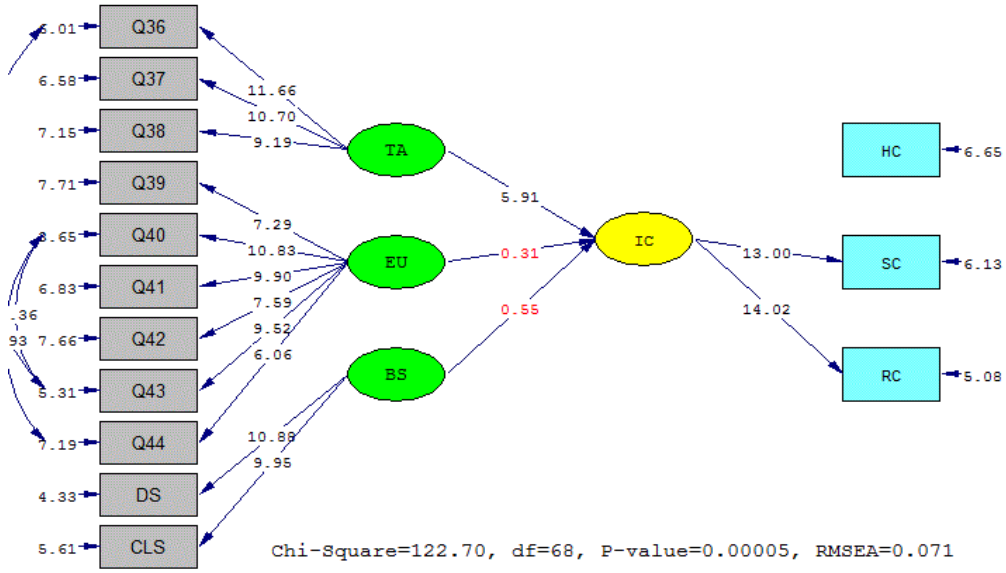

Chart 2: Model in the significant numbers state (t-value)

Table 10 represents fit indices of the main model along with the values of each of them. As it can be observed, χ^2 value to degree of freedom is equal to 1.80 and less than 3, which is an appropriate value. Low rate of this index represents the small difference between the conceptual model of the study and observed data. Also RMSEA value is equal to 0/071 and less than 08/0. Moreover, lesser value of RMSEA index represents better fit of the model. NFI - NNFI - IFI - CFI indices are greater than 0.9 and GFI index is greater than 0.8. Therefore, the model fit is appropriate and it is approved.

Table (10): Evaluation of the model fit

Indices	Reported value
Chi-square	122.70
Degree of freedom	68
Chi-square to degree of freedom	1.80
RMSEA	0.071
GFI	0.88
AGFI	0.81
NFI	0.95
NNFI	0.97
IFI	0.97
CFI	0.98

A summary of the standardized coefficients, coefficients of determination and t-statistics is presented in table for each of the paths and study hypotheses. The table shows the coefficient of determination for a intellectual capital variable estimated as 0.94. Environmental uncertainty and in business strategy together could explain 94% of changes in the intellectual capital. According to the value of standardized coefficient and t-statistics, it can be said that there is a significant impact of technological advancement on intellectual capital but there is no significant impact of technological advancement on variables of business strategy and environmental uncertainty.

Table 11: Summary of Standardized coefficients, coefficients of determination, t-statistics and results of the main model hypotheses at 95% confidence level.

The main assumptions	Standardized coefficients	t-statistics	Coefficient of determination	Result of study hypothesis
technological advancement → intellectual capital	0.90	5.91	0.94	Approved
Environmental uncertainty → intellectual capital	0.02	0.31		Rejected
Business Strategy → intellectual capital	0.08	0.55		Rejected

Discussion and conclusions

In the first main hypothesis, the relationship between intellectual capital and technological advancement is discussed. The results showed that there was a significant and positive (direct) impact of technological advancement on intellectual capital. According to the results of the first hypothesis, it can be stated that with increasing advances in technology, intellectual capital is becoming more important as theoretically the occurrence of this result can be expected. The second hypothesis of the study examined the relationship of intellectual capital and environmental uncertainty. The results showed that environmental uncertainty has a significant impact on intellectual capital. The third hypothesis examined the relationship between business strategy and intellectual capital. Obtained results indicated that there is no significant impact of business strategy on intellectual capital. The thirteenth hypothesis examined the impact of environmental uncertainty on the company's relational capital and results revealed that there is a significant and positive relationship between company's environmental uncertainty and intellectual capital.

As the study results showed, there is a positive significant relationship between intellectual capital and variable of technology advancement of companies. Therefore, it is recommended that managers of manufacturing companies improve their technology advancement in the respective companies for improvement of intellectual capital information. Also managers and investors must pay more attention to their technological advances and improve them because improvement of intellectual capital information is one of the secrets of survival in today's competitive world. That's why considering improvement of intellectual capital information and whatever affects it can be considered as the main concern for organizations and managers. It is clear that there is a greater need for companies operating in a dynamic competitive environment to improve information on intellectual capital.

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