

# Impacts of Intellectual Capital on Enterprise Performance: An Empirical Study of High-tech Enterprises in Xi'an, China

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**Abstract:** Intellectual capital (IC) is one of the most important sources of enterprise' sustainable competitive advantage. This study proposes a three-dimensional construction for describing and measuring a firm's IC which includes human capital, structural capital, and customer capital. Based on the definition of IC, we theoretically hypothesize the interactions among each dimension of IC and their influence on enterprise performance. Questionnaire method is used to collect data from enterprises in Xi'an High-tech Zone. SPSS 22.0 and AMOS 22.0 software are used to test the hypothesis and model with structural equation model method. The results shows that human capital positively influence structural capital, structural capital has positive influence on customer capital, and enterprise performance are positively influenced by all the dimensions of IC.

**Keywords:** Intellectual capital; human capital; structural capital; customer capital; enterprise performance

## 1. Introduction

Knowledge and intellectual assets have become the most important resources in contemporary knowledge-based economy. A company's market value is becoming more different from its book value as the intangible assets, such as knowledge and intellectual asset, rather than tangible assets are creating more value for companies. IC has become the key factor that contributes to the company value creation as the main carrier of intangible assets. However, IC is mainly concentrated in the high-tech enterprises and is indispensable driver for the high-tech enterprise value creation. Hence, this paper intend to study the definition and construction of IC and its effects on enterprise performance in the context of high-tech industry. Based on this study, some managerial implication are hoped to be provided and help manager to establish effective management of the IC. Furthermore, we hope to arouse the social attention to knowledge and intellectual assets in order to promote the sustainable development of national economy.

## 2. Literature Review

In 1969, "intellectual capital" of modern sense is proposed by John Kenneth Galbraith and the relevant literature has flourished since then. There are many definitions of IC. From Stewart's [1] view, IC „is intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth“. Roos et al. [2] suggest that IC is all the processes and the assets which are not normally shown on the balance sheet, as well as all the intangible assets which modern accounting methods consider (mainly trademarks, patents and brands). The convergence exists in these definitions in a way. We suggest that the variety of definitions is because of the different economic environment and enterprise type. Overall, these definitions include assets like human capital, intellectual property, organizational structure and information systems, etc.

Most of the research shows that there is a positive relationship between IC and enterprise performance [3][4][5]. Wann-Yih Wu et al. [6] assess the IC management in Taiwanese IC design companies and the results reveal that approximately one third of the companies sampled had excellent efficiency in IC management, while the others still had considerable room to improve their IC management. Song J et al. [7] suggest firms should align three different dimensions (State-owned non-state, managerial ownership and ownership concentration) of ownership structures with market orientation in order to achieve a superior innovation performance. Iazzolino and Laise [8] hold the view that according to different definitions and constructions of IC, IC has different influence in enterprise performance.

From the review of relevant literature, we can see there is a lack of insight into the high-tech enterprise especially in China economic climate. Furthermore, there still lack the research on the interactions among dimensions of IC and their impact on enterprise performance. Thus, in this study, we intend to fill these gaps and enrich the existing research.

## 3. Research Design

### 3.1 Definitions of Variables

There are different definitions of IC. Hall [9] consider IC are consisted of two parts, one includes business reputation, brands contracts and database, the other part is the skills that employees have. Stewart, Papula and Volna [11] hold the view that IC consists human capital, structural capital and customer capital which is widely accepted and used in academy area. Johannessen et al. [10] suggest IC consists human capital, structural capital, customer capital and intellectual assets.

Enterprise Performance is a kind of output which includes employee output, customer relationships and so on [12].

Man [13] thinks enterprise performance are reflected on enterprise profitability indicators and growth indicators. Overall output performance of enterprise and is the unification of process and outcome. Including the human and financial performance.

In this paper, we use the classic definition of IC referred to Stewart. Besides, we define enterprise according to Wu et al. [14], which suggest enterprise performance are output efficiency of enterprise resource like human and financial resource. As for IC is one of the most important resource in enterprise, so this definitions of performance fit our study appropriately. For the details of variable definitions, see Table 1.

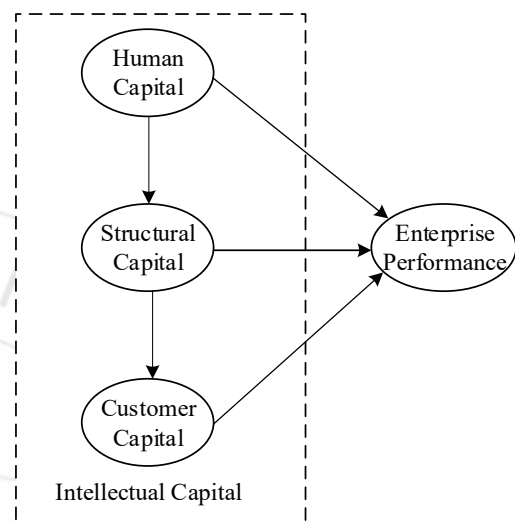
**Table 1:** Definitions and measurements of the intellectual capital

Construct	Definition
Intellectual Capital (IC)	Material (knowledge, information, intellectual property, experience) that can be put to use to create wealth.
Human Capital (HC)	Knowledge, skill, experience that employee have.
Structural Capital(SC)	Rules and regulations, information system and enterprise culture etc., which can transform the personal knowledge into organization's common capital.
Customer Capital(CC)	Relationship with stakeholders of the enterprise, such as customer's loyalty, degree of satisfaction and recognition of enterprise image
Enterprise Performance (EP)	Overall output performance of enterprise and is the unification of process and outcome. Including the human and financial performance.

### 3.2 Hypothesis and Model

In this paper, we suggest the intellectual capital is consisted of human capital, structural capital and customer capital. Human capital are knowledge, skill, experience that employee have. Most of studies show that human capital contributes to the enterprise performance as human talents are the core resource of enterprise [15]. Thus, we assume that human capital positively influence enterprise performance (Hypothesis 1). Structural capital refers to rules and regulations, information system and enterprise culture etc., which can transform the personal knowledge into organization's common capital. While the enterprise rule, regulations and systems are created and controlled by the human resource, the highly qualified talents will help construct better structural capital, so we assume that the human capital positively influence structural capital (Hypothesis 2). Enterprise with excellent structural capital will decrease the redundant information and processes. In the whole, the structural capital will increase the resource output efficiency of enterprise [16]. Thus we assume that structural capital positively influence enterprise performance (Hypothesis 3). Customer capital means the relationship with stakeholders of the enterprise, which can

develop enterprise's market channel, promote corporate reputation and strengthen customer loyalty. Customer capital will directly improve enterprise performance by contributing to the sales and marketing and enterprise image. Thus we assume customer capital positively influence enterprise performance (Hypothesis 4). Besides, if the enterprise's regulation and rules are efficient, it will provide better service and experiences for customer and strengthen the relationships with customer, so can we assume that structural capital positively influence customer capital (Hypothesis 5). According to the analysis and hypothesis above, we establish the research model, see Figure 1.



**Figure 1:** Research model

### 4. Data and Analysis

In this paper, the measurement scale of IC we use are from Wu et al. and measurement scale of enterprise performance are from Jia et al. [17] We collect the data of enterprises in Xi'an High-tech Zone, Shaanxi province from January 5th, 2017 to February 3rd, 2017. 342 valid questionnaires are received.

**Table 2:** Reliability and validity test results

Variable	Item Number	Cronbach $\alpha$	AVE
Human Capital	6	0.870	0.606
Structural Capital	7	0.881	0.583
Customer Capital	6	0.879	0.623
Enterprise Performance	5	0.879	0.805

Firstly, we test the reliability and validity of the data by SPSS 22.0 and AMOS 22.0. The results are shown in table 2 and table 3. All the variables' Cronbach  $\alpha$  are greater than 0.8, and AVE values are greater than 0.5, which prove the data has good reliability and convergent validity.

**Table 3:** Discrimination validity test results

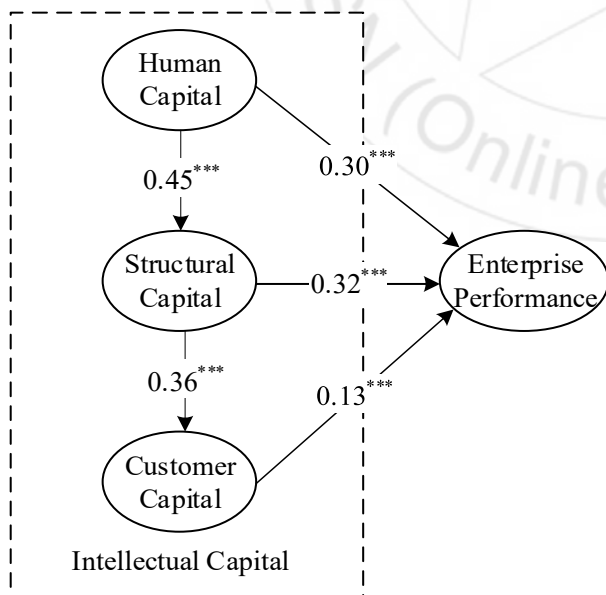
Variable	HC	SC	CC	EP
Human Capital	0.778			
Structural Capital	0.412	0.764		
Customer Capital	0.234	0.311	0.789	
Enterprise Performance	0.381	0.449	0.383	0.897

In order to test the discrimination validity of variables, we calculate the correlation coefficient and the results are shown in table 3. The diagonal data is the square root of variable AVE. The results show that all the correlation coefficients are smaller than the corresponding square root of AVEs, which proves that the data has good discrimination validity.

**Table 4:** Model fit results

Indicator	Critical Value	Results	Accept or Not
$\chi^2/df$	<3.00	1.534	Accept
RMR	<0.05	0.035	Accept
SRMR	<0.05	0.031	Accept
GFI	>0.90	0.918	Accept
NFI	>0.90	0.914	Accept
IFI	>0.90	0.968	Accept

At last, we use the AMOS 22.0 software to test the research model fit with structural equation model method, the results are shown in table 4 and path coefficient are shown in figure 2. In table 4, we can see all the modern fit indicators meet the critical value, thus the modern fitting is good and reliable. In figure 2, \*\*\* means  $p < 0.001$ . We can see human capital has significantly positive relations with enterprise performance (path coefficient = 0.30,  $p < 0.001$ ), hypothesis 1 is verified. Human capital has significantly positive relation with structural capital (path coefficient = 0.45,  $p < 0.001$ ), hypothesis 2 is verified. Structural capital has significant influence on enterprise performance (path coefficient = 0.32,  $p < 0.001$ ), hypothesis 3 is verified. Enterprise performance is significantly influenced by customer capital (path coefficient = 0.13,  $p < 0.001$ ), hypothesis 4 is verified. Structural capital significantly influences customer capital (path coefficient = 0.36,  $p < 0.001$ ), hypothesis 5 is verified.



**Figure 2:** Path coefficient of the research model

## 5. Conclusions and Implications

The main outcomes are as follows: A reasonable construction of IC is established including three elements,

which are human capital, structural capital and customer capital. The mutual enforcement effect are found to exist in three dimensions of IC. Human capital is the most important IC because it positively influence structural capital and enterprise performance. Thus, leaders and managers should put more attention to human resource recruitment and employee training in order to keep the high quality of human capital. Besides, structural capital has significant influence on customer capital and enterprise performance. Managers should established efficient regulations and process to increase the organization's flexibility and output efficiency, it will also improve customer's consumption experiences. Enterprise should also make efforts on maintain good relationships with customer and build good enterprise image as customer capital will directly increase enterprise performance.

This study has some limitations. First of all, this study focus on and collect the data from high-tech enterprise in Xi'an High-tech Zone, the further study can explore more industries and areas. Secondly, this study divide the IC into human capital, structural capital and customer capital, while the economic development and industry differences may influence the construction of IC. Thus, the further study can use different IC constructions according to specific situation.

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