Measurement of Intellectual Capital of ICT Service Offices

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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 study applied concept of the multiple criteria decision-making (MCDM) approach to measure intellectual capital of ICT service offices in Thailand. Two case studies 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.

Caption describing picture or graphic.

Keywords:

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

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 the two ICT service offices of higher education institutes in Thailand. The criteria for measurement were detected from literature reviews of the previous research. The results were compared and synthesised for potential improvement.

The paper is organised into five sections. Section 2 presents the background of the study. Section 3 explains research methodology, research design, and measurement techniques. The main results are summarised and discussed in Section 4. Conclusions are presented in the final section.

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, infrastrutural assets (e.g. processes, methods, and technology), intellectural 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. Two case studies are 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 Kaset and RIT are both ICT service offices belong to two large universities in Thailand. The two offices have many things in common such as 40-50 members of staff and types of provided services (e.g. web technology, Internet service provider, ICT training, for instance). However, ICT at Kaset are continually being developed for a long time whereas Kaset is relatively superior to RIT in terms of budgeting support, human resources development, and well structured organisation.

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 two ICT service offices: Kaset and RIT. The missions of both offices are quite similar, being *"the best ICT service offices with sustainable performance"*. 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 intellectual capital (IC) are composed of human, structural and relational capital. Each high level criterion consists of many sub-criteria derived from literature reviews and the results of the pre-test from the main project of this study, *"An interactive web-based model for knowledge management and improvement of quality management system (QMS) in the field of adjusted CRM for SME"*. This project is being conducted with the grants from Asia IT&C Project, the European Union.

- 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.

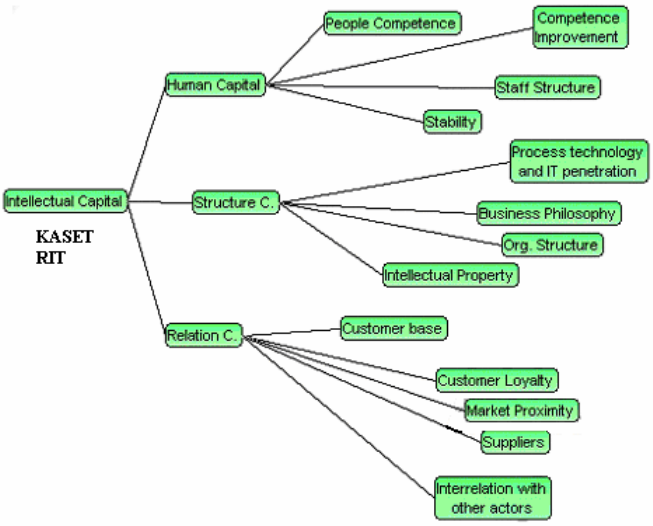

Figure 1: Criteria Hierarchy for Intellectual Capital Measurement

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, both executives and staff, of the two 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 office were averaged as the group weight.

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 Kaset was scored at 80 whereas that of RIT was assigned a score of 60. If more alternatives (i.e. organisations) are measured, they will be given scores based on the information, which reflects their actual performance.

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

Both Kaset and RIT similarly identified a level of importance of high level criteria of IC components. The weights of human, structural, and relational capital were specified as .500, .300 and .200, respectively. Since the weights of low level criteria are difference, the average weight was 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 Kaset, with a score of 65, is higher than that of RIT, with a score of 60.

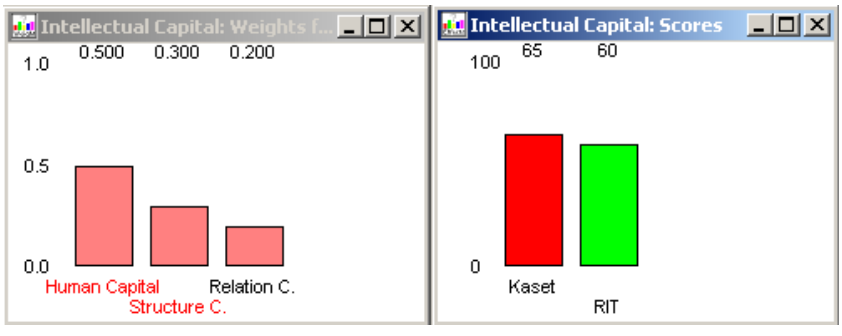

Figure 2: Measurement of Intellectual Capital (IC) of the Two Organisations (Kaset and

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.

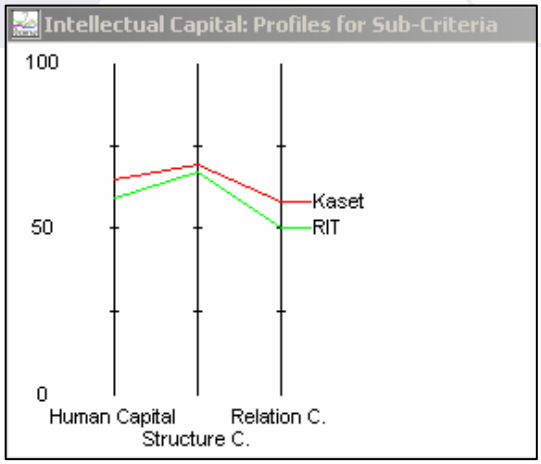

Figure 3. Profile of Intellectual Capital (IC) of the Two Offices (Kaset and RIT)

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.

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 makes 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/~fsciang/km4sme/).

References

Belton, V. (1990). *Multiple criteria decision analysis- Practically the only way to choose*. Birmingham: Working paper 90/10.

Brooking, A. (1996). Intellectual capital: Current issues and policy implications. *Journal of Intellectual Capital, 1* (4).

Chen, J., Zhu, Z., & Xie, H.Y. (2004). Measuring intellectual capital: a new model and empirical study. *Journal of Intellectual Capital, 5*(1), 195-212.

Edvinsson, L. and Malone, M.S. (1997). Intellectual capital: Realizing your company's true value by finding its hidden brainpower. Harper- Collins Publishers: New York.

Guthrie, J. (2001). The management, measurement and the reporting of intellectual capital. *Journal of Intellectual capital, 2*(1), 27-41.

Luu, N. Wykes, J. & Williams, P. (2001). *Invisible value: The case for measuring and reporting intellectual capital.* Department of Industry, Science & Resources, Commonwealth of Australia: Canberra, ACT

Montequin, V.R. (2003). *Intellectual capital measurement: A review.* Asia IT&C Project 22-32. University of Oviedo, Spain.

Numsirikul, K. (2003). *Balanced scorecard and management cockpit.* Chulalongkorn University, Thailand.

Phatak, A. (2003). Intellectual capital in small teams: Towards a methodology for capturing intangible sssets. *CSIRO Mathematical and Information Sciences.* Report No. CMIS 03/81

Roos, J., Roos, G., Edvinsson, L., & Dragonetti, N.C. (1998). *Intellectual capital. Navigating in the new business landscape.* New York University Press: New York.

Sullivan, P.H. (2000). *Value-driven intellectual capital: How to convert intangible corporate assets into market value.* John Wiley & Sons: New York.

Sveiby, K.E. (1997). *The new organisational wealth: Managing & measuring knowledge-based assets.* Berrett-Koehler Publishers: San Francisco.

Sveiby, K.E. (2001). *Methods for measuring intangible assets [Online]*. Available: http://www.sveiby.com/articles/IntangibleMethods.htm [2004, January 2].

Visual Thinking. (1995). *V.I.S.A. for Windows: User Guide*. Glasgow. UK: Visual Thinking International Limited.