Measuring The ICT Maturity Of SMEs

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ABSTRACT:

This paper introduces a model for measuring ICT (Information Communication Technology) maturity of SMEs (Small and Medium Enterprises). It is based on 4 main factors: Infrastructure, Application, Human Resource and ICT Policy. The ICT maturity of an enterprise is a solid foundation for successful implementation of knowledge management. Based on trend analysis, this paper proposed a 5-stage road-map of ICT development in SME: Inactive, Basic, Substantial, Web-based and Knowledge-oriented. In which, Knowledge-oriented is the highest development stage. Besides, this paper also built up a questionnaire for measuring ICT maturity of SMEs, and used it in practice for some Vietnamese SMEs. This tool will be very helpful for SMEs to know about their current situation, which could be the first step for them to make a plan for improving their ICT maturity. This could help them to strengthen their competitive capability and lead to effective management of knowledge resource for their development in the age of knowledge.

Keywords: *ICT Maturity, SMEs, Measurement, Indicators, IT, Knowledge Management, Knowledge-Oriented, KMS*

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1. Introduction

In modern organizations, knowledge is one of key successful factors. Especially in the era of information and knowledge, if any organization manages its knowledge resource effectively, it will have competitive advantages ensuring the firmly development. However, the most important thing in knowledge management is knowledge sharing, which depends mostly on the development of ICT.

According to research about the impact of Organizational Context and Information Technology on employee Knowledge-Sharing Capabilities (Kim & Lee, 2006), by analyzing data from five public sector and five private sector organizations in South Korea, five most elements: Social networks, centralization, performance-based reward systems, employee usage of IT applications, and user-friendly IT systems were found to significantly affect employee knowledge-sharing capabilities in the organizations. This determined the important role of ICT use, ICT applications and the appropriate policies inside an organization, which can be called the maturity of ICT.

Moreover, with the fast development of ICT, e-commerce, and globalization, small and medium enterprises (SMEs), which are the most majority and flexibility in the business world, become more and more important. Their operations are responsible for generating more than 50% of the GDP of the whole world. Different from the large enterprises, SMEs are faster, easier to change and adapt in accordance with market demand and economic pressures.

The fast development of technology will also support SMEs to become the main factor for innovation in the economy. In fact, there are some SMEs, who could compete strongly with the large ones in the digital world nowadays based on their knowledge and innovation capability.

However, in comparison with large enterprises most of SMEs do not have enough sources for investing and developing ICT in their enterprises. Moreover, they do not know what kind of ICT system is suitable for them and how to apply ICT to improve their businesses. Can they implement modern information system such as Knowledge Management System right now? Most of those questions require that they should know about their current state of ICT use in doing business. Only

when knowing their current situation, they could decide what kind of ICT systems to use, how and when to implement those systems as well as how to improve their ICT maturity for better performance.

In the trend of globalization, a right tool for measuring ICT maturity is more and more important. Knowing current situation, integrating appropriate ICT applications with business processes at the right time, SMEs could improve their competitive capability and develop their innovation capability for knowledge creating and sharing, which are very important to compete and survive in the knowledge society.

In order to address those problems, firstly, the ICT development trends should be considered from many viewpoints and a model for measuring ICT maturity would be proposed. Secondly, a detailed development road-map of ICT use in SMEs would be built and features for each stage would be clarified based on above trends. Thirdly, indicators for measuring the ICT development of enterprises should be revised. With those results, an aggregation function for computing ICT maturity is considered, then, a tool for measuring ICT maturity is made and suggestions for improving ICT maturity are given. Finally, a practical use of this tool to measure ICT maturity of some Vietnamese SMEs would be taken place as a demonstration.

2. Literature Review And Model For Measuring ICT Maturity

2.1. Development Trend Of ICT Use

The following section summarized previous results about ICT trends in order to know about the affects of ICT to the development of our society as well as enterprises.

According to a report of Australia Government (Australian Communications & Media Authority, 2008) about ICT development trend, there are top six trends as follows:

TREND 1: An accelerating pace of change in ICT.

TREND 2: Diversity in the development of physical infrastructure.

TREND 3: Continuing spread of distributed connectivity.

TREND 4: Enhanced content and network management capabilities.

TREND 5: The emerging social web.

TREND 6: Continuing scientific and technological innovation.

However, above trends cover most of development trends of ICT use in general only. By collecting recent forecasts from other books, studies, some other features of the ICT development trend in business management are shown below:

- Increase in knowledge related works and knowledge workers (Drucker, 1999).
- Change in kind of products/ services and ways of doing business in the digital age (Rifkin, 2000).
- SOA – Service Oriented Architecture (Krafzig et al, 2004).
- Globalization and outsourcing make the economy more flexible, mobility and flatter (Friedman, 2005).

Besides, from a previous study of Europe (Chesser & Skok, 2000), a road-map for ICT development was suggested with 4 steps of ICT development in SMEs as follow:

- Inactive - no current use of ICT in company.
- Basic - including word processing and other desktop packages.
- Substantial - extending into the networking of PCs and several applications.
- Sophisticated - involving the integration of applications and exploiting ICT to achieve service differentiation.

Moreover, the third wave of human socio-economic development is described in the book "The Fifth Generation Management" (Savage, 1996) as the Age of Knowledge. The first wave was the Agricultural Age with wealth defined as ownership of land. In the second wave, the Industrial Age, wealth was based on ownership of Capital, i.e. factories. In the Knowledge Age, wealth is based upon the ownership of knowledge and the ability to use that knowledge to create or improve goods and services.

According to the KM Maturity Model (Kochikar, 2000), there are 5 levels of maturity in an organization toward Knowledge Management (KM):

i. Default: Complete dependence on individual skills and abilities.

ii. Reactive: Perform tasks constituting basic business repeatable.

iii. Aware: Restricted ability for data-driven decision making; restricted ability to leverage internal expertise; ability to manage virtual teams well.

iv. Convinced: Quantitative decision making for strategic and operational applications; high ability to leverage internal/external sources of expertise; realizes measurable productivity benefits through knowledge sharing; ability to sense and respond to changes in technology/business environment.

v. Sharing: Ability to manage organizational competence quantitatively; strong ROI-driven decision making; streamlined process for leverage new ideas for business advantage; flexible for change in technology/business environment.

In the Knowledge Age, there is a great chance for SMEs to 'do big' and big enterprises to 'do small'. The economy will become very flexible and mutual related. The ICT developments must aim to maximize the capability in connecting, integrating, mobility, and innovative of individuals, organizations and governments.

2.2. Definition And Model For ICT Maturity Of SMEs

There is no clear definition of "SMEs", as well as "ICT maturity", so the following definitions will make these concepts clearer in this paper context.

SMEs or small and medium sized enterprises could be defined differently in many countries, but in this context, we use a simple definition, which based on the definition of European Commission - 'SMEs are enterprises with less than 250 employees'. This definition makes SMEs be the most majority of world economy.

ICT maturity of SME: Originally, 'maturity' is the state of being mature or full development, 'ICT' stands for Information Communication Technology, so 'ICT maturity of SME' is the state of an SME, in which it reaches fully development state in applying Information Communication Technology in doing its business.

In general, to measure ICT maturity in business, some elements related to MIS (management information system) is often considered, such as: hardware, software, data, process, human,

network… Besides, the ICT policy also plays important role in developing the ICT use in business. The benefits of MIS should be measured by its contribution to business activities from operating level to top level of management. Moreover, the ICT maturity of SME is also affected by the outside environment, which includes Government, Consumer, Supplier and Competitor.

So, in order to know about the current use of ICT in an SME, the information about above elements should be collected. To simplify the data collection process as well as to understand the ICT maturity of an SME through above elements, the following model is proposed to measure ICT maturity of SME, in which four main ICT factors inside an enterprise are: ICT Policy, ICT Infrastructure (hardware, network), ICT Application (software, data, process), and ICT Human Resource.

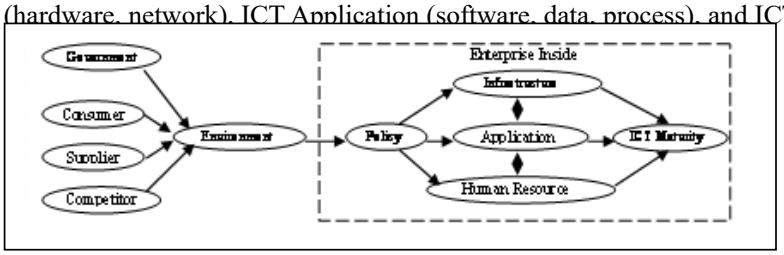

Figure 1: Model For ICT Maturity In Business

- Policy: written/unwritten rules, regulars, procedures, ways of doing business in an enterprise, which show the recognition, intention, determination of company leaders and staff to apply ICT in maximizing their business efficiency. This factor effects on all other factors of ICT use in business.

- Infrastructure: ICT devices and services, such as: server, PC, laptop, mobile, telephone, fax, network, internet, LAN, WAN… which help the SME in storing, processing, communicating and searching information. This is the basic for all other ICT applications in an enterprise.

- Application: application softwares which change the processes and ways of doing business. Some popular applications are Management information system, Decision support system, intranet, extranet, e-commerce, knowledge base system, social network services… ICT Application has mutual-relation with both ICT Infrastructure and Human Resource.

- Human Resource: one of the most important factors of ICT use in enterprise, which includes: staff literacy, ICT skills, innovation skills, IT experts, IT leaders, ICT training, R&D activities…

Although each of above factors has different effects on ICT maturity of an SME, they all show one or some aspects of the ICT development in business. So, they should be considered carefully for measuring their contribution to the ICT maturity of an SME. The development trend of above dimensions could be summarized as follow:

- ICT Policy: In SMEs, there is the change from an old hierarchy business model to a more flexible and mobility one.

- ICT Infrastructure: this dimension is easy to measure because of its visibility. The change in hardware is also happened in a fast speed. The development trend of ICT infrastructure in SMEs is shown by the increase in connectivity and mobility day by day.

- ICT Application: the trend for ICT application in SMEs is the integration all of their information systems and business models to create e-business.

- ICT Human Resource: this is the most important factor in ICT maturity. The development of human resource is shown in the sophisticate level of their skills as well as the innovation capability of SMEs.

2.3. Overview Of Indicators For ICT Maturity

In order to create a list of indicators for measuring ICT maturity in SMEs, more details should be added to above model. Each dimension in 4 main factors could be measured by many aspects which shown their trend of development. The main purpose is that these indicators should be easy to get information as well as exactly shown the ICT maturity of an SME. Firstly, this research collects indicators from previous measurements and then reorganized them according to above model. Secondly, discussing with experts in Business, Information Technology to make adjustments and add more indicators so that ensuring the above purposes.

There are many measurements related to ICT development of a nation or enterprise, with various viewpoints. The following measurements will be considered for building a list of indicators for measuring ICT maturity of SMEs:

- ICT Opportunity Index (ICT-OI - International Telecommunication Union, 2007)
- Knowledge Innovation and Knowledge Economy Index (KI/KEI - World Bank Institution, 2007)
- Digital Opportunity Index (DOI - International Telecommunication Union, 2007)
- Network Readiness Index (NRI - World Economy Forum, 2007)
- E-Readiness (Economist Intelligence Unit – Economist & IBM Institute for Business Value, 2007)
- Vietnam ICT Index (VN-ICTI - Vietnam Association for Information Processing, 2006)

In general, this comparison tells us that those measurements pay more attention to outside environment rather than to inside factors of an enterprise. Some new trends, such as: mobility, innovation, social services... are not included. Moreover, most measurements lack of detail information about ICT use in business, such as: software applications, business intelligence, e-business activities.

Table 1: Advantages And Disadvantages Of Previous Measurement

Measurement (From year)	Advantages	Disadvantages
ICT-OI (2005)	- Focus on ICT infrastructure and ICT HR - Easy to get the information from public statistic.	- No indicator for application and policy - Most indicators are at national level
KEI (1995)	- Measure knowledge use for development. - Measuring Innovation factors, which is important of modern organizations.	- Lack of information about ICT application. - Technology related indicators for e-commerce is not included.
DOI (2003)	- Main focus is: Opportunity, Infrastructure, and Utilization - Easy to get the information from public	- Indicators for ICT application are not enough. - Most indicators are used for measuring at national level.
NRI (2002)	- Measure the preparation of a country to use and get benefit from ICT development - Many indicators for measuring the ICT maturity of Government, Business and Individual.	- It is appropriate for national level measuring than business level. - Most business related indicators are just measuring ICT Environment.
e-Readiness (2003)	- Most indicators of ICT infrastructure, HR. - Measure ICT infrastructure and its benefits for Government, Individual and Business.	- No indicator for ICT application. - Some indicators are hard to get information.
VN-ICTI (2005)	- Measure ICT development of government sector - Some detailed indicators for measuring ICT application.	- Lack of indicators related to new trends of ICT use in business. - Lack of indicators for HR and R&D activities.

3. Road-Map For ICT Development In SMEs

So, from above trends, there could be a strong belief that ICT development should gradually turn an SME to a knowledge-oriented enterprise, in which, knowledge workers and knowledge works will be very important. The 4-stage road-map of previous research is good for classifying SMEs based on their ICT development, but it is not enough to show the new trends of ICT use in business toward a knowledge-oriented enterprise. So, the 4th stage should be further divided to keep up with the vast change of business environment and ICT use in SMEs recently.

Nowadays, two main forces that mostly effect to SMEs are:

- E-commerce: rapidly development of Internet and ICT use, not only in hardware but also in software, especially web-based services, makes e-commerce become very popular in doing business. The more and more increasing revenue of B2B and B2C businesses proved the importance of web technologies in creating strategic advantages for SMEs. With the development of web 2.0 and its applications in business, various web services become important tools for advertising, marketing, trading, broadcasting, sharing knowledge and building virtual social networks. This force would lead to the so-called 'web-based enterprises'.

- Globalization: followed the above force, globalization freed human resource, opened chances for labor to work all over the world. Knowledge workers and knowledge works will increase in the age of knowledge, so they will become a main source for innovation and development. The need for keeping intellectual capital is very important for maintaining the sustainable development of any enterprise. The development of ICT use in organizations helps SMEs to be able to concentrate on their intellectual capital and enables them for effective knowledge management. This force would lead to the so-called 'knowledge-oriented enterprises'.

Based on above classification (Chesser & Skok, 2000) of ICT development in SMEs, with consideration of recent development trends as well as conditions for knowledge management maturity, the 'Sophisticated' phase is suggested to be divided into 2 stages: Web-based and Knowledge-oriented. With this suggestion, Web-based is ready for Level 3 (Aware) and Knowledge-oriented is ready for Level 4, 5 (Convinced, Sharing) of Kochikar's KM maturity model. Finally, the 5-stage road-map of ICT development includes:

- Inactive – no current use of ICT in company
- Basic – including word processing and other desktop packages
- Substantial – extending into the networking of PCs and several applications
- Web-based – extending to e-commerce with many web-based services
- Knowledge-oriented – integration of applications and using ICT tools for innovation and knowledge management.

Each of maturity levels is characterized by certain observable capabilities of 4 major factors: Policy, Infrastructure, Application and Human Resource. Based on trend analysis of ICT use in SMEs, the following table maps above 5 stages of ICT maturity in SMEs with its specific features:

Table 2: ICT Maturity Stages And Its Features

	Maturity level	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
	Development Trend	**Inactive**	**Basic**	**Substantial**	**Web based**	**Knowledge oriented**
Infrastructure	Connectivity & Mobility	Telephone	PC, laptop	Network	Internet	Wireless
ICT HR	Sophisticated & Innovation	Unskilled	Business skills	Technology skills	MIS skills	Learning skills
Application	Integrated applications	No application	Office, E-mail	MIS applications	E-commerce	E-business
Policy	Flexibility & Mobility	No policy	Standardize	Modernize	Cooperation	Outsourcing

Certainly, above 5 stages do not exclude, but include each other. Any SME must pass through this road-map on the way to be fully maturity in ICT. So, the ICT maturity of an SME could be known based on getting information about its ICT use according to 4 main factors and comparing with above classification.

4. Indicators Of Knowledge-oriented ICT Development

After considering all of related factors of other previous measurements, a collection of suitable indicators is made for measuring ICT maturity of an enterprise, which mostly based on: ICT Infrastructure, ICT Human Resource, ICT Application and ICT Policy. However, adjustments should be made and new indicators should be added to create the final list of indicators. Moreover, indicators must ensure the accuracy of the measurement as well as be simple enough to get information from SMEs.

The final list of indicators of Knowledge-oriented ICT development includes most of common indicators of previous measurement. Some indicators were omitted because of some reasons, such as: not suitable for this measurement, measure some outside aspects of an enterprise, be easily derived from other indicators, not existing in SME context… Some new indicators have also been added (+) in order to show the new trends of each dimension, such as: mobility, integration, flexibility and innovation. Moreover, column 'Stage' tries to combine indicators with development stages: 1-Inactive; 2-Basic, 3-Substantial, 4-Web-based, 5-Knowledge-oriented.

Table 3: Indicators Of Knowledge-Oriented ICT Development

	Indicators	ICT -OI	KEI	DOI	NRI	e-Readi -ness	VN-ICTI	New	Stage
ICT Infrastructure	Fixed telephone	x	x	x	x				2
	Mobile devices	x		x	x				5
	Number of computers	x	x	x	x	x	x		2
	Type of Internet access	x		x	x	x			4
	Local area network						x		3
	Internet bandwidth	x			x				4
	Secure Internet Server/ Hosting				x	x	x		4
	Security & backup system						x		4
	Wide area network (WAN, GAN)							+	3
	Wireless LAN/ wifi							+	5
	Wap/ i-mode access							+	5
ICT Application	Standard application software						x		2
	Internet use for getting information						x		4
	Website						x		4
	Services for which Internet is used				x		x		4
	E-Marketing				x				5
	Online payment system							+	4
	Security system for e-Commerce							+	4
	E-mail/ IM for communicating							+	2
	Social Network for cooperate							+	5
	Remote Meeting/Voice Conference							+	5
	Intranet/ Extranet							+	3
	Management Information Systems							+	3
	SCM/ ERP/ CRM							+	3
	Business Intelligent/Knowledge Base							+	5

Human resource	ICT training	x			x		x		3
	Share of employee using a computer	x					x		2
	Share of employee using the Internet	x		x			x		4
	Royalty payment & receipt		x			x			5
	Patent application		x		x				5
	Company spending on R&D				x	x			5
	Capacity for innovation				x				5
	IT specified employee						x		3
	IT department / CIO						x		4
	Business specified employee							+	2
	Knowledge exchange programs							+	5
	Expertise Reuse							+	5
ICT Policy	ICT investment				x	x	x		3
	Quality policy						x		2
	Privacy policy						x		4
	Regulatory quality		x		x	x			2
	Security policy							+	4
	Piracy policy							+	5
	IT expert recruitment/ training							+	5
	Upgrade ICT hardware/ software							+	3
	Assessment effectiveness							+	5
	ICT use for KM is a priority							+	5

5. ICT Maturity Index

5.1. Tool For Measuring ICT Maturity

In order to measure ICT maturity of SMEs, a questionnaire is designed based on above indicators (see Appendix). This survey will be taken place both online and offline. Each questionnaire will be used to collect information from leaders, top IT managers (CIO) of each company. The ICT maturity index (ICTMI) of that company will be calculated based on the following function:

$$ICTMI = \alpha I + \beta A + \gamma H + \theta P \qquad (0 \le I, A, H, P, ICTMI \le 1,\ \alpha + \beta + \gamma + \theta = 1) \tag{1}$$

with $I = \frac{\sum_{l=1}^{4}\left(\frac{\sum_{k=1}^{n_l} I_{lk}}{n_l}\right)}{4}$, $A = \frac{\sum_{l=1}^{4}\left(\frac{\sum_{k=1}^{m_l} A_{lk}}{m_l}\right)}{4}$, $H = \frac{\sum_{l=1}^{4}\left(\frac{\sum_{k=1}^{p_l} H_{lk}}{p_l}\right)}{4}$, $P = \frac{\sum_{l=1}^{4}\left(\frac{\sum_{k=1}^{q_l} P_{lk}}{q_l}\right)}{4}$

(I_{lk}, A_{lk}, H_{lk}, P_{lk}: indicators of stage l ; n_l, m_l, p_l, q_l: number of respective indicators of stage l)

Because of no information for weighting of I, A, H, P, let $\alpha = \beta = \gamma = \theta = \frac{1}{4}$. After getting more results, more appropriate coefficients will be chosen for a better index. The result of ICTMI could be attached to 5 stages of ICT development road-map as follow: 0-1/5: Inactive; 1/5-2/5: Basic; 2/5-3/5: Substantial; 3/5-4/5: Web-based; 4/5-1: Knowledge–oriented. All of above indicators will be quantized to be from 0 to 1 by some means, such as: percentage, range, frequency… This tool can also be used for evaluating and comparing the ICT maturity of each field of business, each province, each country and each region all over the world.

5.2. How To Improve ICT Maturity Index Of An SME

In order to change from this stage to next stage, the enterprise should improve its 4 elements (ICT infrastructure, ICT human resource, ICT application and ICT policy). However, from figure 1, we know that ICT policy affects to all other factors of ICT use in SMEs, so ICT policy should be

considered firstly in improving the ICT maturity of an SME. Because of correlation of 3 remain factors, ICT infrastructure, ICT application, and ICT human resource should be improved simultaneously. Obviously, SMEs should have a suitable policy for improving the ICT use depend on their budget and business strategy. However, at each ICT maturity level, the SME should invest more on each different aspect of ICT use, for example: ICT infrastructure is important for Inactive to Basic, ICT Application is important for Basic to Substantial, ICT policy is more important for Substantial to Web-based and Human Resource is very important for Web-based to Knowledge-oriented.

This tool could be used to show the ICT maturity of SMEs and give them primary guidance for improving their ICT maturity toward knowledge oriented one. When SMEs reach to web-based or knowledge-oriented stage, it is the right time for them to concentrate on their knowledge system. Even at the knowledge-oriented stage, they should continue to improve their knowledge system and innovation capabilities because knowledge is endless and innovation is developing.

6. Survey Results

A practical survey is conducted to test this tool for measuring the ICT maturity of SMEs in Ho Chi Minh city, Vietnam.

The survey took place from December 2008 to February 2009. The sample is 150 enterprises located in HCM city, from both public and private sector. The valid response rate is about 57.3% (86 enterprises).

The following tables and charts illustrate the ICT maturity of SMEs in Vietnam through this survey.

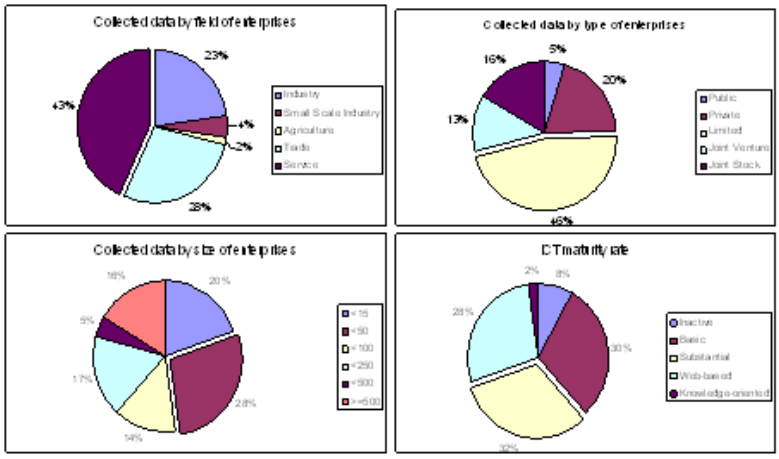

Figure 2: Statistics Of Collected Data By Field, Type, Size And ICT Maturity Of Enterprises

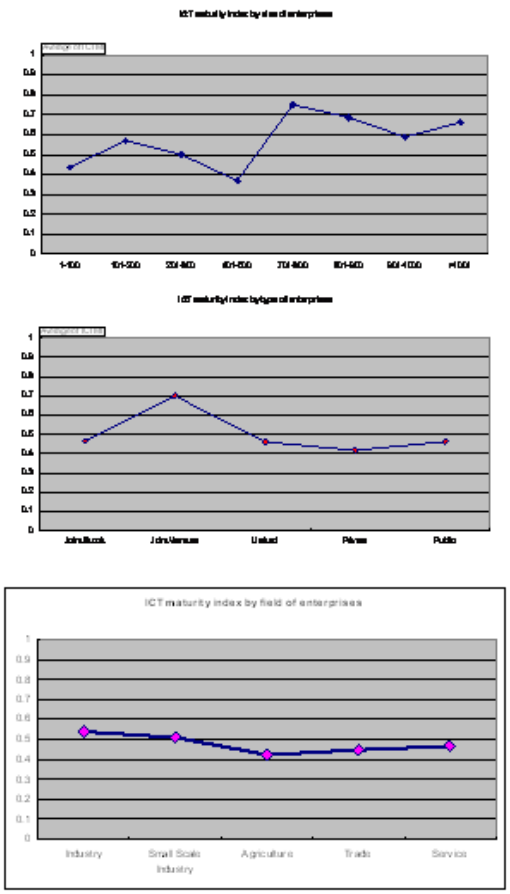

Figure 3: Relationship Between ICT Maturity Index And Size, Type, Field Of Enterprises

Table 4: Average ICTMI By Field And Type Of Enterprises

	Public	Private	Limited	Joint Venture	Joint Stock
Industry	-	0.4403	0.4652	0.7090	0.3777
Small Scale Industry	-	**0.1856**	0.3543	0.7277	0.5481
Agriculture	0.5377	-	0.3124	-	-
Trade	-	0.2466	0.4412	0.7448	0.5783
Service	0.4384	0.4621	0.4612	0.7006	0.4136

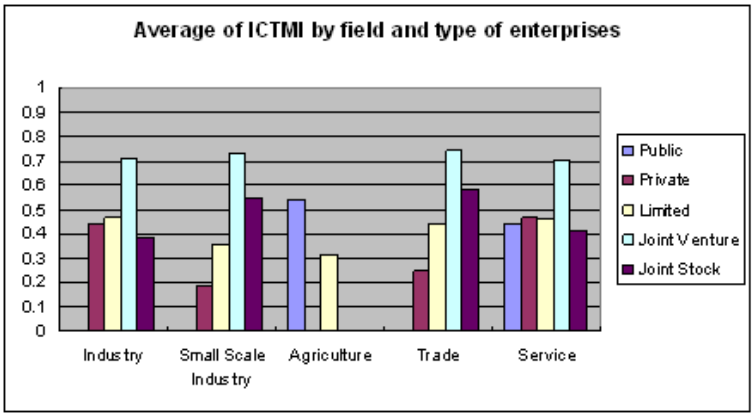

Figure 4: ICT Maturity Index By Field And Type Of Enterprises

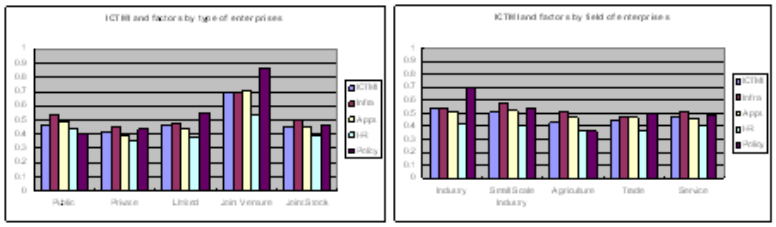

Figure 5: Comparison Of ICTMI And Other Factors By Type And Field Of Enterprises

In summary, the ICTMI of Vietnamese enterprises is at the average level (Substantial) and need to be improved more. For SMEs, the highest ICTMI belongs to enterprises with about 100-200 employees. By type of enterprises, the Joint Venture companies get the highest ICTMI (0.7), and the Private companies are in the lowest position (0.4). Among various fields, there is no big difference in ICTMI. In comparison with other factors of ICTMI, Human Resource is at a lowest level for most of enterprises and should be improved to raise the ICTMI to a higher position.

7. Conclusion

In general, it is very difficult for an enterprise to build up a knowledge system without appropriate ICT infrastructure and previous ICT applications. Moreover, to strengthen the competitive capability of SMEs, it is very important to apply appropriate ICT applications at the right time rather than adopting newest information systems.

This paper contributes to practical aspect of building a knowledge system by doing the first step, which is measuring the ICT maturity. Based on this result, SMEs can start making a plan for improving their ICT maturity toward Knowledge-oriented in order to use their knowledge resource effectively for development in the future.

Besides, to use this tool in practice, a questionnaire is established based on list of suitable indicators for ICT maturity. A practical survey by this tool is also conducted for some Vietnamese SMEs, which is a good demonstration.

However, there are some limitations of this tool and should be improved in the future. Implications for further improvement are: considering an appropriate aggregation function for ICT maturity index; finding appropriate actions for improving ICT maturity of SMEs; keeping track of ICT development of SMEs in a country according to the time-series records for supporting governmental policy making.

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10. Appendix: Questionnaire For Measuring The ICT Maturity Of SMEs

(Please type your answer directly or check ☑ to appropriate position)

General Information

1. Company location (province/city/country)?.....
2. Company field?..... ❑ Industry; ❑Agriculture; ❑Trading; ❑Service; ❑Small Scale Industry; ❑Other _____
3. Company type?..... ❑Public; ❑Private; ❑Joint Venture; ❑Joint Stock; ❑Limited Liability; ❑Other _____
4. Company size (number of employee) .....

ICT Infrastructure Information

5. Number of fixed telephone .....
6. Number of business mobile devices .....
7. Number of computers (desktop, laptop).....
8. Type of Internet access ..... ❑ No Internet; ❑Dial up; ❑ADSL; ..... ❑ISDN; ❑Cable modem; ❑Leased line; ❑Satellite; ❑Others _____
9. Local area network (LAN) ..... ❑ Yes ; ❑ No
10. Internet bandwidth ..... ❑ Unknown ; ❑ < 4 mbps ; ❑ < 8 mbps ; ❑ < 16 mbps ; ❑ < 32 mbps ; ❑ >= 32 mbps
11. Internet Server/ Hosting with high security ..... ❑ Yes ; ❑ No
12. Security & backup system ..... ❑ Yes ; ❑ No
13. Wide area network (WAN, GAN) ..... ❑ Yes ; ❑ No
14. Wireless LAN/ wifi Internet..... ❑ Yes ; ❑ No
15. Company info/services could be accessed through Wap/ i-mode access ..... ❑ Yes ; ❑ No

ICT Application Information

16. Standard application software..... ❑No use; ❑Office software; ❑CAD/ CAM ; ❑Database; ❑Other _____
17. Using Internet for getting information ..... ❑ Usually ; ❑ Sometime ; ❑ Rarely ; ❑ Never
18. Website presence ..... ❑ Yes ; ❑ No
19. Internet Services which is used or provided..... ..... ❑No service; ❑Searching; ❑Ordering; ❑Purchasing; ❑Marketing & sale; ❑Customer support; ❑Other _____
20. Customer understanding/e-Marketing ..... ❑ Yes ; ❑ No
21. Online payment system..... ❑ Yes ; ❑ No
22. Security system for e-commerce..... ❑ Yes ; ❑ No
23. E-mail/ IM for communicating ..... ❑ Yes ; ❑ No
24. Forum/ Social Network for cooperate ..... ❑ Yes ; ❑ No
25. Remote Meeting/ Voice Conference ..... ❑ Yes ; ❑ No
26. Using services through Intranet/ Extranet ..... ❑ Yes ; ❑ No
27. Management Information Systems .... ❑No use; ❑Finance-Accounting; ❑Human Resource Management; ❑Document Management; ..... ❑ Assets Management; ❑ Inventory Management; ❑Decision Support System (DSS); ❑Other _____
28. Integrated Information Systems..... ❑SCM ; ❑ERP ; ❑CRM; ❑Other _____
29. Knowledge Systems..... ❑ Business Intelligent ; ❑ Knowledge Base/KMS; ❑Expert System; ❑Other _____

ICT Human Resource Information

30. ICT training ..... ❑ Usually ; ❑ Sometime ; ❑ Rarely ; ❑ Never
31. Number of employees using a computer .....
32. Number of employees using the Internet .....
33. Royalty payment & receipt ..... ❑ Yes ; ❑ No
34. Number of patent/ license application : .....
35. Spending rate on R&D per year ..... ❑ < 5% ; ❑ 5 - < 15 % ; ❑ 15 - < 30 % ; ❑ >=30%
36. Capacity for innovation/ creating new products, services ..... ❑ Yes ; ❑ No
37. Number of IT specified employee .....
38. Separate IT department with CIO ..... ❑ Yes ; ❑ No
39. Number of Business specified employee .....
40. Knowledge transfer/ exchange programs within enterprise..... ❑ Yes ; ❑ No

41. Central database for supporting Expertise Reuse ..... ❑ Yes ; ❑ No

ICT Policy Information

42. ICT investment budget/ development budget ..... ❑ < 5% ; ❑ 5- < 15 % ; ❑ 15 - < 30 % ; ❑ >=30%
43. Quality policy ..... ❑ No quality policy ; ❑ ISO ; ❑ CMMI ; ❑ Others _____
44. Privacy policy ..... ❑ Yes ; ❑ No
45. Regulatory quality..... ❑ Good ; ❑ Fair ; ❑ Not Good ; ❑ Bad
46. Security policy..... ❑ Yes ; ❑ No
47. Piracy policy..... ❑ Yes ; ❑ No
48. Upgrade ICT hardware/ software ..... ❑Annually; ❑2-year period; ❑3-year period; ❑No policy
49. Assessment effectiveness ..... ❑ Good ; ❑ Fair ; ❑ Not Good ; ❑ Bad
50. KM based on ICT use is a priority ..... ❑ Yes ; ❑ No

Company Name .....
Contact Name / Position .....
Contact e-mail (to get survey result) .....

--- THANK YOU VERY MUCH FOR YOUR COOPERATION ---

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