



## Asia IT&C Project 22-32

An interactive web-based model for knowledge management and improvement of quality management system (QMS) in the field of adjusted CRM for SME

### ANINTELLECTUAL CAPITAL MEASUREMENT MODEL FOR THAI SMEs

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### Measurement of Intellectual Capital for Thai SMEs

#### Abstract

In the knowledge based economy, organisations are making every effort to accumulate their intellectual capital (IC) because their future prosperity tends to depend on IC instead of traditional physical assets. Therefore, they are willing to audit and measure IC and make it transparent to manage. Since intellectual capital is hard to measure using standard accounting practices a simple method of measurement is proposed.

This paper applied concept of the multiple criteria decision-making (MCDM) approach to measure intellectual capital of Thai SMEs. Ten companies were investigated

and measured at the strategic level because it is much easier for decision makes to make judgement, compare, and observe the impact of each IC component. The method of measurement is user friendly to facilitate self assessment. The results are used for improving IC and organisational performance in order to ensure for sustainable development.

#### Keywords:

intellectual capital, IC, multiple criteria decision making, MCDM, ICT, Thailand, SMEs

## 1. Introduction

Thailand with the vision towards knowledge based economy has transformed an importance of physical assets to highlights of intangible high value added products and services such as software development, designed products, scientific and financial consulting services. These intangible assets are defined as intellectual capital (IC).

Intellectual capital (IC) can be measured by deducting an organisation's book value (i.e. the value of physical assets reported by standard accounting practices) from market value (Phatak, 2003). That is the market values are the sum of financial capital (tangible capital) and intellectual one (intangible capital).

IC has long been silently resided in an organisation in the form of goodwill, brand names or trademarks. At present, many organisations are willing to measure IC in order to ensure their future competitiveness and to make it more transparent for value creation and management. In general, IC can be increased via human resources improvement, alignment of organisational structure, and strong support for closed networks and good relationships with stakeholders.



Many techniques have been employed to measure intangible assets such as relative value, balanced scorecard, competency models, subsystem performance, benchmarking, business worth, business process auditing, "knowledge bank", and brand equity valuation, for instance (Guthrie, 2001). Recently, some organisations in Thailand begin to measure their

business performance with balanced scorecard and benchmarking (Numsirikul, 2003).

Balanced scorecard adds three additional perspectives including customers, internal business processes, and learning/growth to traditional financial measurement. Benchmarking is employed to compare company's performance against that of the recognized leaders in order to leverage intellectual assets. These two techniques are relating to operational level whereas intellectual capital (IC) is measured an organisation's performance at the strategic level.

This paper proposed the measurement of intellectual capital (IC) of Thai SMEs based on 10 cases. The criteria for measurement were detected from literature reviews of the previous research. The results were compared and synthesised for potential improvement.

## 2. Background of the study: Intellectual Capital Measurement

Intellectual capital (IC) measurement has been developed by many organisations and researchers, initiating by Sveiby (1997) and Sullivan (2000). Skandia, a Swedish financial services company, is the first company to replace traditional financial in its annual report with IC value (Edvinsson & Malone (1997).

According to the Skandia model, IC consists of two main elements of human and structural capital.

Human capital combines knowledge, professional and social competence, capabilities, expertise, creativity, motivation, and leadership of organisations' staff. On the other hand, structure capital covers internal processes, infrastructure (e.g. information technology, management database) culture, patents, training programs, and organisational strategies that support its core competence (Edvinsson & Maloan, 1997).

Brooking (1996) proposed IC as an integration assets of human-centred assets, infrastructural assets (e.g. processes, methods, and technology), intellectual property assets (e.g. copyrights and patents) and market assets.

Roos and his colleagues (Roos, Roos, Edvinsson, & Dragonetti, 1998) presented the IC model with the components of human capital (e.g. intellect, skill, creativity, the way they work), organisational capital (e.g. system, IP, processes, databases, values, and culture), and relational capital. Relational capitals are assets derived from good relationships with suppliers, customers



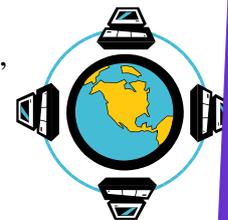
partners, networks, regulators and interrelating stakeholders. Among others, customer capital (e.g. customer relationships, loyalty) is the most vital asset (Luu, Wykes, & Williams, 2001). Sveiby (2001) proposed direct intellectual capital methods (DIC), market capitalization method (MCM), return on assets methods (RA) and scorecard methods (SC), number of times in training (days per year), and annual sales per customers.

Chen, Zhu and Xie (2003) design a measurement model and a qualitative index system of IC in order to provide a good tool for organisations to manage their IC. The study found that there is a significant relationship between the scores of the four IC elements (i.e. human capital, structural capital, innovation capital and customer capital) and its business performance.

According to this study, intellectual capital consists of human, structural and relational capital. The indicators for human capital are people competence, competence improvement, staff structure, improvement of capacity of persons and groups and innovation, and stability. Structure capital is divided into process technology and IT penetration, product technology, business philosophy, organisation structure, and intellectual property. Relational capital consists of customer base, customer loyalty, market proximity and marketing effectiveness, suppliers, and interrelation with other actors (Montequin, 2003).

### 3. Research Methodology and Design

This study employs interviews as methods of data collection. Ten case studies were used as a pilot project for IC measurement using the simple decision-making tool. This tool will be modified to an interactive web-based measurement tool. The case studies namely A, B,....and J are Thai SMEs. Their profiles and characteristic are presented in Table 1.

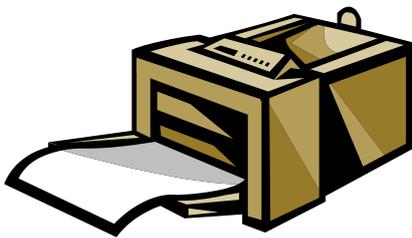


**Table 1: Organizational profiles**

Organizational Profile										
Names of companies	A	B	C	D	E	F	G	H	I	J
Website of your company (URL)	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes
Types of business	Software house	IT services	IT services	IT services	Computer embroider	Manufacturing	Service, advertisement	Construction	import-export	Food catering
Number of staff (Persons)	10-45	10-50	10-50	10-45	100-200	>200	<10	<10	<10	10-15
Registered Capital (million Baht)	10-50.	50	10	1-10	NA	150	1-10	5	1-10	1-10
Years in service	6	16	10	25	6	13	1-5	7	<1	6-10
Procedures for quality control of the company...	No	No	No	TQM	No	ISO	No	No	No	No

The ten Thai SMEs have some varieties in terms of business types, number of staff, registered capital and years in service. Most of them (70%) have developed their websites as web presence. Half of them (60%) provides services related to ICT (e.g. web technology, Internet service provider, ICT training, for instance). The other types of business are manufacturing advertisement, construction, import-export, and food catering. Numbers of staff are ranging from less than 10 persons up to 200 persons. Register capital is approximately 10 million Baht. They are in business around 6-10 years. However, some companies are continually being developed for a long time. Only 2 companies have certified for procedures for quality control.

Multiple criteria decision-making (MCDM) is applied as a tool for IC measurement. MCDM is an approach that takes explicit account of multiple, conflicting criteria in decision-making. It helps decision-makers understand a problematic situation, looks for appropriate alternatives, finds criteria to differentiate the alternatives and makes appropriate judgements leading to better decisions (Belton, 1990).



MCDM provides many advantages in the analysis and measurement of complex and difficult decisions especially, in the issues of technology performance and measurement. Decision-makers employ MCDM to evaluate and prioritise the proposed alternatives that can enhance achievement of business goals. For example, they are able to measure the level of IC by themselves and compare end results among organisations. Therefore, they may enhance their level of understanding and learning. Once the

best alternative is selected, it can be elaborated using other decision tools such as simulation software to detect factors that may enhance IC.

According to this study, the alternatives for IC measurement consist of ten SMEs. Their missions are quite similar, being “*a sustainable performance company*”. Therefore, each aims at optimizing its intellectual capital to fulfil the mission.

The IC was measured using the software application called V.I.S.A. (Visual Thinking, 1995). This software is based on a linear additive value model. It helps decision-makers to clarify various obscure and uncertain issues, evaluate specified alternatives, and fulfil a need for more sophisticated sensitivity analyses. The process of measurement is followed three fundamental stages: structuring the conceptual model, eliciting information and values, and measurement and sensitivity analysis.

### Step 1: Structuring the conceptual model

At this stage, decision-makers set an objective that they are willing to achieve, resolve or compare. Then, all alternatives are proposed for measurement under a set of certain criteria. The criteria are identified and structured into a tree form. High level criteria involve the main issues that are taken into account whenever an organisation measures its IC. On the other hand, low level criteria include specific issues detailed from the high level main criteria.

According to this study, high level criteria of (IC) are composed of human, structural and relational level criterion consists of many sub-criteria derived from and the results of the pre-test from the main project of this *interactive web-based model for knowledge management quality management system (QMS) in the field of adjusted*. This project is being conducted with the grants from Asia European Union.



intellectual capital. Each high literature reviews study, “*An and improvement of CRM for SME*”. IT&C Project, the

- Human capital is elaborated as *people competence, competence improvement, staff structure, and stability*.
- Structural capital consists of *process technology and IT penetration, business philosophy, organisation structure, and intellectual property*.
- Relational capital is composed of *customer base, customer loyalty, market proximity and marketing effectiveness, suppliers, and interrelation with other actors*.

All the criteria (high and low level) of IC are illustrated in Figure 1.

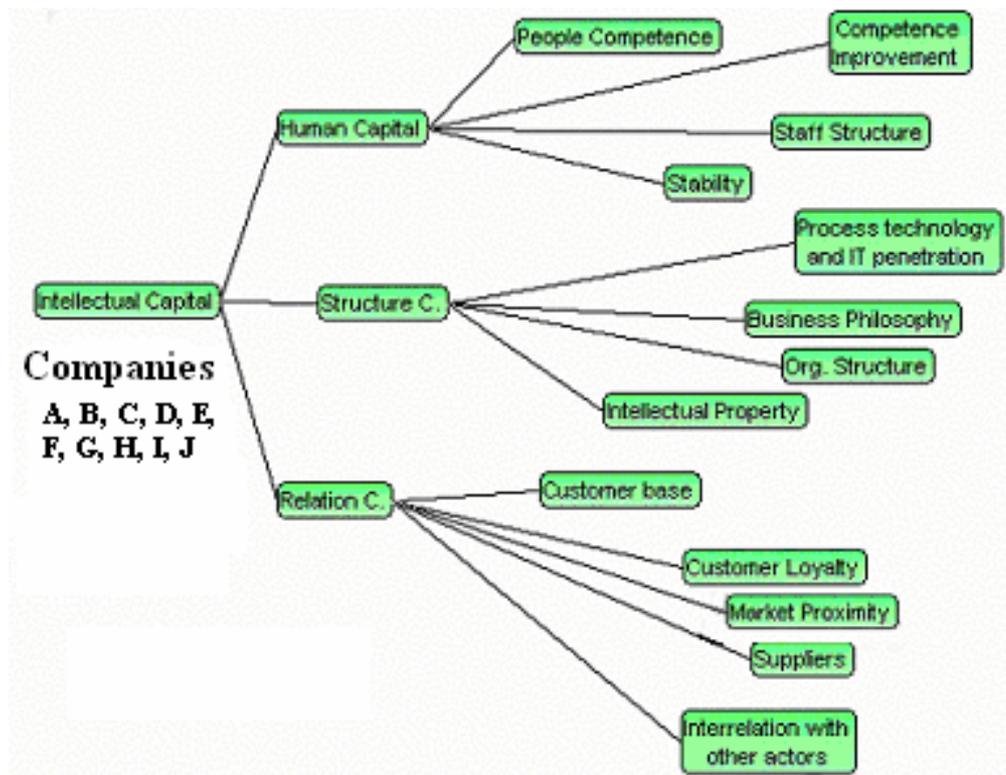


Figure 1: Criteria Hierarchy for Intellectual Capital Measurement

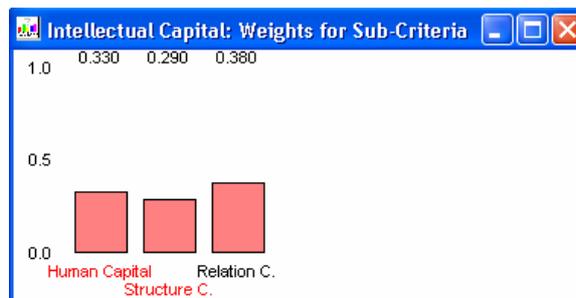
### Step 2: Eliciting Information and Values:

At this stage the “relative importance” of the specified criteria (i.e. weighting) and the performance of alternatives against the specified criteria (i.e. scoring) were determined. The respondents of the ten offices were interviewed to identify level of importance of each IC categories. The total weight is 1 (i.e. 100%) is allocated in order to indicate the level of importance of each criterion based on their perspectives and existing data. All the weights derived from each company were averaged as the group weight.

The weights of high level criteria consisting of human capital, structure capital, and relational capital were 0.33, 0.29, and 0.38, respectively. The details and value of main components are illustrated in Table 2 and Figure 2. That is, the respondents highlighted on the importance of relational capital as the most important component of IC.

**Table 2: The average weights of high and low level criteria for intellectual capital measurement**

Main Components	Average Level of Importance	Sub-components	Average Level of Importance
Human Capital (e.g. knowledge competence experience of employees)	0.33	People Competence	0.35
		Competence Improvement	0.24
		Staff Structure	0.2
		Stability	0.21
Structural Capital (e.g. work process, organizational structure, vision, mission)	0.29	Process Technology and IT Penetration	0.31
		Business Philosophy	0.23
		Organization Structure	0.27
		Intellectual Property	0.19
Relational Capital (e.g. relationship with customers, vendors, partners, banks, government agencies, and other actors)	0.38	Customer Base	0.26
		Customer Loyalty	0.19
		Market Proximity and Marketing Effectiveness	0.17
		Suppliers	0.21
		Interrelation with other Actors	0.17



**Figure 2: The weights of high level criteria for intellectual capital measurement**

The weights of low level criteria had been identified as the level of importance of the main components of IC. The details of values are illustrated in Table 2 and Figure 3.



**Figure 3: The weights of low level criteria for intellectual capital measurement**

After the weights of both high and low level criteria had been determined, all the alternatives were scored against the specified criteria. The scores were entered on a 0 to 100 scale, where a higher value represented a high performance outcome. For example, the criterion of “*employees who have sufficient competence to work*” of Company A was scored at 70 whereas that of Company C was assigned a score of 50. If more alternatives (i.e. organisations) are measured, they will be given scores based on the information, which reflects their actual performance.

**Table 3: Scores of IC sub-components of each company**

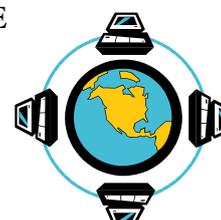
Intellectual Capital Components		Names of Companies									
Main components	Sub-components	A	B	C	D	E	F	G	H	I	J
Human Capital	People Competence	63	25	70	83	68	48	76	80	70	66
	Competence Improvement	42	45	60	60	63	38	84	60	82	50
	Staff Structure	52	55	66	73	63	48	88	74	86	74
	Stability	80	86	65	83	84	56	100	64	70	70
Structural Capital	Process Technology and IT Penetration	97	80	98	68	54	50	88	90	100	52
	Business Philosophy	73	98	66	63	23	58	80	72	83	47
	Organization Structure	73	100	100	0	60	40	90	60	47	60
	Intellectual Property	40	0	0	0	0	47	70	60	0	23
Relational Capital	Customer Base	80	43	47	35	3	60	88	50	70	50
	Customer Loyalty	90	57	33	68	53	58	78	54	55	64
	Market Proximity and Marketing Effectiveness	67	54	21	28	12	45	90	55	66	50
	Supplier	40	0	0	0	0	28	90	70	80	70
	Interrelation with other Actors	0	80	51	100	50	58	100	63	38	50

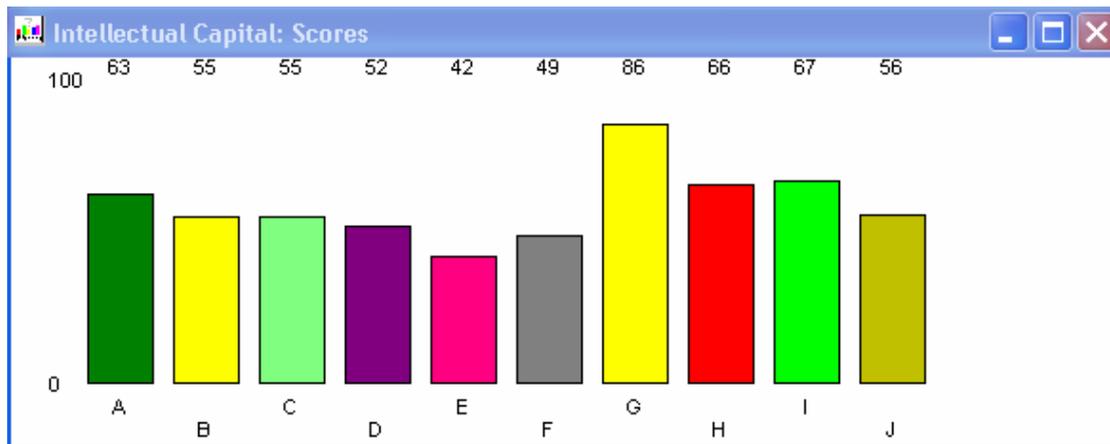
### Step 3: Measurement and sensitivity analysis

This stage aimed at measuring the final outcomes based on specified criteria. The V.I.S.A. software was employed to calculate the final weighted scores. The outcomes are synthesised and then investigated the impact of changing priorities and values.

## 4. Results and Discussion

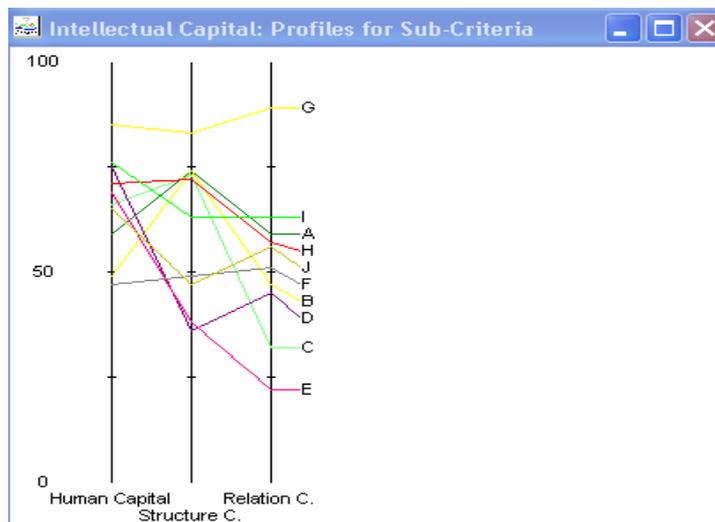
The ten companies identified a level of importance of high level criteria of IC components. The weights of human, structural, and relational capital were averaged as 0.33, 0.29 and 0.38, respectively. Since the weights of low level criteria are difference, the average weight was also calculated. The score of each criterion is identified by staff of each organisation based on its present performance. Finally, the final score of each office was calculated. According to Figure 2, intellectual capital of the ten companies, with a lowest score of Company E of 42 and the highest score of Company G, with a score of 86.





**Figure 2: Measurement of Intellectual Capital (IC) of the ten companies**

Kaset was judged superior to RIT in every criterion, especially human and relational capital. The profiles of IC measurement of the two offices are indicated in Figure 3. The results are greatly similar to those of intuitive perceptions of the respondents, almost all of whom considered that Kaset was superior to RIT.



**Figure 3. Profile of Intellectual Capital (IC) of the ten companies**

Both offices accept the end results of their existing levels of IC and are willing to increase them by scrutinizing the drawbacks of each IC component. They prefer to improve structural and customer capital to human capital in the future because it is difficult to recruit new staff and retain staff, who gains ICT professional competence in Thailand. Therefore, they are willing to set up well structured work practices and procedures (i.e. strategic plan, quality management systems, and business philosophy), and support innovation and intellectual property.

Relational capital especially customers is also being taken into account. Their customers and stakeholders have been neglected because both offices are monopolistic services providers. Therefore, if they concentrate on improving customer base, customer loyalty, marketing, suppliers, and interrelation with other actors, they can enhance their intellectual capital.



### IC Measurement of Each Company

Each company can measure intellectual capital based on their own data. Since each company weight the importance of IC components differently depending on industry, cultural value, and readiness of each company. The software allows each company for self evaluation without difficulties. The example of IC scores of the three companies are illustrated based on their data. Details are illustrated in Figure. The IC scores of companies F, H, I are 50, 67, and 69 respectively

#### Company F



#### Company H



## Company H



## 5. Conclusion

Intellectual capital (IC) is becoming the important issue for Thai economy. Thailand has introduced the concept of IC and promoted it as the most vital asset for sustainable development in the knowledge based economy. Since IC is intangible, there is a need for sufficient transparency in management and measurement.

The study applied the concept of the multiple criteria decision making (MCDM) to measure intellectual capital of ICT service offices in Thailand. The IC of the two case studies, (i.e. Kaset and RIT) was investigated and measured at the strategic level because it is much easier for decision makers to make judgement, and observe the impact of each criterion on IC. The measurement was designed based on decision support system concept. That is, it was a tool for self assessment, with user friendly functions, graphic, and sensitivity analysis. The two offices have used the end results to improve their levels of IC via the three main components of human, structural, and relational capital in order to increase their competitiveness and retain their sustainable development.

For the forthcoming study, the measurement tool will be customized to support self-evaluation of Thai SMEs (i.e. small and medium sized enterprises) via the web-based system, being available at (<http://pirun.ku.ac.th/~fsci/km4sme/>).

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