Competitive Intelligence Software Evaluation Taxonomy (SET) for SMEs in Malaysia - An Effectiveness Report

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Abstract

The increasing need for competitive advantage in fast moving industries such as Information, Communication Technologies (ICT), means some SMEs are looking at Competitive Intelligence (CI), a systematic process for gathering, analysing, and managing information that can affect a company's plans, decisions, and operation. Some software companies have developed online tools and software that promise to enhance the CI process and the value CI brings to organisations. The success of these CI software tools depends, however, on the sophistication of an organisation's understanding of the CI process and scope. Different companies derive different values from different approaches to CI, and therefore require a online tool or software that is specific to their company's needs, resources and management style. This research investigated the management structures and contexts of ICT SMEs in Malaysia to develop a more customised approach to the effective use of CI software for SMEs in the ICT sector, as well as in the selection of appropriate CI software.

This paper describes the two-stage research approach. The first stage involved identifying the management style and context of a group of 680 SMEs, in the Malaysian Government's Multimedia Super Corridor, a government supported area for local businesses. This stage used a cluster analysis approach, to create a taxonomy of ten SME clusters and their management style. These clusters were then used as the basis for the second stage to develop suitable criteria to evaluate available online tools and software for conducting competitive intelligence from an SME perspective. The evaluation criteria were applied to eight CI-ready software packages to identify the most suitable software for each cluster of SMEs. Finally, the research surveyed a small sample of managers to obtain the prospective users' perceptions of the recommended software.

The research findings provide evidence of a range of SME structures in a variety of contexts. Levels of importance placed on different levels in the CI process are identified, as well as aspects that need support, automation and/or augmentation. The software evaluation in the second part of the research provided ten recommendations of suitable software package(s) for each SME cluster. The perceived effectiveness study that concluded the research provided mixed responses. All in all, the research confirms that SMEs can be analyzed by clusters but further research would be necessary to confirm the effectiveness of using the recommended CI software over a longer period of time.

The authors would like to note that some of the diagrams (Diagrams 3 and 4) and tables (Tables 1 and 2) featured in this article are only partially shown and had to be resized and cropped to fit the publication's requirements and dimensions.

1. Introduction

Small and medium-sized enterprises (SMEs) in Malaysia, particularly in the information and communications technology (ICT) sector, are faced with an increasingly volatile environment. The Malaysian business scene has opened up their markets to the world where smaller businesses find themselves competing with newly launched multinational subsidiary and subdivision companies, along with large local firms. In recognising the rising need for competitive support, companies are increasingly relying on Competitive Intelligence (CI), a systematic process for gathering, analysing, and managing information that can affect a company's plans, decisions, and operation. For managing competitive information, software companies have also developed online tools and software that enhance the CI process and the value CI brings to organisations. The success of these CI software tools depends, however, on the sophistication of an organisation's understanding of the CI process and scope. Different companies derive different values from different approaches to CI, and therefore require a tool that is specific to the company's needs. Therefore, this research presented here investigated the structures and

contexts of SMEs based on CI concepts to derive a more customised approach to the use of CI for SMEs in the ICT sector, as well as in the selection of appropriate CI software.

This paper describes a research project in two stages. The first stage involved identifying the nature and range of SMEs, which exist under Malaysia's Multimedia Super Corridor, a government benchmarking body for local businesses. This gives an account, on the basis of cluster analysis, of a taxonomy of SME categories consisted of ten clusters. The relationships and clusters found in the first part of the research offered the basis for the second part of the research, which constructs the criteria for evaluating online tools and software for competitive intelligence. The evaluation criteria are then used to evaluate eight CI-ready software packages in finding suitable tools for the different categories of SMEs. Finally, the research concludes with a study of the prospective users' perceived effectiveness in SMEs drawn from the identified clusters.

2. Questions informing the research

It was hypothesized that SMEs have faced a number of important changes to the environment in which they operate. First, there is generally an increase in activity and government support in many countries for their ICT industries to be more competitive, locally as well as internationally. Thus there is a need to identify structural and contextual characteristics, which leads to the question 'What are the structural and contextual characteristics of SMEs in the ICT sector?' Secondly, the changes in competitive activities amongst SMEs lead to increasing concerns on developments in strategic performance, platforms for technological tools and infrastructure as well as factors relating to targeted competitors. In addition to these functions, these categorizations help in identifying different types of needs in terms of the preparations of competitive intelligence operations within SMEs, which raises the question, 'What are the key intelligence needs in terms of strategic actions, technology planning and decisions, and specific competitors?' Thirdly, Malaysia's Multimedia Super Corridor (MSC) provides support for SMEs, which includes exclusive access to the centralized state-of-the-art IT infrastructure, business consulting and ready market access through government supported missions and related activities. So, 'How does availability of resources play a role in the structure, context, and intelligence needs of SMEs?' Fourthly, with access to information being one of the main incentives, there is a need to identify specific CI tasks for SMEs which then raises the question whether there are differences in the tasks between structures and contexts of these companies. The fifth question is 'Can the survey results develop a taxonomy of configurations to identify relationships between each identified structure and context to specific CI tasks and their intelligence needs?'

3. Theoretical and methodological framework

The basic unit of a CI system is the Intelligence Cycle (Fuld, 1995 and Kahaner, 1996). Larry Kahaner, author and founder of Alexandria, a firm specializing in corporate intelligence, claims the CI process that is used by companies is similar to that which is employed by the CIA and others in the intelligence community worldwide. While specific authors divide the process into three (Westney and Goshal, 1994) or seven phases (SMAC, 1996), all cover essentially the same elements with varying degree of detail in their descriptions of the basic components (Bergeron and Hiller, 2002). In 2003, Francis Bouthillier and Kathleen Shearer introduced a 6-step version of the Intelligence Cycle (**Figure 1**). This was used to construct the framework for this research.

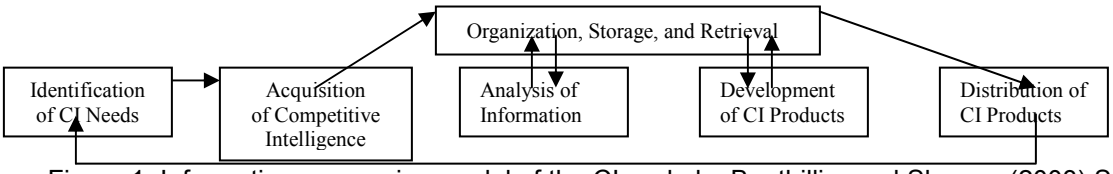

Figure 1 Information-processing model of the CI cycle by Bouthillier and Shearer (2003) Source: Bouthillier, F. and K. Shearer, *Assessing Competitive Intelligence Software: A Guide to Evaluating CI Technology*, Information Today, 2003, p. 43.

Incorporating Bouthillier and Shearer's Model, **Figure 2** shown below represents the methodological framework for the research, combining several theories and concepts. To achieve the Taxonomy of CI Configurations for SMEs, a composite of Mintzberg's Analysis for Organisational Configurations (Mintzberg et al, 2002), Bouthillier and Shearer's Intelligence Cycle (Bouthillier and Shearer, 2003), and Herring's Key Intelligence Topics (Herring, 1989) were employed. The Taxonomy was then used as a basis for the construction of evaluation criteria and simulations for evaluating CI software. Finally, to test the Taxonomy and the validity of the software evaluation, Davis' Technology Acceptance Model (TAM) Model was used to evaluate perceived effectiveness (Davis, 1989).

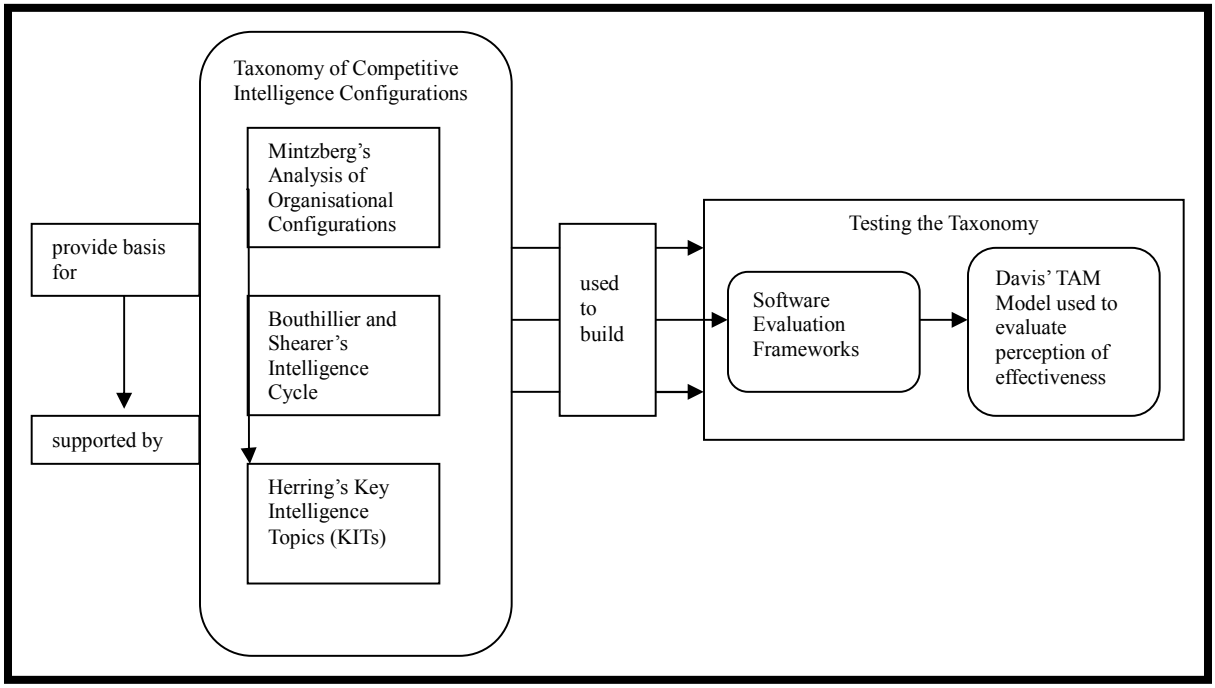

Figure 2 The methodological framework

The collected concepts and models combined to create the methodological framework shown above guided the research in the collection and development of research tools and methods employed. Also, all data gathered and software evaluation frameworks analysed were interpreted based on this methodological framework.

4. Data collection and analysis

To answer the questions informing the research, the researcher surveyed 680 Malaysian SMEs from the ICT sector. The study involved targeting users and potential users of software for CI. The organizations involved in the study were from the following sub-industry clusters: a) software developers/business applications service providers, b) production (postproduction/ animation/ graphic design), c) telecommunications, d) content development, e) education and training f) hardware/ electronics design, g) systems security, h) systems integration, i) mobile/wireless technology, and j) shared services. These ten sub-industries were officially listed to make up the ICT sector in Malaysia's Multimedia Super Corridor.

An online questionnaire resulted in 270 respondents. Besides the questionnaire, further data collection was achieved through interviews with 14 CEOs (or equivalent) representing SMEs from every sub-industry cluster. The interview questions were based on the established and widely used Key Intelligence Topics (KIT) interview technique (Herring, 1989). The interviews generated qualitative information about respondents' perceptions of KITs, in three parts: a) business decisions and strategic topics, b) early warning topics, and c) key players. 'Business decisions and strategic topics' identifies the decisions

and/or strategic directions the company may take, while considering the types of competitive information, as well as the methods and timing in using it. 'Early warning topics' relate to the company's recent unexpected events and its effects, and ways of anticipating events using competitive information. 'Key players' topics' explore highlighted key players within the company's marketplace and their importance to the company.

The Taxonomy developed from the findings was then tested through an evaluation study of CI software. This second stage of the study sought to establish the range of CI software tools that was likely to be suitable for SMEs in general, the level of consonance between structural and contextual features identified, key intelligence needs and preferences in the CI process, with the functions of CI software tools, the CI software that was likely to be suitable for different relationships of structures, contexts, and key intelligence needs and the CI process of Malaysian SMEs in the ICT sector.

The software recommendations were then presented to selected participants of various job scopes and levels from the ten clusters. A questionnaire based on Davis' TAM model (1989) to study perceived effectiveness was developed and distributed to 24 participants. This part of the research studied whether the online and software tools were perceived as it would operate effectively in the small and medium-size enterprises, whether there were differential perceptions of effectiveness between the different levels in employees within a specific SME and finally, to verify the consistency of the results achieved, the taxonomy developed and the CI software evaluated. The 'multiple constituency' approach to understanding effectiveness evaluated the CI software effectiveness for SMEs as well as the differential perceptions of effectiveness in specific SMEs. This approach allowed the gathering of data from different groups of respondents in different contexts, specifically the grouping of respondents by level of seniority within each company.

5. Selected findings

The sample of findings presented here is divided into two parts as per the two stages of the research. The first introduces a partial model of the CI Software Evaluation Taxonomy based on the analyzed data from the first stage of the research. The second reports the outcome of the results in testing the Taxonomy, applying it in an actual software evaluation study of eight online application and software packages and tested across the ten cluster configurations from the Taxonomy. The research concluded with a brief test on a small sample of respondents of their perceived effectives of the software that had been recommended to them based on the software evaluation study, which preceded it.

The Taxonomy of software needs configurations for CI referred above is used to identify the relationships between each identifiable structure and context of these SMEs in terms of specific CI tasks and their intelligence needs. The following table (**Table 1**) provides a selected portion of the full CI Software Evaluation Taxonomy that was based on the findings gathered from Malaysian SMEs in the ICT sector:

Variable categories CLUSTER (n)	Structural and Contextual Characteristics	Intelligence Cycle Value Placement in Software Functions	Key Intelligence Needs
Software developers	• Closely exhibited the structural and contextual characteristics of the entrepreneurial SME. • Majority of companies have fewer staff. • Low specializations. • Fairly simple technological structure. • Low accessibility to resources. • Fairly active in conducting competitive research.	• Fairly high interest in software functions that help highlight aspects of CI needs. • Fairly high interest in functions to acquire and organize, store and retrieve information. • Fair level of concern for analysis support capabilities. • Fair levels of importance being placed on producing and disseminating their CI findings.	• *Strategic decisions* - aim to expand their products and services into different areas, focus is the cash requirements for executing the expansion., and monitor critical industry investments made by other companies. • *Early warning* - technological shifts and constant changes in customer perceptions on 'our' products and services. • *Key players* - larger firms and multinational companies to be constant threats.
Production & design	• Also exhibited the structural and contextual characteristics of the entrepreneurial SME. • Fairly low levels in the number of employees. • Fairly low levels of specializations. • Fairly low levels in technological structure. • Complexity level for resource accessibility was on the lower end. • Lower but reasonable complexity level for research capability.	• Exhibit fairly low concerns with the first phase – identifying CI needs. • Fair level of interest in the second and third phase – acquisition of information and organization, storage, and retrieval. • Fairly low impression for the analysis functions (fifth phase). • The last two phases – the development and dissemination of CI reports – were not considered very important in their practice of CI.	• *Strategic decision* - to provide a unique but effective approach to post production work and design, creating a strong unique presence in the production cluster. • *Early Warning* - Preferences of clients are difficult to anticipate, and even when correctly anticipated, other external factors can still cause changes to occur. • *Key players* - competing and outsourcing graphic design firms, postproduction houses, animation companies, and large organization that have interest in graphical image development.

Table 1 Partial model of the CI Software Evaluation Taxonomy of configurations for MSC-status SMEs in Malaysia's ICT sector

As mentioned earlier, The Taxonomy in Table 1 is a reduced version of a much larger and more comprehensive model. The Taxonomy illustrate in detail the overall nature of each cluster in terms of structural and contextual characteristics, Intelligence Cycle values in CI software, and key intelligence needs. These aspects of SMEs were then put in perspective to illustrate and give an overall view of its environments and characteristics in simulating their possible approaches and uses in CI software.

The first cluster in the taxonomy illustrated the CI configurations of companies in the software industry. Based on the results from the respondents of this cluster, small and medium-sized enterprises in the software development division showed structural and contextual characteristics of the entrepreneurial-type company. This meant that most companies have a low number of staff who were not given specific job scopes, but instead, they were responsible for all aspects of the company. Ironically for companies that were heavily involved in technology development, these SMEs did not show evidence of a complex technological structure and access to technology support. However, their tendency for low accessibility to technology tools proved to be the result of low turnovers and lack of monetary access for most of the companies under this cluster. Nevertheless, the lack of financial resources did not stop these companies from undertaking in-depth research on their competitive environment. Possibly due to their high allocation for research, they placed fair to high values for all sections of the CI process to be integrated into their prospective CI software.

To describe the environment of these SMEs, an analysis of key intelligence topics representative of this cluster was undertaken. Software companies, generally aimed to expand their products and services into different areas, hence focused on improving revenues so as to satisfy the financial targets required to execute the expansion. In supporting their goals for improved financial stability, they focus on monitoring critical industry investments made by other companies so as to make proper decisions in current and future investments. In addition to monitoring investment transactions, they also centred on monitoring movements in trends of related technologies, as well as changes in perceptions of consumers on related products and services. Also, extra attention was given to key stakeholders in the industry, namely larger companies that potentially threatened the SMEs.

Including the Production and Design cluster shown here, eight other clusters were described under these categories. The following Figures 3 and 4 are two of the ten sets of software evaluation criteria.

From the Taxonomy, ten sets of evaluation criteria was conceptualized for the ten clusters identified in the first stage, which provided a conceptual view on the ‘preferred’ features and functionalities of CI software for companies within each cluster. Each configuration was divided into two general sections – the intelligence cycle, which the phases conforms to the needs of each cluster - and other general criteria, which included supporting information for evaluation gathered from the questionnaire survey, technical and financial restrictions, and information and criteria for simulation based on their respective key intelligence needs. The ten sets of software evaluation criteria were then used to evaluate the eight selected online applications and software packages. As mentioned earlier in the article, Figures 3 and 4 are two evaluation criteria models extracted from the comprehensive set of ten. Also, following Figures 3 and 4 is Table 2, which details the outcomes from the software evaluation study. Like Table 1, Table 2 is also a diminutive extraction from a much larger and more comprehensive model.

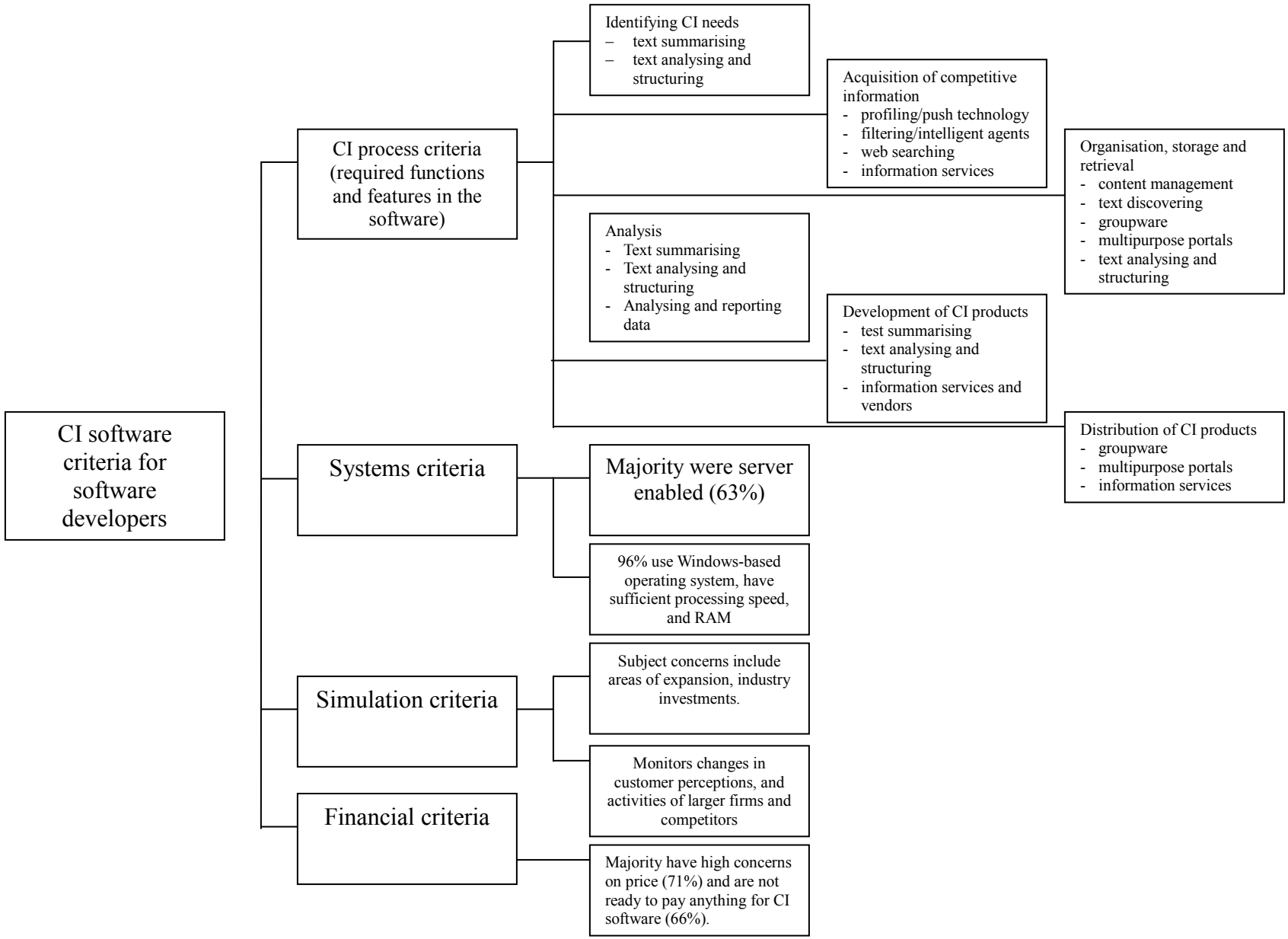

Figure 3 Evaluation criteria for software developers cluster

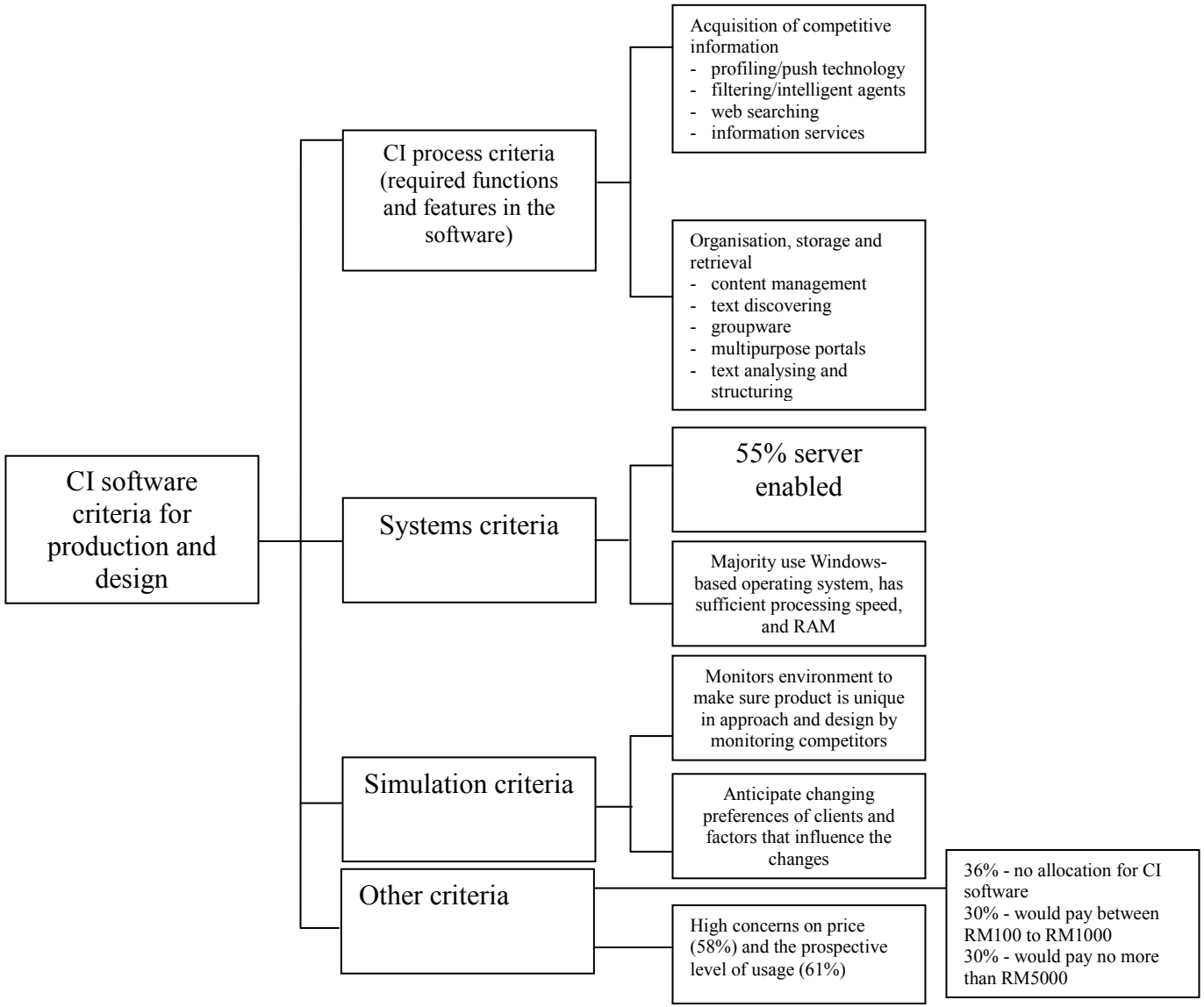

Figure 4 Evaluation criteria for production and design cluster

Table 2 Partial overview of evaluation studies for Software A and its comparable fit with SME clusters' CI requirements.

Software Evaluation Factors	Cluster structure and contextual characteristics overview				
CI Process • Identifying CI needs: provides database to resolve KIT questions, offers many CI topic fields and prompts users to other CI areas. • Acquisition of competitive information: (with IntoAction 4.0) provides real time and archived newsfeeds and information via a customisable and integrated news management function. • Organisation, storage and retrieval: (with Newsroom) supported by InTouch Competitor Hotline. • Analysis • Development of CI products: Produces charts, graphs and over 150 reporting templates. • Distribution of CI products: Various formats and compatible with IntoAction.	**Software developers**	**Production & design**	**Telecommunications**	**Content development**	**Education & training**
	• Does not suit staff's skill sets: not fairly intuitive, difficult to use and requires some training. • Cluster is fairly active in competitive research. Software fulfilled all six of the IC employed. • Functions can help users to meet their objectives of making strategic decisions (focus on cash needs for expansion), providing early warning notices (technological shifts and customer perceptions), and providing information about key players (as a source of threat).	• Does not suit staff's skill sets: not fairly intuitive, difficult to use and requires some training. • Competitive research is not a priority and is of limited scope and use. Software may be underutilised. • Fulfilled Acquisition and Organisation, storage and retrieval. • Functions helped in effectiveness of production processes, uniqueness and appeal of end product, fluctuating trends and preferences of individual clients and tender/bidding CI. Presented new CI scope through identifying CI needs function. • Less to low interest in other functions.	• Somewhat meets staff's skill sets: mixed complexity to functions. • Competitive research is conducted but of limited scope. Software may be underutilised. • Fulfilled Identifying CI needs and Organisation, storage and retrieval. • Functions helped in pricing (tariff prices and regulations, cost efficiency), customer perceptions (scope of competition's products and services offering) and telecommunication trends (Internet based advances). • Less to low interest in other functions.	• Does not suit staff's skill sets: not fairly intuitive, difficult to use, text based data/output and requires detailed training. • Competitive research is not a priority and is of limited scope and use. Software may not be utilised. • High regard for software's Analysis. • Functions helped in pricing (cost efficiency), client perceptions (scope and quality of competition's services) and technology trends (Internet and software advances). • Less to low interest in other functions.	• Does not suit staff's skill sets: difficult to use and requires detailed training. • No allocation for competitive research other than track market players. Software may not be utilised. • Functions somewhat helped in pricing (cost efficiency), client perceptions (marketing education programmes, competitive pricing certifiable reputation and academic standards) and identifying possible alliances. • Software lacks Analysis. Somewhat meets Development of CI products and Distribution of reports. • Less to low interest in other functions.
	Hardware/ electronics design	**Systems security**	**Systems integration**	**Mobile/wireless technology**	**Shared Services**
	• Staff may have skill sets but no specialisation. • Interested in conducting competitive research. Software may be integrated into decision-making. • Fulfilled Acquisition; Organisation, storage and retrieval; Development and Distribution of CI products. Lacks Analysis. • Functions to monitor brand, technology advances, logistics and communications. Also provides information about possible alliances and expansion	• Staff may have skill sets but lacks accessibility to resources. • Capable but not interested in conducting CI. Software may not be utilised. • In favour of Acquisition and Distribution only. • Functions for brand development and monitoring acquisitions. • No to low interest in other functions.	• Does not suit staff's skill sets and no staff allocation. • Not capable of conducting CI. Software may not be utilised. • Interest in Analysis, Develop and Distribute products. • Functions to help brand development; match objectives of companies to parallel their customer's needs and, information about changes in related technology. • Low interest and value in other functions.	• Staff may have skill sets and allocation. • Positive associations for competitive research. Software may be integrated into decision-making. • Interest in all functions. Concern for Analysis support. • Functions to monitor related technology "race", competitors' technology developments and service suite of service providers.	• Staff may have skill sets but no allocation. • Limited allocation for competitive research. Software may be underutilised. • Interest in Analysis and high regard for Develop and Distribute products. • Functions to anticipate clients' needs and monitor competition's services' suite and capabilities. • Low interest and value in other functions.

Software Evaluation Factors	Cluster structure and operations overview				
Systems requirements Strategy! Requires at least Windows 95, a Pentium 100Mhz processor and 24 megabyte of RAM or more.	**Software developers**	**Production & design**	**Telecommunications**	**Content development**	**Education & training**
	• Simple technology structure with low accessibility to resources. • 63% were server enabled and 96% are Window-based, have sufficient processing speed and RAM. • Can install and have sufficient capacity to use.	• Low levels of technology structure with low accessibility to resources. • 55% were server enabled and majority are Window-based, have sufficient processing speed and RAM. • Can install and have sufficient capacity to use.	• Simple technology structure with low accessibility to resources. • 50% were server enabled and 94% are Window-based, have sufficient processing speed and RAM. • Can install and have sufficient capacity to use.	• Complex technology structure with high accessibility to resources. • 58% were server enabled and a majority a Window-based, have sufficient processing speed and RAM. • Can install and but allocation is for tools, applications and production of end product.	• Simple technology structure with low accessibility to resources. • 40% were server enabled (60% not server enabled) and 100% are Window-based, have sufficient processing speed and RAM. • Might have insufficient allocation to install.
	Hardware/ electronics design	**Systems security**	**Systems integration**	**Mobile/wireless technology**	**Shared Services**
	• Complex technology structure with high accessibility to resources. • 58% were server enabled and 100% are Window-based, have sufficient processing speed and RAM. • Can install and have sufficient capacity to use.	• Complex technology structure with low accessibility to resources. • 71% were server enabled and 100% are Window-based, have sufficient processing speed and RAM. • Can install and have sufficient capacity to use.	• Simple technology structure with high accessibility to resources. • 94% were server enabled and 100% are Window-based, have sufficient processing speed and RAM. • Might have insufficient allocation to install.	• Complex technology structure with low accessibility to resources • 39% were server enabled (57% not server enabled) and a majority are Window-based, have sufficient processing speed and RAM. • Might have insufficient allocation to install.	• Complex technology structure with low accessibility to resources. • 46% were server enabled (54% not server enabled) and a majority are Window-based, have sufficient processing speed and RAM. • Might have insufficient allocation to install.
Other criteria Base Price: $7500 Package 2: $11,800 Package 3: $22,000/ year Usability: Individual or Enterprise use Functions more efficiently with IntoAction and Newsroom.	**Software developers**	**Production & design**	**Telecommunications**	**Content development**	**Education & training**
	• 71% high concerns on price and 66% would not spend for CI software. • Software can be integrated into their decision-making process and their strategic direction. Price is a deterrent.	• 58% high concerns on price and 36% no allocation for CI software. • 61% are doubtful of its usage. • Software can be installed, but might be under utilised.	• 72% high concerns on price and 44% would not spend for CI software. • 50% are doubtful of its usage and 33% its applicability to structure. • Price and applicability are deterrents.	• 72% high concerns on price and 53% would not spend for CI software. • 50% are doubtful of its usage, 41% are concerned with training, 33% have moderate concerns for security and 29% for maintenance. • Price and usage are deterrents.	• 45% high concerns on price and 25% would not spend anything for CI software. • 50% are doubtful of its usage, 25% concerned with credibility and 25% concerned with applicability. • Can install and have sufficient capacity to use.
	Hardware/ electronics design	**Systems security**	**Systems integration**	**Mobile/wireless technology**	**Shared Services**
	• 57% high concerns on price and 36% would not spend anything for CI software. • 52% are doubtful of its usage. • Price and usage are deterrents.	• 57% high concerns on price and 14% would not spend anything for CI software. • 28% are doubtful of its usage, maintenance and expertise respectively. 48% have concerns with security. • Price is a deterrent.	• 55% high concerns on price. • 55% are doubtful of its usage, 27% for maintenance, 33% for training and 38% for its applicability to structure. • Price and usage are deterrents.	• 82% high concerns on price and 45% no allocation for CI software. • 34% are doubtful of its usage, 30% for maintenance. • Price is a deterrent.	• 64% high concerns on price and 17% would not spend for CI software. • 53% are doubtful of its usage, 35% for technology requirements and 38% for its applicability to structure. • Price and usage are deterrents.

Figure 3 shows the overall conceptual framework for software evaluation for the software developers' cluster, the first of ten frameworks in the study, eight of which not shown in this article. The framework shows that prospective users of CI software from the software developers' cluster hold fairly high regard to software that supports in identifying their CI needs. Users from this cluster also chose software functions that acquire, organise, store, and retrieve information as being of importance. For storing and retrieving information that is also required by users of this cluster, content management technologies are expected. The users also value software support for information analysis, development and distribution aspects of the CI process within the CI software.

Apart from studying the functionalities of the 'ideal' software, other factors were also included in the evaluation. These factors cover the users' technical and financial boundaries, and key intelligence needs, which were used to make assumptions in simulating the information searching and management situations within each SME cluster. Although the software developers were assumed to be very technically oriented, the data gathered to outline their technical margins show that majority of the companies (63%) within this cluster are not connected to an in-house or online server, which is a major requirement for some CI software. This requirement allows accessibility for all users from one centralised location. However, these companies not connected to a server can only choose standalone CI applications, which can be accessed and used without having to run a server. The remaining technical requirements include operating systems, processing speed, and random access memory requirements, which 96% of all respondents from this cluster equally qualified. As for their financial circumstances, 71% of SMEs within the software developers' cluster are concerned with the price of the application, and 66% of the respondents were not ready to make any financial allocations for software to support CI. Their key intelligence needs gathered from the first stage of the research showed that the information to be integrated, stored, organised, and retrieved in terms of CI is related to areas of expansion, industry investments, changes in customer perceptions, and the monitoring of larger firms and multinational companies that may pose threats. For the evaluation, these topics were used to translate and fulfil the software's information requirements, such as customising the fields and taxonomy; to test the storage and retrieval functions, such as in developing related search strategies, and other acquiring and organising techniques; and to test the reporting aspects of the software.

Figure 4 shows the evaluation criteria of the Production and Design cluster, the second of the ten clusters evaluated. Unlike the criteria listed for Software Developers, prospective users of CI software within the production and design cluster only require functions that support the second and the third phases of the intelligence cycle to be automated, as these phases have been considered the most tedious aspects of the CI process. The software functions within the second phase involve the software's abilities to identify information sources and specific topics, monitor the content of the sources, filtering and alerting of information, importing, screening and rating of information. The software functions within the organising, storing and retrieving of information phase involve indexing of information, hierarchical and cross-topic linking, storage capabilities, searching and browsing.

In terms of systems criteria, only 14 (45%) of the 31 respondents within this cluster had been working in a company that utilised a network using a server, which allowed the employees to access the company intranet and applications at a central location. This technological feature within the companies would also enable them to use any of the more comprehensive server-based CI software. The remaining 17 companies within this cluster, which is the majority, would be limited to the standalone software and online services. Out of the 31 respondents, 24 admitted to using Windows-based operating systems, 23 with a minimum Intel Pentium II processor, and 25 with at least a 64 mega-byte RAM.

In preparing a simulation for evaluation, the key intelligence topics gathered from the first stage of the research showed that prospective users would use the CI software to monitor the environment in making sure their product maintains their uniqueness in approach and design. The focus would also be on factors that influenced in the changes in client preference, whether trends in design or changes in company image and objectives. Monitoring and gathering the appropriate intelligence about these changes helps decision-makers anticipate the changing preferences in customers. Other criteria that were gathered from the survey are the high concerns on the price of software and the related level of usage. It was also

indicated that 36% of the respondents had no plans for allocating funds for implementing CI software; 30% would pay between RM100 and RM1000, and 30% would pay no more than RM5000.

Based on the outcome of the software evaluation study of ten clusters, recommendations were made on the most suitable software for every type of sub-industry cluster. These recommendations were not published here due to privacy issues of the software companies. Following these recommendations, a perceived effectiveness test was conducted to test the Taxonomy's effectiveness for use in choosing the suitable software, based on the structures and contexts provided.

The results showed that the perceived effectiveness of the recommended CI software of employees by different levels and responsibilities conveyed more similar reactions to one another within each cluster, while only a few showed differences. However, due to the problems related to the lack of time given to the participants to review the recommended software, the feedback showed more negative reactions than positive ones. Table 3 below is an extraction of a more comprehensive table illustrating the outcome of the perceived effectiveness study.

Table 3 Partial overview of findings on the perceived effectiveness of recommended CI software for users in SMEs

Perception of Effectiveness										
Cluster	**Software developers (Software 4)**		**Production & design (Software 2 & Software 1)**		**Telecommunications (Software 4 & Software 1)**			**Content development (Software 3)**		
Variables	**Manager**	**Line staff**	**Manager**	**Line staff**	**Upper Mgmt**	**Manager**	**Line staff**	**Upper Mgmt**	**Manager**	**Line Staff**
Perceived usefulness:										
Ability to accomplish CI tasks	Neutral	Fairly useful	B: Fairly useful S: Very useful	B:Fairly useful S:Fairly useful	B: Fairly useful S: Very useful	B: Fairly useful S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Fairly useful
Effect of job performance	Fairly useful	Fairly useful	B: NeutralS: Very useful	B:Fairly useful S: Neutral	B: Neutral S: Very useful	B: Neutral S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Neutral
Effect on productivity	Fairly useful	Fairly useful	B: Fairly useful S: Very useful	B:Fairly useful S: Neutral	B: Fairly useful S: Very useful	B: Fairly useful S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Neutral
Work effectiveness	Fairly useful	Fairly useful	B: Fairly useful S: Very useful	B:Fairly useful S: Neutral	B: Fairly useful S: Very useful	B: Fairly useful S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Neutral
Work efficiency	Fairly useful	Fairly useful	B: Fairly useful S: Very useful	B:Fairly useful S: Neutral	B: Fairly useful S: Very useful	B: Fairly useful S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Neutral
Overall usefulness	Fairly useful	Fairly useful	B: Fairly useful S: Very useful	B:Fairly useful S: Neutral	B: Fairly useful S: Very useful	B: Fairly useful S: Very useful	B:Fairly useful S: neutral	Neutral	Fairly useful	Fairly useful
Perceived ease-of-use:										
Learn to use software	Fairly easy	Fairly difficult	B: very easy S: very difficult	B: very easy S: difficult	B: very easy S: very difficult	B: very easy S:very difficult	B: very easy S: difficult	Fairly easy	Fairly difficult	Fairly easy

Able to do what is intended by user	Fairly easy	Fairly difficult	B: fairly easy S: fairly easy	B: fairly easy S: difficult	B: fairly easy S: fairly easy	B: fairly easy S:difficult	B: fairly easy S: difficult	Fairly easy	Fairly difficult	Fairly easy
Understandability of functions	Fairly easy	Fairly difficult	B: easy S: fairly difficult	B: easy S: difficult	B: easy S: fairly difficult	B: fairly easy S:very difficult	B: easy S: difficult	Fairly easy	Fairly difficult	Fairly easy
Flexibility	Fairly difficult	Fairly difficult	B: NA S: fairly difficult	B: easy S: difficult	B: neutral S: fairly difficult	B: fairly easy S:very difficult	B: fairly easy S: difficult	Fairly easy	Fairly difficult	Fairly easy
Prospects for users to be skilful	Fairly easy	Neutral	B: very easy S: fairly difficult	B: easy S: difficult	B: very easy S: fairly difficult	B: fairly easy S:very difficult	B: very easy S: difficult	Fairly easy	NA	Fairly easy
Overall ease-of-use	Fairly easy	Fairly difficult	B: easy S: fairly difficult	B: easy S: difficult	B: easy S: fairly difficult	B: fairly easy S:very difficult	B: easy S: difficult	Fairly easy	Fairly difficult	Fairly easy
Negative aspects	- No links to information sources - Manual	- Not connected to Internet	B: - Not worth the price S: - Doesn't do much	B: - Expensive S: - Many functions to understand	B: Lack internet search function S: Takes time to learn	B: many manual functions S: hard to use	B: Text analyser can't replace search engines S:hard to use	- No management capabilities	- Does not manage collected information	- Manual storage of information
Positive aspects	- Effective use of categories - Report capabilities	- Able to customise. - Intuitive - Record of activities	B: - Useful for detecting Web changes S: - good for managing info.	B: - Analysis S: - Good for managing information	B: Text analyser S: Good link to in-house dbase and solutions	B: considers many aspects of competitive analysis S:Customisable	B: Tracking of user's activities S: work with many formats and documents	- Easy to use - Easy navigation - Report capabilities	- Easy integration - Useful search history function	- Clear ranking - Useful summary function.
Optional comments	Need more time for review		S: not tested in context	S: not tested in context		Too little time to evaluate	Hard to use, not enough time to learn	Need more time to learn	Not enough time to test	Need more time to learn

In Table 3, the study compared the responses between staff of different levels within the scope and dimensions of the TAM model (Davis, 1989) listed on the left column of the table. Here, the manager and the line staff from the software developers' cluster mainly share the same experience in terms of perceived usefulness about Brimstone, except for a 'neutral' response by a manager about Software 4's support in its ability to accomplish tasks. In terms of perceived ease-of-use, however, the managers felt that the software was a fairly easy application to operate as opposed to the lower level staff, who conveyed difficulty in its usage. As for the respondents from the production and design cluster, both the manager and line staff perceived Software 2 to be fairly useful, while Software 1 was perceived by the manager to be very useful, but neutral by the line staff. In the telecommunications cluster, the responses pertaining to perception of ease-of-use for both the manager and line staff found Software 4 to be very easy to operate, while Software 1 was found to be difficult by both parties. The staff from upper managerial and managerial levels in the telecommunications cluster found Software 4 and Software 1 to be overall fairly useful and very useful, respectively, however, the line staff was neutral in their answers regarding Software 1. As for ease-of-use, all levels found Software 4 to be easy to fairly easy to use, but, as for Software 1, similar to the production and design employees, staff from all levels found Software 1 to be from fairly difficult to very difficult to use. The staff from the upper management and line staff levels in the participating company representing the content development cluster, responded neutral to Software 3, but manager-level responses were of fairly useful regarding perceived usefulness. Differences in views continued to occur about the software's perceived ease-of-use, where upper management and line staff found Software 3 to be fairly easy, but the manager thought it was fairly difficult.

The remaining six clusters not shown in Table 3 detail the findings of the perceived effectiveness study as categorized here.

6. Implications for Future Work

The limitations of the research project discussed in the previous chapter assisted in the consideration of implications of the study for future work. Further research might include:

- a longitudinal review of structural and contextual characteristics, their views of the intelligence cycle, and their key intelligence needs over a period of two to three years, to observe changes and evolution in CI practices within each business and industry and its effects;
- a strengthening of the qualitative data on key intelligence needs by having a larger sample for each clustered group, which would give a more inclusive representation of the industry in research;
- a more exclusive assessment of perception of effectiveness of CI software for prospective users in SMEs, by devising a methodology that would include all the dimensions of the Davis' TAM model (1989), which would then produce more comprehensive results;
- a more focused assessment by way of case studies of companies that are using CI software and, perhaps, conduct a comparative study of before and after scenarios;
- on a more technical side, another evaluation study of CI software may be used as the basis towards a construction of a prototype software for CI, perhaps using concepts developed from a Software Engineering perspective, for example, Bernard Wong's Software Evaluation Framework (SEF). (Wong, 2004)

In addition to the possible future work relating to improving this research, the analysis of SMEs in terms of structure, context and CI processes and needs, conducted in the first stage of this study, could be used for comparative purposes, in other countries. The differences in CI related concepts across other regions need to be further investigated, as the current developments in conceptual CI have been more from the US, Canada, Britain, Australia, South Africa, Sweden, Finland and other European countries.

Considering the limitations and the list of possible improvements that can be made to this research, an additional consideration of the research reported in this thesis concerns the incorporation of a much bigger sample of SMEs in subsequent research, re-integrating a more enhanced methodology for all three stages. By using a better approach based on previous shortcomings, more significant results could

be expected, such as a more defined and exclusive SME groups and better ‘fit’ with variables relating to CI processes and needs. Subsequent stages of the research might also be better tested. This implies that a more complex clustering procedure on the basis of other additional factors, which may include strategic factors and aspects of operations, would have to be performed in order to identify more ‘defined’ cluster groups in the SME world.

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