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Study on the Relation between Intellectual Capital and Corporate Performance for the Management of Organisational Capital

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Editor's Foreword

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Abstract

This paper describes the outline of a study related to analyses of value relevance based on financial databases, and empirically clarifies the relation between intellectual capital, especially organisational capital, and corporate performance through questionnaire surveys of listed companies in Japan for the management of organisational capital.

The study, based on financial databases, showed that high-tech and low-tech industries had different intangible characteristics, and although a statistically significant difference was not seen between the two types of industry for the value relevance, it was found that intangibles were increasing in high-tech industries.

According to the analysis results through online and mail-in questionnaire surveys, no direct relation was found between organisational capital and corporate performance, like the findings of prior studies. Accordingly, the effects of organisational capital will be reflected indirectly rather than directly on corporate performance, like those of human capital.

The results of the study using organisational IQ showed that it exerted a non-positive, though not significant, impact on corporate performance. However, the analysis on its direct impact on corporate performance showed that it significantly exerted a positive impact on subjective performance.

Although organisational capital is considered to be exerting a positive effect on corporate performance, at least indirectly, it has not yet been clearly shown how variations of corporate organisational activities, policy, and mechanisms affect corporate performance. Thus, a future research task is to clarify the constituent factors of organisational capital and the management of such factors.

Keywords: value relevance, high-tech and low-tech industries, intangibles, online survey, mail-in survey, intellectual capital, organisational capital, corporate performance, organisational IQ

1   INTRODUCTION

Intellectual capital is considered to exert a substantial impact on corporate performance or corporate value, which has become an issue of growing interest. Hence, intellectual capital is expected to be created and effectively used to enhance corporate performance as well as corporate value by positioning it as a core strategy of business management.

In recent years, studies on intellectual capital have focused on organisational capital, which is regarded as a category of intellectual capital and is gaining in importance. Organisational capital means an accumulation or combination of capabilities and resources inherent to a firm along with organisational behaviour, policy, and structure that enable the firm to sustain a competitive advantage for a long time (Lev and Radhakrishnan 2003).

Prescott and Visscher (1980) considered especially organisational capital in intellectual capital as a sequence of information on work, individuals and skills by specifically referring to the following three categories of information: (1) information on optimal matching between work and employees, (2) information on optimal mutual matching among employees as team members, and (3) information on optimal in-house formation of a skill system peculiar to a firm. A firm is a repository of such information. The questions about the essence of a firm are probably associated with such organisational capital.

However, due to the difficulty of appraising the value of intellectual capital such as organisational capital and human capital, as well as the lack of data on such capital compared with that on research and development, etc., there have been few analyses of the relation between intellectual capital and corporate performance – that is, compared with data on research and development spending, etc. shown in financial statements, there is little data on intellectual capital such as organisational capital and human capital, and so the relation between intellectual capital and corporate performance is not well understood.

This paper describes the outline of a study related to analyses of value relevance based on financial databases, and empirically clarifies the relation between intellectual capital, especially organisational capital, and corporate performance by combining questionnaire data and financial data through questionnaire surveys of listed companies in Japan for the management of organisational capital.

2.   STUDY ON ANALYSES OF VALUE RELEVANCE

2.1   Intangibles and corporate value in the two types of industry

Although intangibles may be considered to be claimable rights to receive interests or benefits in the future with no forms of physical substance or financial product, in most cases intangibles are not reflected in current balance sheets due to the controversial characteristics of intangibles in terms of institutional perception. Thus, it has been pointed out that the significance (value relevance) of accounting information has been substantially declining.

Considering corporate characteristics based on the degree of potentiality of holding significant intangibles[1] which are not reflected in financial statements, Hosomi (2007) broke down the listed companies in Japan into two categories of high-tech industries and low-tech industries[2] (see Tables 1 and 2), and attempted an empirical analysis of the relation between intangibles and corporate value in the two types of industry.[3] Industries with a higher potentiality

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[1] Intangibles are intangible sources of value (claimable rights for future benefits) created by innovation (new discovery), unique organisational design, or a human resources system. Intangibles here include intangible fixed assets recorded in the balance sheet as well as off-balance-sheet items which may be considered intangible assets.

[2] According to Francis and Schipper (1999), high-tech industries and low-tech industries were classified based on corporate characteristics of the degree of potentiality of holding important intangibles not reflected in financial statements. In other words, industries with a high potentiality of holding significant intangibles not reflected in financial statements were classified as high-tech industries, and industries without such a high potentiality were classified as low-tech industries.

[3] Collins et al. (1997) conducted an analysis of the relation between the accounting information (net assets [equity] and net income) and the share prices of US companies. According to their report, the analysis results showed that the explanatory power on the accounting information of US companies was not decreasing, but has tended to increase for the past 40 years (1953–93).Francis and Schipper (1999) also reported that the value relevance between the accounting information and the share prices of US companies tended to increase during the period of about 40 years (1953–93) in light of the transition of the determination coefficients. In contrast, Brown et al. (1999) reported that the analysis results of Collins et al. (1997) and Francis and Schipper (1999) were attributable to the increase of scale

of holding significant intangibles which are not reflected in financial statements were classified

as high-tech industries, and the other industries were classified as low-tech industries for the

analysis.

Table 1: Classification of high-tech industries by SIC codes

High-Technology Industries	
283	Drugs
357	Computer and Office Equipment
360	Electrical Machinery and Equipment,Excluding Computers
361	Electrical Transmissions and Distribution Equipment
362	Electrical Industrial Apparatus
363	Household Appliances
364	Electrical Lighting and Wiring Equipment
365	Household Audio,VideoEquipment,Audio Receiving
366	Communication Equipment
367	Electronic Components,Semiconductors
368	Computer Hardware(Including Mini,Micro,Mainframes,Terminals,Discs,Tape Drives,Scanners,Graphics Systems,Peripherals,and Equipment)
481	Telephone Communications
737	Computer Programming,Software,Data Processing
873	Research,Development,Testing Services

factors, and when such scale factors were controlled, the value relevance measured by determination factors decreased. Also, Lev and Zarowin (1999) conducted an analysis on the relation between the accounting information (net assets [equity]), net income, and the standard/changing amounts of cash flow) and share prices/share returns of US companies. The analysis results showed that the explanatory power of share prices/share returns of accounting information of US companies continuously decreased for the past 20 years (1977–96). Usui (2005), who conducted an analysis on such a relation of Japanese companies, also reported that there was no evidence of a long-term increasing tendency of the value relevance of accounting information when the value relevance was measured by the explanatory power of share evaluation models.

Table 2: Classification of low-tech industries by SIC codes

Low-Technology Industries	
020	Agricultural Products－Livestock
160	Heavy Construction,Excluding Building
170	Construction-Special Trade
202	Dairy Products
220	Textile Mill Products
240	Lumber and Wood Products,Excluding Furniture
245	Wood Buildings,Mobile Homes
260	Paper and Allied Products
300	Rubber and Miscellaneous Plastics Products
307	Miscellaneous Plastics Products
324	Cement Hydraulic
331	Blast Furnaces and Steel Works
356	General Industrial Machinery and Equipment
371	Motor Vehicles and Motor Vehicle Equipment
399	Miscellaneous Manufacturing Industries
401	Railroads
421	Trucking,Courier Services,Excluding Air
440	Water Transportation
451	Scheduled Air Transportation,Air Courier
541	Grocery Stores

2.2 Research method

First, in order to verify the difference in the relation with intangibles between high-tech industries and low-tech industries, two-sample t-tests were conducted on the ratio of research and development spending/total assets and the market capitalisation/net assets book value in the two types of industry.

Second, an empirical study was conducted of the value relevance of accounting information of high-tech industries and low-tech industries of the listed companies in Japan. In this study, according to Brown et al. (1999), etc., a multiple regression analysis was conducted using Formula 1. This formula explains how accounting information affects corporate value. The dataset used for the analysis was extracted from Compustat (global) based on the SIC codes.

Formula 1

$$\frac{P_{i,t}}{P_{i,t-1}} = a_{0,t} + a_{1,t}\,\frac{EPS_{i,t}}{P_{i,t-1}} + a_{2,t}\,\frac{BVPS_{i,t}}{P_{i,t-1}} + \varepsilon_{i,t}$$

where,

$P_{i,t}$: Share price of firm i at business term t (share price three months after the end of the fiscal term of the firm, closing share price in June)

$EPS_{i,t}$: Earnings per share of firm i at business term t

$BVPS_{i,t}$: Book value of equity per share of firm i at business term t

$\varepsilon_{i,t}$: Other information on value relevance of firm i at business term t (error term)

$P_{i,t-1}$: Share price of firm i at business term t-1 (share price 12 months before the end of the fiscal term of the firm, share price at the end of the previous fiscal year)

Third, an analysis using a time regression approach was also attempted to observe time-series variations of this adjusted R-square. In this study, according to the prior studies, a single regression analysis was conducted using Formula 2. This formula explains how time affects adjusted R-square.

Formula 2

$$Adj.R_t^2 = \phi_0 + \phi_1 TIME_t + \varepsilon_t$$

where,

$Adj.R_t^2$: Adjusted R-square at business term t

ϕ_1 : Regression coefficient of time. If this value is negative (positive), the supplementary explanatory power of the explanatory variables may be becoming weaker (stronger).

t : 1990–2006

2.3   Results

First, when two-sample t-tests were conducted on the research and development spending/total assets and the market capitalisation/net assets book value, a statistically significant difference

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was seen between the two types of industry. Thus, the two types of industry had different intangible characteristics (see Table 3 and Figure 1).

Second, when an analysis was conducted of the value relevance of accounting information using adjusted R-squares, the hypothesis of lower-value relevance of accounting information in high-tech industries was not supported. R-squares of low-tech industries are lower than those of high-tech industries, contrary to our hypothesis (see Tables 3 and 4 and Figure 1). Thus, the hypothesis of lower value relevance in high-tech industries was not supported.

Third, the result of time regression revealed that intangibles were increasing in high-tech industries in this period (see Formula 3). Thus, the hypothesis of a more downward tendency of value relevance of accounting information in high-tech industries was partly supported.[4] The serial correlation was not seen in this analysis period (see DW[5] of Table 3).

Formula 3

$$Adj.R_t^2 = 27.02131 - 0.01346 TIME_t + \varepsilon_t \quad (p\text{-}value:0.0057)$$

Thus, though a statistically significant difference was not seen between the two types of industry for the value relevance it was found that intangibles were increasing in high-tech industries.

However, there is an opinion that it is necessary to use not coefficients of determination but residual variances to see the explanatory power when the sample is extremely different, like the sample in very long-term time series or each country (see Gu 1999). In this study, the value of the portion that could not be explained by the input factors, such as net assets and net income, was regarded as the value of intangibles. Although the factors influencing corporate value (share

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[4] Although the negative coefficient of TIME means the fall of coefficients of determination according to progress of time, the decline of coefficients of determination means the increase in intangibles.

[5] DW stands for the Durbin-Watson statistic. Durbin-Watson test is a typical test which investigates whether there is any serial correlation in time-series data. DW takes a value from 0 to 4. If close to 0, positive serial correlation is suspected. If close to 4, negative serial correlation is suspected. If close to 2, there is no serial correlation.

prices) besides these intangibles were supposedly in existence (see Collins et al. 1997), these

factors, except the scale factor, were not controlled in this study.

Table 3 and Figure 1: Ratio of research and development spending/total assets of high-tech and low-tech industries

	High-tech	Low-tech
1990	3.27%	1.25%
1991	3.29%	1.21%
1992	3.49%	1.19%
1993	3.52%	1.20%
1994	3.53%	1.26%
1995	3.38%	1.21%
1996	3.25%	1.21%
1997	3.29%	1.21%
1998	3.39%	1.22%
1999	3.56%	1.19%
2000	3.51%	1.53%
2001	3.64%	1.51%
2002	3.64%	1.60%
2003	3.73%	1.65%
2004	3.53%	1.82%
2005	3.58%	1.75%
2006	3.54%	1.66%
Analysis periods average	3.48%	1.39%
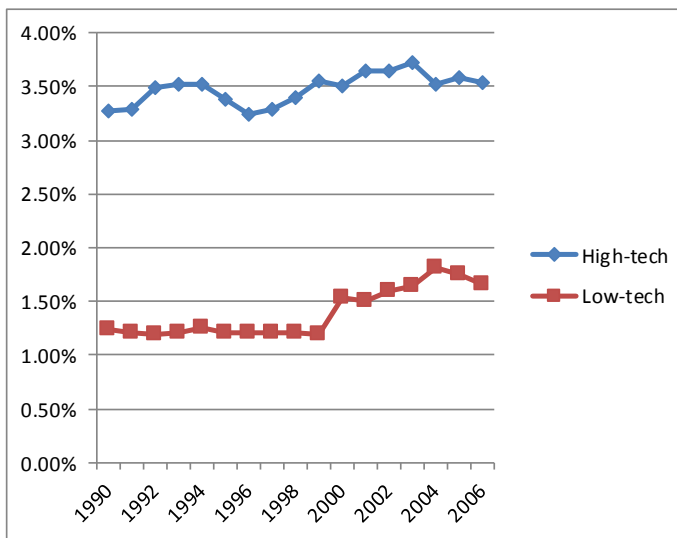
two-sample t-test
The null hypothesis that two variables were equal was rejected by the significance level of 0.1%.
test statistic (t-value) 31.78671 > t border value (two-tailed test) 2.73849
(p value :0.000)

Table 4 and Figure 2: Market capitalisation/net assets book value of high-tech and low-tech industries

	High-tech	Low-tech
1990	4.40	4.86
1991	3.15	3.65
1992	2.25	2.41
1993	2.10	2.14
1994	2.51	2.88
1995	3.27	2.06
1996	3.07	2.45
1997	2.19	1.81
1998	1.60	1.55
1999	7.04	1.30
2000	4.92	1.33
2001	2.42	1.30
2002	2.76	0.99
2003	1.68	1.35
2004	3.83	1.43
2005	3.27	1.75
2006	3.80	1.63
Analysis periods average	3.19	2.05
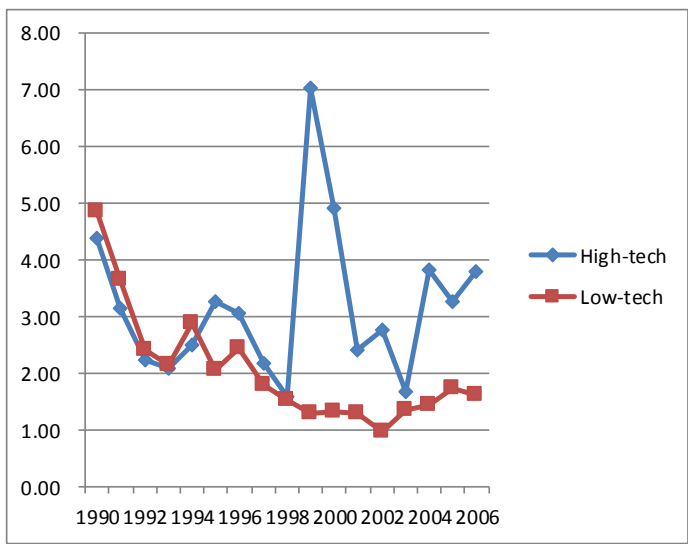
two-sample t-test
The null hypothesis that two variables were equal was rejected by the significance level of 1%.
test statistic（t-value） 2.806989 ＞ t border value （two-tailed test） 2.73849
（p value :0.008）

Table 5: Result of multiple regression analysis of high-tech industries

| Year	Coefficient (t-value)	Const.	EPS ∕Pt-1	BVPS ∕Pt-1	P-value(F-test)	Adj.R-square	DW	N
1990	Coefficient	0.909	14.08	0.652	0.000	39.90%	2.115	155
	(t-value)	10.791***	7.042***	2.773***				
1991	Coefficient	0.586	8.276	0.276	0.000	31.80%	1.929	160
	(t-value)	13.435***	7.286***	1.942*				
1992	Coefficient	0.499	2.666	0.26	0.000	18.20%	2.063	164
	(t-value)	11.137***	5.081***	2.332**				
1993	Coefficient	0.874	0.264	0.467	0.000	9.90%	1.888	163
	(t-value)	13.595***	.609	4.456***				
1994	Coefficient	1.023	-0.230	0.574	0.000	14.10%	1.959	170
	(t-value)	15.032***	-0.539	5.370***				
1995	Coefficient	0.609	0.923	0.214	0.000	17.30%	2.020	182
	(t-value)	17.176***	4.405***	3.267***				
1996	Coefficient	1.146	-0.058	0.34	0.021	2.30%	2.049	249
	(t-value)	14.192***	-0.122	2.781				
1997	Coefficient	0.766	1.025	0.238	0.000	6.10%	1.934	274
	(t-value)	18.019***	2.042**	3.201***				
1998	Coefficient	0.726	1.848	0.021	0.000	12.10%	1.787	292
	(t-value)	16.679***	6.191***	0.364				
1999	Coefficient	1.774	1.134	-0.224	0.044	1.40%	1.989	312
	(t-value)	12.188***	2.024**	-1.744*				
2000	Coefficient	1.681	2.256	0.002	0.018	1.80%	2.103	329
	(t-value)	9.148***	2.826***	0.015				
2001	Coefficient	0.658	0.158	0.234	0.000	13.70%	1.709	353
	(t-value)	20.520***	0 .963	7.548***				
2002	Coefficient	0.734	0.397	0.134	0.000	9.50%	1.917	390
	(t-value)	25.230***	3.740***	5.283***				
2003	Coefficient	0.76	0.577	0.196	0.000	13.60%	2.002	444
	(t-value)	21.358***	5.063***	7.187***				
2004	Coefficient	2.644	3.672	-0.042	0.375	0.00%	2.017	491
	(t-value)	3.288***	1.399	-0.095				
2005	Coefficient	1.099	0.927	0.216	0.000	4.30%	2.106	520
	(t-value)	18.291***	2.531**	3.808***				
2006	Coefficient	1.047	1.865	0.179	0.000	11.00%	1.989	553
	(t-value)	22.622***	7.173***	3.415***				
Average					0.027	12.18%	1.975	306
Median					0.000	11.00%	1.989	292

Note: p*<.1, p**<.05, p***<.01.(two-tailed tests)

Table 6: Result of multiple regression analysis of low-tech industries

Year	Coefficient (t-value)	Const.	EPS ∕Pt-1	BVPS ∕Pt-1	P-value(F-test)	Adj.R-square	DW	N
1990	Coefficient	1.037	4.704	0.624	0.004	3.90%	1.854	233
	(t-value)	9.915***	1.505	1.984**				
1991	Coefficient	0.592	3.011	0.523	0.000	19.10%	2.096	235
	(t-value)	16.171***	5.105***	4.587***				
1992	Coefficient	0.537	0.439	0.257	0.001	5.20%	2.086	235
	(t-value)	16.022***	1.405	2.976***				
1993	Coefficient	0.797	0.93	0.495	0.000	16.90%	1.808	236
	(t-value)	17.102***	2.000**	6.353***				
1994	Coefficient	0.927	0.644	0.481	0.000	18.50%	1.729	244
	(t-value)	20.526***	1.618	7.098***				
1995	Coefficient	0.615	0.589	0.236	0.000	15.70%	1.991	288
	(t-value)	24.623***	3.013***	5.889***				
1996	Coefficient	1.204	0.290	0.088	0.200	0.40%	2.021	334
	(t-value)	26.826***	0.901	1.362				
1997	Coefficient	0.715	1.419	0.087	0.000	8.80%	1.739	373
	(t-value)	25.533***	5.213***	1.978**				
1998	Coefficient	0.657	0.848	-0.012	0.000	8.70%	2.013	389
	(t-value)	25.833***	6.238***	-0.420				
1999	Coefficient	0.99	0.341	0.099	0.001	3.00%	2.086	401
	(t-value)	19.945***	2.326**	2.829***				
2000	Coefficient	1.097	0.731	0.005	0.002	2.50%	1.987	416
	(t-value)	16.968***	3.549***	0.146				
2001	Coefficient	0.907	0.106	0.108	0.000	7.80%	1.977	424
	(t-value)	26.229***	1.990**	5.794***				
2002	Coefficient	1.004	0.167	-0.018	0.015	1.50%	1.865	433
	(t-value)	48.416***	2.730***	-2.481**				
2003	Coefficient	1.176	-0.025	0.002	0.753	-0.30%	1.757	439
	(t-value)	46.287***	-0.516	0.292				
2004	Coefficient	1.94	0.819	-0.069	0.001	2.50%	1.873	443
	(t-value)	32.764***	3.602***	-3.399***				
2005	Coefficient	1.143	0.531	0.099	0.000	7.80%	1.994	449
	(t-value)	21.089***	4.488***	2.760***				
2006	Coefficient	0.976	0.537	0.19	0.000	11.60%	2.035	451
	(t-value)	23.668***	4.939***	5.903***				
Average					0.057	7.86%	1.936	354
Median					0.000	7.80%	1.987	389

Note: $p^* < .1$, $p^{**} < .05$, $p^{***} < .01$.(two-tailed tests)

Figure 3: Transition of adjusted R-square of high-tech and low-tech industries
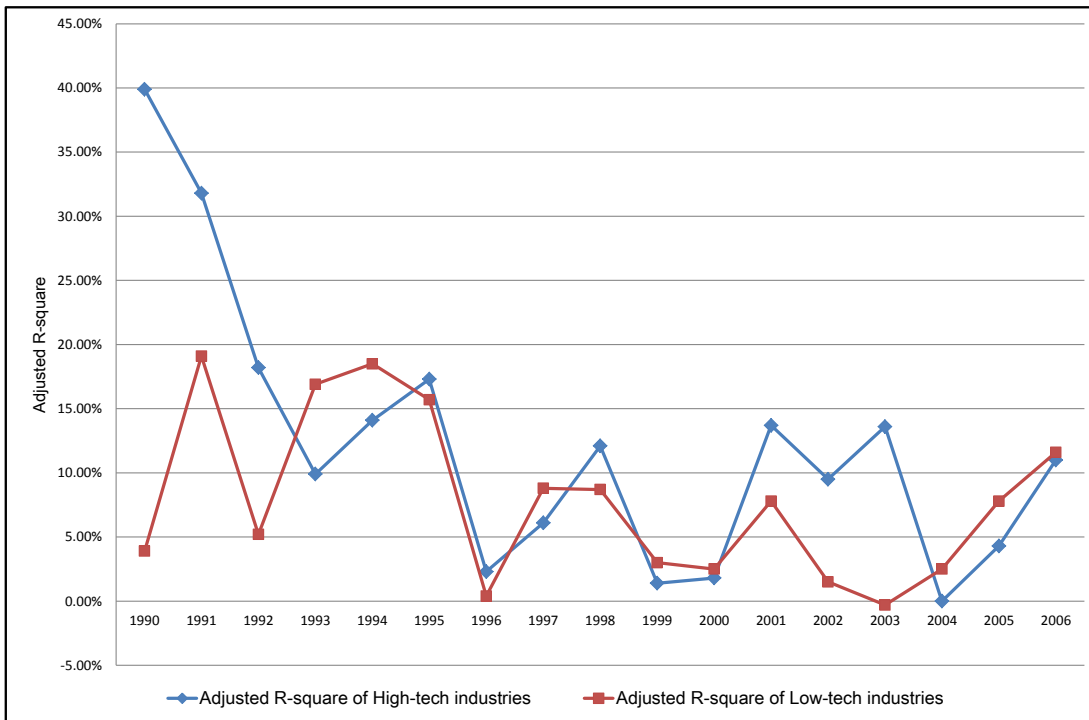
3. STUDY THROUGH QUESTIONNAIRE SURVEYS

3.1 Significance and classification of intellectual capital

The study described in section 2 above was a quantitative study mainly using corporate financial data, and revealed some findings about intellectual capital (intangibles). However, it would appear to be difficult to reveal the relation between intellectual capital and corporate performance using only financial data. Therefore, in this section, we describe analyses based on questionnaires regarding intellectual capital, especially organisational capital and corporate performance.

Until now, based on deduction of the explanatory power on corporate value such as share prices, etc., using input factors such as net assets (equity) and net income as explanatory variables, the value whose part cannot be explained by such input factors has been indirectly considered to be the value of intangibles, but few empirical studies have directly examined the

impacts of intellectual capital (intangibles) on corporate performance using in-house qualitative data such as questionnaires. Under such circumstances, some of our research on intellectual capital conducted based on the questionnaires is described in this section.

There is no general, uniform definition of intellectual capital. However, among the intangible factors created through human intellectual activities and expected to produce income for a firm, a property with asset characteristics is called 'intellectual asset' and, when protected by law, 'intellectual property'. In this study, the term 'intellectual capital' was used since it means capital from stakeholders because intellectual assets contribute to a firm's long-term creation of valuable products and profits.[6]

Although there is no established theory about the constituent factors of intellectual capital, in this study intellectual capital was broken down into four categories – human capital, organisational capital, innovation capital, and relational capital – for the analysis, which was prepared based on examples from prior studies by Tseng and Goo (2005), etc., also reflecting the typical viewpoints of Edvinsson and Malone (1997), Lev (2001), etc. This classification is considered appropriate and so was used in this study, too.

Human capital is a category of intellectual capital, which is created by human resources such as corporate employees. Specifically, the management skills, competency, volition, etc. of management personnel as well as operation skills, competency, volition, etc. of corporate employees are classified as human capital. Although human capital is considered to be a very important subset of intellectual capital, it is off-balance sheet according to the institutional accounting system except for personnel expenses such as salaries, which are recorded as costs for business management.

Organisational capital is a category of intellectual capital, which is created by an organisational form. Specifically, a firm-specific organisational structure, stylised business

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[6] This is practically synonymous with the term 'intellectual asset'. But, when an intellectual asset is considered as one of various types of capital put into business management activities, the term 'intellectual capital' is used.

process, organisational culture, etc. are classified as organisational capital. According to Evenson and Westphal (1995), organisational capital is the knowledge or capacity to establish a system to integrate the skills of employees and physical capital in an ingenious way.

Innovation capital is a category of intellectual capital, which is created by discovery and innovation, which can also be said to be the development and enforcement ability of products or services. Specifically, research and development investment as well as legally protected embodiments created by this investment – such as patent property, trade secrets, copyright, etc. – is classified as innovation capital.[7]

Relational capital is a category of intellectual capital, which is created by a relationship which an organisation builds up with a stakeholder group outside the corporation or created by information sharing and collaboration among employees or departments within an organisation. Specifically, it is customer interactions and relationships acquired through business activities, and a firm's relationships with customers and suppliers or value of networks within an organisation that are classified as relational capital.

3.2 Research hypotheses

As described above, in this study intellectual capital was divided into four categories: human capital, organisational capital, innovation capital, and relational capital. In this section, a research model of the relation between intellectual capital and corporate performance was developed.

In our study we conducted an analysis by assuming that human capital influenced the other three endogenous intellectual capitals (organisational capital, innovation capital, and relational capital) as an exogenous variable, because, according to the prior studies (Bontis et al. 2000, etc.), human capital did not directly influence organisation performance (corporate performance)

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[7] Since the capacity related to innovation is also created by an organisation, some consider that it comprises part of organisational capital. However, as the organisational capacity itself possessed by a corporate organisation and the inventive capacity, etc. are considered to be separate, in this study innovation capital was separated from organisational capital.

positively, but indirectly affected organisation performance (corporate performance) through customer capital and structural capital.

Organisational capital embedded in organisational structure, business processes, procedures, manuals, information systems, organisational culture, etc. can help a firm to get appropriate information and to make good decisions and then enhance corporate performance (H1-1). The important points to assess a firm's innovation capability are the development ability as well as the enforcement ability of products or services, all of which influence corporate performance positively (H1-2). Corporate performance or corporate value can be generated by good relationships with other business participants such as its customers, suppliers, and also by information sharing and collaboration among employees or departments within an organisation (H1-3).

Employees with expert knowledge or excellent skills and high willingness to learn should be able to establish good information systems and standard operating processes (H2-1). We consider that creative employees with expert knowledge or excellent skills have a major influence on firm innovativeness (H2-2). Competent employees will substantially understand customer demands and the convenience of information sharing and collaboration within their organisation. Therefore, they may increase their value by meeting the demands of customers as well as the demands within their organisation (H2-3).

We consider that organisational capital helps improve innovation ability because creating an innovation culture in an organisation is important for a firm's innovation ability (H3-1). If a firm establishes information systems to recognise customer demands and convenience of information sharing and collaboration within the organisation, it will be able to maintain good customer relationships, good information sharing, and collaboration among employees or departments (H3-2).

To achieve good relationships with customers and information sharing and collaboration within the organisation, a firm needs to maximise the benefits of networking by helping to

increase reliability, equality, and flexibility through production and service process innovation (H4-1).

Research hypothesis 1

H1-1   Organisational capital positively affects corporate performance

H1-2   Innovation capital positively affects corporate performance

H1-3   Relational capital positively affects corporate performance

Research hypothesis 2

H2-1   Human capital positively affects organisational capital

H2-2   Human capital positively affects innovation capital

H2-3   Human capital positively affects relational capital

Research hypothesis 3

H3-1   Organisational capital positively affects innovation capital

H3-2   Organisational capital positively affects relational capital

Research hypothesis 4

H4-1   Innovation capital positively affects relational capital

3.3   Study through an online survey

Hosomi (2009) attempted an empirical clarification of the hypotheses on the relation between intellectual capital and corporate performance with the structural equation model (SEM)[8] by

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[8] The SEM is an approach that integrates factor analysis and multiple regression analysis to study the causal correlation among variables by extracting unmeasurable latent variables as factors. Thanks to this approach, in this study a model of the relation between inherently unmeasurable intellectual capital and corporate performance was created, and the analysis was made feasible.

combining questionnaire data and financial data through an online questionnaire survey of employees in companies listed on the first and second sections of the Tokyo Stock Exchange (TSE), except those in the financial industry (see Table 7).

As mentioned in section 3.1 above, the constituent factors of intellectual capital were broken down into four categories – human capital, organisational capital, innovation capital, and relational capital – for the analysis. Concrete questionnaire items were prepared based on Tseng and Goo (2005) and Subramaniam and Youndt (2005).

The indicators of corporate performance (financial data) were measured based on return on sales (operating income), return on sales (net income), return on assets (ROA), log natural (ln) of market capitalisation, PBR (price book-value ratio), etc., which were extracted from Thomson Reuter's Worldscope Fundamentals (mean value of the most recent three terms) (see Figure 4).

The proposed model was rejected in the chi-square test, but the CFI[9] of .895 and the RMSEA[10] of .094 show that our hypothesised model fits the data well to some extent.

The analysis results on research hypotheses showed that innovation capital exerted a somewhat positive impact on corporate performance. Also, relational capital exerted almost no impact on corporate performance, though the impact was somewhat positive (but not significant).

In contrast, organisational capital exerted a somewhat negative (but not significant) impact on corporate performance, contrary to the research hypothesis. The result showing the negative coefficient of the organisational capital was quite similar to the analysis result of Tseng and Goo (2005), who conducted an analysis using a similar approach to the SEM (both of the results showed common distinctive features of 'not significant'). However, it was observed that

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[9] CFI (comparative fit index) is representative goodness-of-fit index for structural equation model (SEM), which showed deviation with distribution of a model and true distribution taking the complexity of a model into consideration. CFI values range from 0 to 1 and such values over 0.90 are considered to be favourable (however, it is not an absolute criterion).

[10] RMSEA (root mean square error of approximation) is representative goodness-of-fit indexes for structural equation model (SEM), which showed deviation with distribution of a model and true distribution as a quantity per degree of freedom. RMSEA values below 0.05 indicate a good fit, values over 0.1 indicate a poor fit, and the range between 0.05 and 0.1 is an allowable range.

organisational capital exerted a substantial positive impact on innovation capital and relational capital (see Table 8).

Finally, we state limitations and our future task arising out of this study. First, further study on the validity of questionnaire items may be needed although they were prepared based on prior studies. The items of the financial data used for corporate performance were selected based on the prior studies. However, since the particular items used for corporate performance have an influence on the analysis results, further study on them may be needed. Also, in this study we conducted an online questionnaire survey intended for general manager classes (above the rank of director classes) of the listed companies. There was no assurance that each questionnaire answer accurately reflected the status of each relevant firm because this result of the survey was based on the individual answers from general manager classes. Thus, this should be a subject of our future task.

Table 7: Outline of questionnaire survey-online survey

Survey method
・Online questionnaire survey
Survey name：'Questionnaire survey on intellectual capital'
・Research objectives：Attitude survey on intellectual capital in the listed companies
・Survey subjects：Those who work in the companies listed on TSE First Section, TSE
    Second Section, except financial industry among the respondents of pilot survey
    （About 1,100 samples）
・Subject employment position: Above the rank of director classes
    ・・・We performed main survey to about 350 samples which fulfilled the above conditions
・Survey period：From August to early September 2008
・Number of respondents：194（except samples which have missing values and
    problems in data
Measurement scale
・We asked questions by 7-point Likert scale regarding human capital (Q2_1 - 2_5),
    relational capital (Q2_6 - 2_10), organisational capital (Q2_11 - 2_15) and innovation capital (Q2_16 - 2_20)

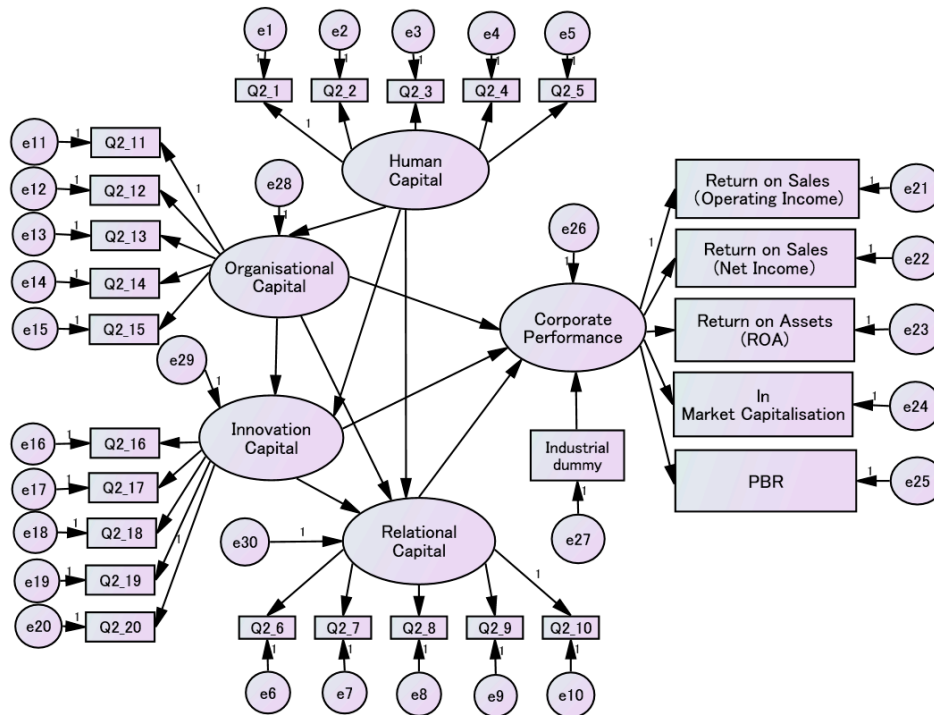**Figure 4: Analysis model–research hypotheses path diagram (Hosomi 2009)**

Table 8: Analysis results of research hypotheses (Hosomi 2009, converted to standardised coefficients)[11]

Research hypothesis		
Items	Hypothetical pathways	Standardised coefficients
H1-1	Organisational capital→Corporate performance	-.295
H1-2	Innovation Capital→Corporate performance	.280**
H1-3	Relational Capital→Corporate performance	.042
H2-1	Human Capital→Organisational capital	.794***
H2-2	Human Capital→Innovation Capital	.230***
H2-3	Human Capital→Relational Capital	.519***
H3-1	Organisational capital→Innovation Capital	.621***
H3-2	Organisational capital→Relational Capital	.437***
H4-1	Innovation Capital→Relational Capital	.011

Note :All coefficients are estimated by muximum likelihood   and computed with AMOS.
χ^2 290)=784.192,GFI=.755,CFI=.895,RMSEA=.094
p *<.1, *p* **<.05, *p* ***<.01.(two-tailed tests)

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[11] The analysis results on research hypotheses (2009) were converted to standardised coefficients.

3.4 Study through a mail-in survey

Hosomi (2011a) attempted an empirical clarification of the hypotheses on the relation between intellectual capital and corporate performance with the SEM by combining questionnaire data and financial data through a mail-in questionnaire survey of the companies listed on TSE First Section and TSE Second Section, except the financial industry (see Table 9).

Although Hosomi (2009) conducted a similar study on the general manager class of the listed companies through an online questionnaire survey, an attempt was made to clarify the difference between the analysis results at that time and the present results.

As mentioned in section 3.1 above, the constituent factors of intellectual capital, similarly to Hosomi (2009), were broken down into four categories for the analysis.[12] Concrete questionnaire items were prepared based on Tseng and Goo (2005) and Subramaniam and Youndt (2005).

The indicators of corporate performance (financial data, objective performance) this time were partly different from those used by Hosomi (2009).[13] They were measured based on return on sales (operating income), return on assets (ROA), log natural (ln) of market capitalisation, PBR (price book-value ratio), etc., which were extracted from Thomson Reuter's Worldscope Fundamentals (mean value of the most recent three terms) (see Figure 5).

The proposed model was rejected in the chi-square test, but the CFI of .906 and the RMSEA of .076 show that our hypothesised model fits the data well to some extent.

The analysis results on research hypotheses showed that innovation capital exerted a positive impact on corporate performance. Also, relational capital exerted a positive impact on corporate performance, though the impact was not so substantial (and not significant).

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[12] The question items regarding relational capital were partly altered.

[13] The indicators of corporate performance (financial data) were measured based on return on sales (operating income), return on assets (ROA), log natural (ln) of market capitalisation, EV/EBITDA multiple, PBR, etc., and, like Hosomi (2009), were extracted from Thomson Reuter's Worldscope Fundamentals (mean value of the most recent three terms).

In contrast, organisational capital exerted a somewhat negative impact on corporate performance (which was not significant), contrary to the research hypothesis. The result showing the negative coefficient of the organisational capital was quite similar to the analysis results of Tseng and Goo (2005) and Hosomi (2009). However, it was observed that organisational capital significantly exerted a substantial positive impact on innovation capital and relational capital (see Figure 6).

The additional analysis in which corporate performance was replaced with subjective performance[14] was conducted. Table 10 shows the analysis results of the research hypotheses. It seems that the minimum standard is met as goodness of fit. Such results are substantially similar to those of analysis using objective performance.

Finally, we state limitations and our future task arising out of this study. First, further study on the validity of the analytic model used in this study may be needed, although it was prepared based on prior studies. In this study, one questionnaire item concerning organisational capital was deleted from the analytic model (see Table 11). Further study on the validity of the questionnaire items may be needed, although they were decided based on prior studies. Also, the recovery rate of our questionnaire survey was anything but high, probably because the survey was related to intellectual capital. It seemed quite necessary to obtain a sufficient understanding of this survey for a higher recovery rate as well as higher accuracy of the analysis.

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[14] An additional analysis was conducted by using questionnaire items prepared on the basis of Lahiri et al. (2009). The scale positions of a firm against competitors for the past three years were asked using a five-point Likert scale regarding sales growth rate, ratio of net profit to sales, overall performance, competitive advantage of organisation, and rate of acquisition of new markets.

Table 9: Outline of questionnaire survey–mail-in survey

Survey method

・Mail-in survey (Questionnaire survey)

Survey name：'Fact-finding survey on intellectual capital of the listed companies'

・Research objectives：To reveal a quantitative overview of the situation on the intellectual capital of the listed companies

・Survey subjects：All companies listed on the first and second sections of TSE except those in the financial industry

・Subject departments： Strategic planning or/and corporate planning

・Survey period：From beginning August to early September 2009

・Number of respondents：158 (recovery rate about 8%)

Measurement scale

・We asked questions by 7-point Likert scale regarding human capital (Q2_1 - 2_5), relational capital (Q2_6 - 2_10), organisational capital (Q2_11 - 2_15) and innovation capital (Q2_16- 2_21)

Figure 5: Analysis model–research hypotheses path diagram (Hosomi 2011a)

Figure 6: Analysis results on research hypotheses (Hosomi 2011a)

Table 10: Analysis results on research hypotheses: additional analysis (Hosomi 2011a)

Research hypothesis		
Items	Hypothetical pathways	Standardised coefficients
H1-1	Organisational capital→Corporate performance	-.374
H1-2	Innovation Capital→Corporate performance	.430***
H1-3	Relational Capital→Corporate performance	.303
H2-1	Human Capital→Organisational capital	.742***
H2-2	Human Capital→Innovation Capital	.301**
H2-3	Human Capital→Relational Capital	.358***
H3-1	Organisational capital→Innovation Capital	.446**
H3-2	Organisational capital→Relational Capital	.622**
H4-1	Innovation Capital→Relational Capital	-.084

Note :All coefficients are estimated by muximum likelihood and computed with AMOS.

χ^2 (279) =553.702,GFI=.790,CFI=.902,RMSEA=.080

p *<.1, *p* **<.05, *p* ***<.01.(two-tailed tests)

Table 11: Analysis model: predictors of modified path diagram (Hosomi 2011a)

Research hypothesis		
Items	Hypothetical pathways	Standardised coefficients
H1-1	Organisational capital→Corporate performance	-.340
H1-2	Innovation Capital→Corporate performance	.568**
H1-3	Relational Capital→Corporate performance	.344
H2-1	Human Capital→Organisational capital	.740***
H2-2	Human Capital→Innovation Capital	.328**
H2-3	Human Capital→Relational Capital	.367***
H3-1	Organisational capital→Innovation Capital	.451**
H3-2	Organisational capital→Relational Capital	.621**
H4-1	Innovation Capital→Relational Capital	-.090

Note :All coefficients are estimated by muximum likelihood and computed with AMOS.

χ^2 (257) =483.959,GFI=.809,CFI=.906,RMSEA=.076

p *<.1, *p* **<.05, *p* ***<.01.(two-tailed tests)

3.5 Summary of an online survey and a mail-in survey

As mentioned in sections 3.3 and 3.4 above, we conducted an empirical study on the relation between intellectual capital and corporate performance with the SEM by combining questionnaire data and financial data.

To clarify empirically the relation between intellectual capital and corporate performance, we conducted two questionnaire surveys, online and mail-in, of companies listed on the first and second sections of the TSE, except those in the financial industry.

Table 12 summarises the online and mail-in questionnaire surveys. The research method was very similar, but the subject of the online survey was personal (general managers in listed companies in Japan), while the subject of the mail-in survey was related to the department (strategic planning or/and corporate planning departments of listed companies in Japan).

The indicators of corporate performance were slightly different. In the online survey, we used two indicators of return on sales (operating income) and return on sales (net income), according to a prior study (Tseng and Goo 2005). Some of the questions were slightly different, and we added one question regarding innovation capital in the mail-in survey.

Table 13 shows the results of the online and mail-in surveys. It seems that the minimum standard is met as goodness of fit. Relational capital to corporate performance gives slightly different results (though both result are insignificant). However, the online survey and the mail-in survey show very similar results on research hypotheses as already mentioned.

- Innovation capital exerted a positive impact on corporate performance
- Relational capital exerted a positive impact on corporate performance, though the impact was not so substantial (and was insignificant)
- In contrast, organisational capital exerted a somewhat negative (but insignificant) impact on corporate performance contrary to the research hypothesis
- However, it was observed that organisational capital significantly exerted a substantial positive impact on innovation capital and relational capital

Thus, no direct relation was found between organisational capital and corporate performance, like the findings of prior studies. Accordingly, the effects of organisational capital will be reflected indirectly rather than directly on corporate performance, like those of human capital.

Table 12: Outline of questionnaire surveys: online survey and mail-in survey

	Online survey	Mail-in survey
Survey name	"Questionnaire survey on Intellectual capital"	"Fact-finding survey on Intellectual capital of the listed companies"
Research objective	Attitude survey on Intellectual capital in the listed companies	To reveal a quantitative overview of the situation on the Intellectual capital of the listed companies.
Survey period	from August 2008 to early September 2008	from August 2009 to early September 2009
Survey subject	Those who work in the listed company (TSE First Section, TSE Second Section, except financial industry)	all companies listed in the First Section and Second Section of the Tokyo Stock Exchange, except financial industry
Subject employment position	General manager classes (above the rank of director classes)	—
Subject departments	—	Strategic planning or/and corporate planning
indicators of corporate performance (financial data)	Return on Sales (operating income), Return on Sales (net income), Return on Assets (ROA), log natural (ln) of market capitalisation,PBR(Price Book-Value Ratio), etc.	Return on Sales (operating income), Return on Assets (ROA), log natural (ln) of market capitalisation,PBR(Price Book-Value Ratio), etc.
Final number of respondents used	194	158
Measurement scale	7-point likert scale	
Questionnaire items	Human capital (Q2_1～2_5), Relational capital (Q2_6～2_10), Organisational capital (Q2_11～2_15) Innovation capital (Q2_16～2_20)	Human capital (Q2_1～2_5), Relational capital (Q2_6～2_10), Organisational capital (Q2_11～2_15) Innovation capital (Q2_16～2_21)

Table 13: Analysis results of research hypotheses: online survey and mail-in survey)

Research hypothesis		Online survey	Mail-in survey
Items	Hypothetical pathways	Standardised coefficients	
H1-1	Organisational capital→Corporate performance	-.295	-.340
H1-2	Innovation Capital→Corporate performance	.280**	.568**
H1-3	Relational Capital→Corporate performance	.042	.344
H2-1	Human Capital→Organisational capital	.794***	.740***
H2-2	Human Capital→Innovation Capital	.230***	.328**
H2-3	Human Capital→Relational Capital	.519***	.367***
H3-1	Organisational capital→Innovation Capital	.621***	.451**
H3-2	Organisational capital→Relational Capital	.437***	.621**
H4-1	Innovation Capital→Relational Capital	.011	-.090

Note:All coefficients are estimated by maximum likelihood and computed with AMOS.
χ^2 290)=784.192,GFI=.755,CFI=.895,RMSEA=.094 (Online survey)
χ^2 (257) =483.959,GFI=.809,CFI=.906,RMSEA=.076(Mail-in survey)
p *<.1, *p* **<.05, *p* ***<.01.(two-tailed tests)

4. STUDY USING ORGANISATIONAL IQ

4.1 Factors of organisational IQ

Although Hosomi (2011b) clarified part of the relation between intellectual capital and corporate performance based on the prior studies, an analysis of the indirect and elusive relation between intellectual capital and corporate performance, especially the relation between organisational capital and corporate performance, was attempted by using organisational IQ.[15]

Organisational IQ is the organisational capacity to structure corporate decision-making, which could be measured on a scale (Mendelson and Ziegler 1999). Mendelson and Ziegler (1999) summed up the following five factors of organisational IQ:

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[15] According to Mendelson and Ziegler (1999), organisational IQ is regarded as the organisational capacity to structure corporate decision-making which could be measured on a scale and was an indicator of an organisation's efficiency of collection and sharing information, decision-making, process of goal setting and implementation, creation of products and business, etc.

- External Information Awareness (EIA)

- Effective Decision Architecture (EDA)

- Internal Knowledge Dissemination (IKD)

- Organisational Focus (OF)

- Continuous Innovation (CI)

That is to say, the management cycle involves the following:

- Necessary information is obtained effectively and efficiently (EIA) →

- Policy is decided (EDA) →

- Information is shared (IKD) →

- Goal implementation is conducted (OF) →

- Continuous innovations (improvements) are made (CI) → return to EIA

According to Hirano (2008), each factor has a complementary position to one another in theory, as shown in Figure 7.

Figure 7: Relations of five factors of organisational IQ
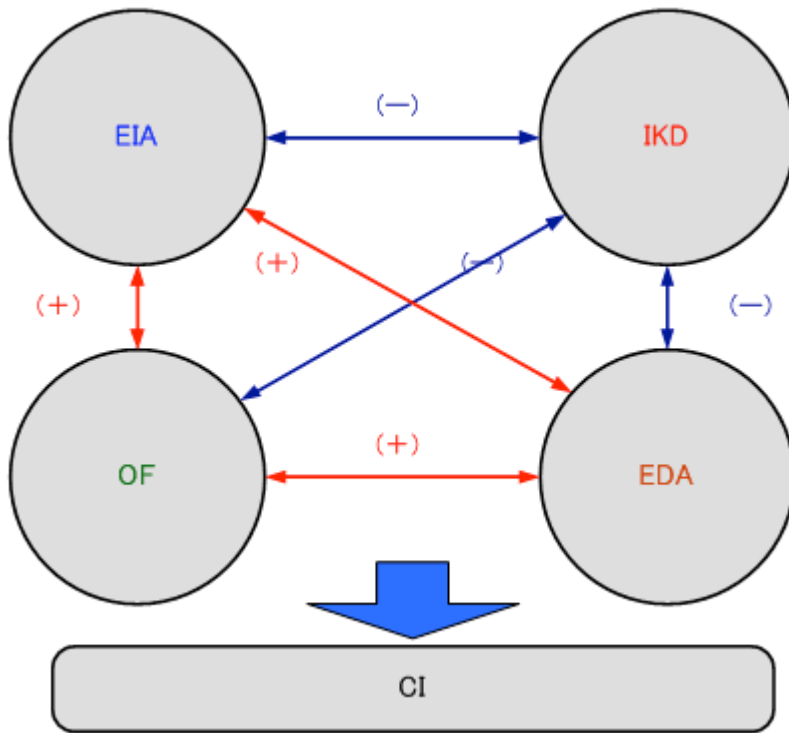
4.2 The analysis results on research hypotheses

The proposed model for objective performance was rejected in the chi-square test, but the CFI of .919 and the RMSEA of .066 show that our hypothesised model fits the data reasonably well. The proposed model for subjective performance was rejected in the chi-square test, but the CFI of .918 and the RMSEA of .069 show that our hypothesised model fits the data reasonably well.

The analysis results on research hypotheses showed that organisational IQ, like organisational capital, exerted a negative (not positive) impact on corporate performance, though not significant. On the other hand, it significantly exerted a substantial positive impact on innovation capital and relational capital (see Table 14).

The direct impact of organisational IQ on corporate performance was also analysed. The results of the analysis using objective performance showed that organisational IQ exerted a positive, though not significant, impact on corporate performance (standardised coefficient:

.285), while the results of the analysis using subjective performance showed that organisational IQ significantly exerted a moderately substantial positive impact on corporate performance (standardised coefficient: .468***).[16]

Figure 8 shows a direct impact of organisational IQ on subjective performance. It seems that the figures of goodness of fit show favourable values.[17] The standardised estimation of corporate performance based on organisational IQ was a somewhat large positive value of .468 at the 1% significant level. Therefore, organisational IQ significantly exerted a moderately substantial positive impact on corporate subjective performance. That is, it can be said that in subjective performance, corporate performance is significantly higher as the score of the organisation has a high organisational IQ.

Finally, we state limitations and our future task arising out of this study. Organisational IQ was analysed as the potential variable that took the place of the organisational capital. It seems necessary to conduct a review on the relation between organisational IQ and organisational capital. The questionnaire items concerning organisational IQ were decided based on prior studies. However, because the content has a substantial influence on the analysis result, further study may be needed. Also, the same index of corporate performance as the index of Hosomi (2011b) was used to conduct an analysis under the same conditions. Further study on this may be needed.

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[16] In the analysis of the influence that organisational IQ gives for directly objective performance, the proposed model yielded a chi-square of 54.478 with 32 degrees of freedom. The GFI of .937, the CFI of .887 and the RMSEA of .068 show that our hypothesised model fits the data reasonably well.

[17] The chi-square test showed a significant result for the model's goodness of fit as well, with GFI 0.941, CFI 0.968, and RMSEA 0.053, which may be favourable values for such goodness of fit.

Table 14: Analysis results on research hypotheses using organisational IQ

| Research hypothesis		Objective performance	Subjective performance
Items	Hypothetical pathways	Standardised coefficients	
H1-1	Organisational IQ→Corporate performance	-.374	.066
H1-2	Innovation Capital→Corporate performance	.690*	.335*
H1-3	Relational Capital→Corporate performance	.364	.032
H2-1	Human Capital→Organisational Capital	.636***	.633***
H2-2	Human Capital→Innovation Capital	.311**	.303**
H2-3	Human Capital→Relational Capital	.534***	.524***
H3-1	Organisational Capital→Innovation Capital	.573***	.559***
H3-2	Organisational Capital→Relational Capital	.640***	.623***
H4-1	Innovation Capital→Relational Capital	-.258	-.231

Note:All coefficients are estimated by maximum likelihood and computed with AMOS.

χ^2 (281) =469.591,GFI=.819,CFI=.919,RMSEA=.066(Objective performance)

χ^2 (304) =523.684,GFI=.806,CFI=.918,RMSEA=.069(Subjective performance)

p *<.1, p **<.05, p ***<.01.(two-tailed tests)

Figure 8: Direct impact of organisational IQ (subjective performance)
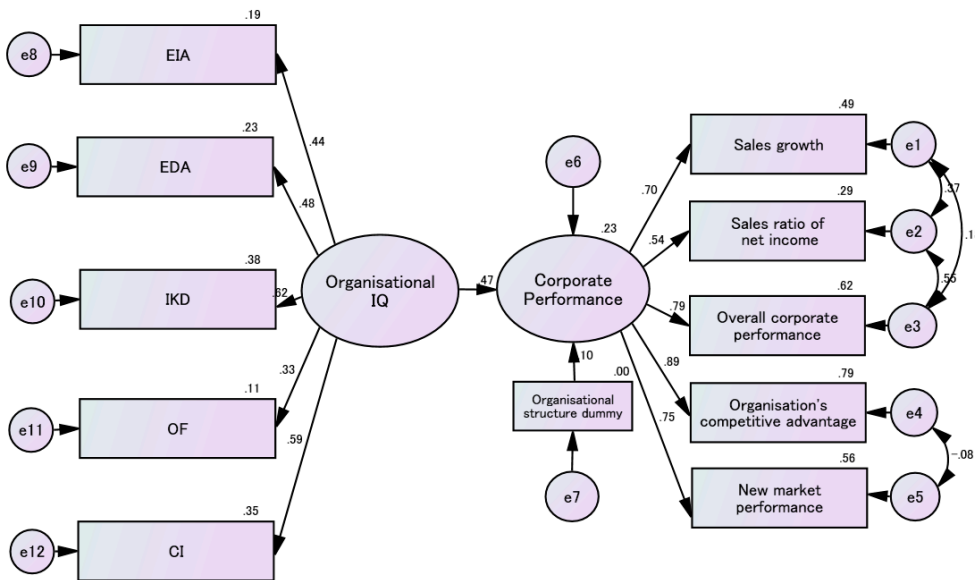
5. CONCLUSIONS

5.1 Our research findings

Study on analyses of value relevance

To see an overall trend of intangibles, we broke down the listed companies in Japan into two categories – high-tech industries and low-tech industries – and attempted an empirical analysis of the relation between intangibles and corporate value in the two types of industry.

First, the analysis results of two-sample t-tests on the two ratios showed that the two types of industry had different intangible characteristics. Second, when an analysis was conducted on the value relevance of accounting information using adjusted R-squares, the hypothesis of lower-value relevance of accounting information in high-tech industries was not supported. Third, the hypothesis of a more downward tendency of value relevance of accounting information in high-tech industries was partly supported.

Study through questionnaire surveys

According to the analysis results through online and mail-in questionnaire surveys, no direct relation was found between organisational capital and corporate performance. Accordingly, the effects of organisational capital will be reflected indirectly rather than directly on corporate performance, like those of human capital.

The analyses of online and mail-in surveys showed very similar results and these analysis results were also very similar to those of Tseng and Goo (2005), who conducted an analysis using a similar approach to the SEM.

Additional analysis in which corporate performance was replaced with subjective performance also showed results substantially similar to those of the analysis using objective performance.

Study using organisational IQ

The results of the study using organisational IQ (Hosomi 2011b), whose model was developed by Mendelson and Ziegler (1999), showed that organisational IQ, like organisational capital, exerted a non-positive, though not significant, impact on corporate performance. As such, also in a study using organisational IQ, the effects will be reflected indirectly rather than directly on corporate performance.

However, the analysis of organisational IQ's direct impact on corporate performance showed that organisational IQ significantly exerted a positive impact on subjective performance. This result suggests that there was a definite relationship between organisational capability and corporate performance, especially subjective performance.

5.2 Future research task on organisational capital

Although organisational capital is considered to be exerting a positive effect on corporate performance, at least indirectly, in light of our research findings, it has not yet been clearly shown how variations of corporate organisational activities, policy, and mechanisms such as organisational structure, business process, and decentralisation of decision-making authority (decentralisation of power), incentive systems, employment and training affect corporate performance.

Thus, a future research task is to clarify the constituent factors of organisational capital and the management of such factors. By clarifying the relation between the constituent factors of organisational capital and intellectual capital, ideal strategies for research and development, etc. as well as ideal personnel strategies may be obtained. In addition, such work may clarify key performance indicators for the management of intellectual capital.

Although such research is currently under way, due to the lack of prior studies on this issue, an appropriate methodology is being examined. For instance, in the related research fields of business management and economics, the enormous disparities in the performance between businesses and production sites were traditionally thought to have been caused by technologies that embodied patents or production equipment, but in recent years intangibles related to personnel and organisation have started to garner attention.

In regard to this, Bloom and Van Reenen (2007) called assets related to personnel and organisation 'management practices', and measured them by conducting an interview survey of companies on whether or not they are equipped with some particular items.[18] To sum up their analysis results, these measures of management practices were strongly associated with firm-level productivity, profitability, and Tobin's Q and survival rates.[19]

Miyagawa et al. (2011) conducted an analysis in light of the results of the research conducted by the workshop on intangible assets within the Japanese Ministry of Economy, Trade and Industry, based on Bloom and Van Reenen (2007). According to the report of Miyagawa et al. (2011), in view of the relation between the scores of human resources management and corporate added value, a positive relation was confirmed between them.

Also, based on Bloom and Van Reenen (2007) and Bloom and Van Reenen (2010), etc., Asaba (2011) examined the factors that enhance the formation of management practices by conducting an interview survey on organisational management and human resources management of 555 Japanese companies, though the number of such examples of the listed companies was small.[20]

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[18] Bloom and Van Reenen (2007) focused on some of the basic management practices and attempted to measure intangibles by scoring the merits and demerits. The basic management practices scored in their study had 18 items.

[19] In this study, cross-national research was also conducted, and data on management practices was gathered from 732 medium-sized firms in the US, the UK, France, and Germany for the analysis. In the cross-country comparison, management practices also displayed significant cross-country differences, with US firms being better managed than European firms on average. Also, this study showed that when the product market competition was weak and family-owned firms passed management control down to the eldest sons, the measures had a downward tendency.

[20] To sum up the analysis results of Asaba (2011), companies affected by foreign investors' holdings had high scores for management practices. Also, companies with greater competition, companies with large-scale business operations, and companies with a high growth rate had high scores for management practices. In contrast, companies

This research is in related specialised research fields, and is not directly related to the current research task. However, conceptually the intangibles which they consider are factors that create discrepancies in performance seen to practically correspond to organisational capital and human capital for this study.

From the viewpoints of traditional accounting practice, which places too much emphasis on the objective judgements (decision-making) of investors, the status of such invisible intangibles will not be well understood. Hence, in light of the viewpoints and analyses methods of other related research fields, the constituent factors of organisational capital and the management of such factors will be clarified going forward.

In addition, despite prudence in cross-national research, empirical clarification will be attempted on whether the constituent factors of organisational capital and the management of such factors vary from country to country (for example, comparison among the UK, Japan, and other countries) based on data from foreign companies.

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with a long history and companies managed by founders had low scores for management practices. In addition, when three potential factors behind the scores were extracted and the formative factor of each potential factor was analysed, the formative factor varied between the potential factors.

Acknowledgements

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Appendix: Questionnaire (mail-in survey)

QUESTIONNAIRE

• Basic questions
Please answer the following questions about you and your company.

A   What is your current section or job description? Please choose one and circle the appropriate number. (In case you choose '12. other', please describe the details in parentheses.)

1. business management   2. general affairs   3. personnel affairs   4. accounting   5. financial affairs   6. planning   7. purchase 8. production   9. sales   10. logistics 11. R & D   12. other (   )

B   What is your post (duty position)? Please choose one and circle the appropriate number. (In case you choose '5 other', please describe the details in parentheses.)

1. representative director   2. executive 3. managerial level   4. division chief level   5. other (   )

C   What is your firm's business category? Please choose one and check the appropriate blank.[21]

Fishery		Precision equipment	
Mining		Other manufacturing	
Construction		Trading	
Food		Retailing	
Textile		Commercial banking	
Pulp/Paper		Securities	
Chemistry		Insurance	
Pharmaceuticals		Other financial service	
Oil		Real estate	
Rubber		Railway/bus service	
Ceramic		Land transportation	
Steel		Marine transportation	

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[21] The business categories are based on Nikkei Secondary Classification Codes.

Nonferrous metal		Air transportation	
Machinery		Warehousing	
Electric equipment		Communication	
Shipbuilding		Electricity	
Automobile		Gas	
Transportation equipment		Other service	

D   How many regular employees does your firm have? Please choose one and circle the appropriate number.

1. less than 500   2. 500-1,000

3. 1,000-5, 000   4. 5,000-10,000

5. 10,000-15, 000   6. 15,000-20,000

7. more than 20,000

E   What is your firm's organisational structure? Please choose one and circle the appropriate number. In case you choose '4. other', please describe the details.

1.   functionalised organization   2.   divisional organisation by type of business/product

3. divisional organisation by region

4. other (Please describe the details.)

II Questionnaire items

(1) Questionnaire items regarding each factor of intellectual capital

Each factor of intellectual capital is described in the following items. Please read each description and circle the appropriate number on a scale of one to seven.

Human capital		least applicable			no opinion			most applicable
Q2-1	The employees are very skilful.	1	2	3	4	5	6	7
Q2-2	The employees are superior to those in other firms.	1	2	3	4	5	6	7
Q2-3	The employees are creative and sensible.	1	2	3	4	5	6	7
Q2-4	The employees are experts in a certain field.	1	2	3	4	5	6	7
Q2-5	The employees are creating new ideas and knowledge.	1	2	3	4	5	6	7
Relational capital		least applicable			no opinion			most applicable
Q2-6	The employees are excellent in collaborating to solve problems in the workplace.	1	2	3	4	5	6	7
Q2-7	The employees share information and learn from each other.	1	2	3	4	5	6	7
Q2-8	The employees exchange opinions and share ideas with others in other sections.	1	2	3	4	5	6	7
Q2-9	The employees cooperate with their customers, suppliers and the partner firm to solve business problems.	1	2	3	4	5	6	7
Q2-10	The employees apply knowledge from other sections to cope with business problems caused by a specific section.	1	2	3	4	5	6	7

Organisational capital

		least applicable			no opinion			most applicable
Q2-11	The employees apply patents or licenses to retain knowledge.	1	2	3	4	5	6	7
Q2-12	Most of the employees' knowledge is compiled in a manual or database.	1	2	3	4	5	6	7
Q2-13	Your organisational culture (e.g. concepts of values, ways of thinking, and behaviour patterns shared in a specific group) contains valuable ideas and business methods.	1	2	3	4	5	6	7
Q2-14	A great deal of knowledge and information is incorporated in your organisational structure, management system, and business process.	1	2	3	4	5	6	7

		far inferior to competitors			same level as competitors			far superior to competitors
Q2-15	How high is your organisational ability to create innovation ability with regard to commercialisation of the products/services launched by you in the last five years compared with such an ability of competitors?	1	2	3	4	5	6	7

Innovation capital			least applicable			no opinion			most applicable	
Incremental innovation ability	Q2-16	How high is your innovation ability to enhance the products and services already sold in the market?	1	2	3	4	5	6	7
	Q2-17	How high is your innovation ability to enhance expert knowledge of the products and services already sold in the market?	1	2	3	4	5	6	7
	Q2-18	How high is your innovation ability to increase the current competitive power?	1	2	3	4	5	6	7
Drastic innovation ability	Q2-19	How high is your drastic innovation ability to outdate the products and services already sold in the market?	1	2	3	4	5	6	7
	Q2-20	How high is your radical innovation ability to substantially change the products and services already sold in the market?	1	2	3	4	5	6	7
	Q2-21	How high is your radical innovation ability to outdate the current expert knowledge of the products and services already sold in market?	1	2	3	4	5	6	7

(2) Subjective performance (additional analysis)

The following items are related to corporate performance. What do you think of the status of your corporate performance in the last three years compared with the corporate performance of competitors? Please circle the appropriate number.

Items regarding corporate performance (corporate earnings)		the most inferior 20%	somewhat inferior 20%	same level 20%	somewhat predominant 20%	the most predominant 20%
Q4-1	Sales growth ratio	1	2	3	4	5
Q4-2	Net profit to sales ratio	1	2	3	4	5
Q4-3	Overall corporate performance	1	2	3	4	5
Q4-4	Competitive advantage of organisation	1	2	3	4	5
Q4-5	Acquisition rate of new market	1	2	3	4	5

(3) Questionnaire items regarding each factor of organisational IQ

The following items are related to organisational IQ. What do you think of the status of your organisational IQ? Please circle the appropriate number of either 1 (yes) or 2 (no). (For some items, please choose the appropriate number from 1 (yes), 2 (no), or 3 (no opinion), and circle it.)

Organisational IQ

			yes	no
① External Information Awareness	Q3-1	Your firm has applied analyses of your customers' feedbacks to develop your products and services in some cases.	yes 1	no 2
	Q3-2	Your firm has analysed the grounds of the disparities between your financial indicator and marking situation with those of other firms.	yes 1	no 2
	Q3-3	Your firm has a system to constantly analyse the external environment such as a trend of technology and laws and regulations compliance.	yes 1	no 2
	Q3-4	Your collaboration with other firms and universities has led to actual projects in some cases.	yes 1	no 2
	Q3-5	Your firm has a system to reflect opinions from other departments and clients when new products are developed, and such a system has been applied in some cases.	yes 1	no 2
② Effective Decision Architecture	Q3-6	On-site judgment in the front lines such as a store and a factory is prioritised for ordinary decision-making.	yes 1	no 2
	Q3-7	When the amount equivalent to about 10% of the department budget (or project) is to be modified during a business term, the head of the department (or the project leader) can substantially expedite decision-making.	yes 1	no 2
	Q3-8	When there is a report on defective goods, an executive or a higher-ranked person expedites decision-making to cope with it.	yes 1	no 2
	Q3-9	The criteria for judgment/reporting when a sales person receives an exceptional demand from a customer about a price, delivery date, etc. are clear and reviewed periodically.	yes 1	no 2
	Q3-10	When there is a new client who offers favourable terms about main raw materials, the decision on whether the current supplier should be changed is made within one month.	yes 1	no 2
③ Internal Knowledge Dissemination	Q3-11	The significant information on the achievements of the whole company/relevant section is released inside the firm (section) in real time.	yes 1	no 2
	Q3-12	Your firm has a system to promote communication with other sections or other teams.	yes 1	no 2
	Q3-13	The top priority is placed on communication skills for one of the evaluation criteria of the managerial personnel.	yes 1	no 2
	Q3-14	Your firm has a system to share knowledge on cases of successful marketing efforts, failures, complaints, etc., and such a system is being utilized.	yes 1	no 2
	Q3-15	Your firm periodically feeds back achievement information on quality, etc. to its main suppliers.	yes 1	no 2

			yes	no	no opinion
④ Organisational Focus	Q3-16	The first-line employees and the partner firm know the order of strategic priorities of the section and the whole company.	yes 1	no 2	no opinion 3
	Q3-17	The core competence of your firm is clear and well-known in the firm.	yes 1	no 2	no opinion 3
	Q3-18	Your firm has fewer lines of products and services per sales than competitors.	yes 1	no 2	no opinion 3
	Q3-19	Your firm has fewer suppliers per sales than competitors.	yes 1	no 2	no opinion 3
	Q3-20	Your firm has no project leader who is concurrently in charge of three or more projects.	yes 1		no 2
⑤ Continuous Innovation	Q3-21	Your firm has an organised environment to encourage its employees to create new things at all times.	yes 1	no 2	no opinion 3
	Q3-22	Your firm has explicit criteria for evaluating new ideas.	yes 1	no 2	no opinion 3
	Q3-23	Your firm has a specific time frame for creative activities.	yes 1		no 2
	Q3-24	Many of the employees are sharing the roadmap of the technical developments of main suppliers as a comprehensive package of benefits.	yes 1		no 2
	Q3-25	Your firm has a system to evaluate the discrepancy between the original purpose and the actual performance, and analyse/examine the grounds after completion of each project.	yes 1		no 2