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An Approach of Purchasing Decision Support in Healthcare Supply Chain Management

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ABSTRACT

The aim of this study is to develop a conceptual approach of supplier selection decision support that promotes in-house methods of decision-making in the healthcare purchasing. Our approach is based on a decision support system (DSS) solution principle in which each selection component is assessed and supported by a new type of DSS model previously developed for rural industries. The study uses survey data to structure a decision model evaluated by a hypothetical case of procuring a hospital x-ray machine. We further demonstrate case data through the features of the DSS model. We believe that the proposed approach addresses a complex supplier selection decision in healthcare purchasing.

Keywords: *decision support systems, supplier selection, group purchasing, health-care procurement*

1. INTRODUCTION

Competitive global market and rapid policy changes in business reinforce manufacturing and service operations to adopt superior IT based applications for supply chain management (SCM) (Siurdyban & Møller, 2012; Ross, Weill, & Robertson, 2006). Strategies for computer-based decision support systems (DSS) have been increasingly recognised, particularly in relation to supplier selection issues for example, intelligent supply chain (Siurdyban & Møller, 2012); knowledge based DSS (Wang et al. 2006), and integrated SCM approach (Lin, et al., 2009). However, these strategies suffer from limitations in offering comprehensive technological provisions of utilising internal and external resources, and facilitating company's in-house efforts in their own core decision-making methods. The issue of promoting in-house methods of core decision-making into solution-in-practice is relatively a new concept, however, this solution still remains unsolved in the current literature of DSS relating to supplier selection issues.

The existing DSS approaches for supplier selection problems (Ho et al., 2010; Bhutta & Huq, 2002 Wang et al. 2006; Lin et al. 2009) use methods such as knowledge-based decision support and integrated decision support which are based on hierarchical structure, model, or mathematical relationship based problem-solving techniques. In most cases, they are sophisticated in achieving quantitative results without considering decision makers subjective preferences and cross-functional adjustments. There is always a mismatch between decision support methods and techniques used in DSS such as case-based and/or reason-based algorithms for predicting outcomes. The main drawback appears to be unsuitability with management's methods-in-practice particularly for group purchasing. A simplified approach of a DSS that promotes in-house methods of decision-making (such as group purchasing decision making) can however be of significance, in which decision makers' subjective preferences are valued. At the same time, the decision maker's involvement at different management levels are defined in the provision of criteria inputs through subjective judgements of group teams. For example, the inputs can be modified, added, or removed directly to help decision makers at group level to reach an appropriate decision by varying qualitative details of potential suppliers.

Rule-based technique of DSS is perhaps the right approach to minimise the shortcomings of DSS for supplier selection. Lee et al. (2006) suggest the use of rules can capture domain expertise of experienced evaluators (e.g. purchase members) who are responsible for time and cost reduction in supplier selection. In rule-based decision making, decision makers can go through various qualitative and quantitative factors to fulfil their procurement needs (Miah & Huth, 2011). As such, the rule-based decision making approach focuses on how the supplier selection process can be delegated to group members across purchasing teams through a de-centrally executed selection process. A set of rules for decision making can be determined from managers' experience of specific supplier portfolios. These rules, though often based on heuristics and created manually, would be used for decision making requirements at team level. However, heuristics can represent better reflection of operational situations in decision making. This is especially relevant when applying group purchasing in healthcare supply chain where a wide range of suppliers are enlisted to win a particular contract. In a recent study, a DSS approach is presented in which supply chain managers can explore supplier selection options to fulfil purchase requirements at different functional or divisional units of an organisation (Miah & Huth, 2011). We argue that the rule-based concept presented in Miah & Huth (2011) can be applied in a situation (health care purchasing) where procurement decision makers need to exercise buying power to optimise benefits. Purchasing function is an important issue in health care supply chain management. Health purchasing deals with varieties of product and service operations related to medical consumables, pharmaceuticals, catering, laundry cleaning, home care products, and general supplies. These wide variety of supplies involve different suppliers, and make a complex supply network from original source to end customer (Harland, 1996; Kritchanchai, 2012).

Realising the importance of using suitable DSS tools in the health care sector, we further extend the rule-based DSS approach by Miah & Huth (2011) to healthcare supplier selection. For group purchasing we propose a conceptual decision support approach for supplier selection purpose. The concept is based on a DSS solution principle in which each selection component is assessed and supported by the new type of DSS model previously developed in rural industries. The study focuses on outlining a conceptual approach of decision support for group purchasing using data collected from the survey. Using design science research as a guide a decision structure is developed and evaluated by a demonstration of hypothetical case of procuring a hospital x-ray machine. We further demonstrate case data through DSS model features. The proposed approach addresses a complex supplier selection decision in group purchasing. It helps decision makers use multi-criteria purchasing options and optimises selection benefits. The computer-based decision support addresses supplier selection issues and enables business organisations to continuously adopt new strategies and policies of purchasing management. The applicability of the proposed approach can also address some issues of cross-functioning decision making (Moses & Åhlström, 2008) in particular for the method of choice in supplier selection.

The paper is organised as follows: section 2 presents a research background on the current supplier selection problem. Section 3 describes the research methods adapted for this study with details of the DSS method and its background of technological relevance. Section 4 gives an example illustration of the approaches. Finally, section 5 includes overall concluding remarks and research directions for the study.

2. THEORETICAL BACKGROUND

SCM often stresses the intensive and long-term character of customer-supplier-relations that lead to a win-win-situation (Lambert, 2008). However, current technological solutions in supplier management have drawbacks to provide win-win outcomes in many practical aspects when using adoptive complex decision methods e.g. group purchasing. In group purchasing, buyers or purchasers work in a team to deal with suppliers in a consolidated way so they can exercise buying power to optimise benefits (Rozemeijer, 2000). At the same time, it is important to maintain long term business relationships with enlisted suppliers to establish a sustainable partnership. It may require utilising fewer suppliers as reliable and profitable (Ho et al., 2010) depending on different conditions and opportunities to maintain in-house core decision making.

2.1 Supplier selection criteria

According to the Supply-Chain Operations Reference (SCOR) model, one of the five major supply chain processes is source (Supply Chain Council, n.d.). The source process of the SCOR model relates to supplier selection, which comprises managing incoming raw materials, supplier selection and certification, supplier relationships and agreements (Stephens, 2001; Stewart, 1997). Supplier evaluation and selection in the supply chain is a key strategic consideration and selecting the right suppliers plays a key role in any organisation becuase it has direct impact on corporate price competitiveness (Kannan & Tan 2006; Ting & Cho, 2008). For supplier selection, companies use both single sourcing and multiple sourcing approaches (Ghodsypour & O'Brien, 2001). In case of single sourcing, the buyer needs to make only one decision regarding selecting the best supplier to satisfy the buyer's entire requirements in terms of demand, quality and delivery (Ting & Chao 2008). This approach holds true for many situations within supply chains, especially when the focus is on complex or high-value parts with a significant after sales services. On the other hand, when a single supplier is not able to satisfy buyer requirements, in the case of multiple sourcing buyers need to purchase some parts from one supplier and other parts from other suppliers to compensate for the shortage of capacity or low quality of the first supplier (Ting & Chao 2008; Miah & Huth, 2011).

Choosing the right supplier involves much more than scanning a series of price lists. In practice, in supplier selection decision, a firm could use several factors such as price offered, quality of supplied goods and services, on-time delivery, after-sales services, supplier location, response to order change or flexibility, and supplier financial status. For supplier selection, most of the literature identify quality, cost and delivery performance history as the most important criteria in vendor selection (Chapman 1993, Hakansson & Wootz 1975, Monczka et al. 1981). Recently, Ho et al. (2010), identify hundreds of supplier selection criteria from literature review. The most popular criterion is identified as quality, followed by delivery, price/cost, manufacturing capability, service, management, technology, research and development, finance, flexibility, reputation, relationship, risk, and safety and environment. Some of these criteria are related to quantitative or hard issues and some are qualitative or soft issues (Ho et al. 2010, Ting & Chao 2008). For procurement purpose to select the appropriate or most suitable suppliers it is necessary to make a trade-off between these soft and hard factors.

2.2 Supplier selection approaches

Supplier selection problems in business domains have been addressed through various approaches by evaluating supplier and product specific data. Using the most important supplier selection criteria, previous research uses different multi-criteria decision making approaches to come to an optimal solution of their choice. The most widely used multi-criteria approaches are: analytical hierarchy process (AHP), analytic netwrok process (ANP), case-based reasoning (CBR), data envelopment analysis (DEA), fuzzy set theory, genetic algorithm (GA), mathematical programming (linear programming, integer linear programming, integer non-linear programming, goal programming, multi-objective programming), simple multi-attribute rating technique (SMART), and their hybrids (Ho et al. 2010; Miah & Huth, 2011; Guneri et al., 2009; Sanayei et al., 2010; Keramydas, et al, 2011). The most popular approach adopted in supplier selection literature is identified as individual approach (58%) compared to hybrid approaches (43%) (Ho et al. 2010). Content analysis of literature shows about fourteen out of seventy-eight articles (17.95%) applied DEA in the supplier selection process (Ho et al. 2010). DEA approaches are used to measure the suppliers performance (Talluri & Sarkis, 2002; Garfamy, 2006; Ross et al. 2006; Saen, 2007), and to evaluate and to select suppliers (Narasimhan, et al., 2001; Seydel, 2006; Wu et al, 2007). Among 78 journal articles 11.54% formulate the supplier selection problem as various type of mathematical programming models such as linear programming (Talluri & Narasimhan, 2003; Ng, 2008), integer liner programming (Talluri, 2002; Hong et al. 2005), goal programming (Karpak et al. 2001), and multi-objective programming (Narasimhan, et al., 2006; Wadha & Ravindran, 2007, Keramydas, Xanthopoulos, & Aidonis, 2011). Overall, among the individual approaches, DEA is the most popular, followed by mathematical programming, AHP, CBR, ANP, fuzzy set theory, SMART, and GA. These types of quantitative approaches are designed mainly for unstructured problem space in which a number of factors can go wrong and involves high degree of uncertainty levels. The approaches also use quantitative measures in supplier selection problem, rather than considering local in-house methods in practice.

2.3 Relevant DSS approaches

The process of purchasing and supplier selection often has problems as the decision process is cross-functional and complex as it requires involvement from different organisational units with differing goals, needs or abilities (Moses & Åhlström 2008). The same is found in the sourcing decision process where both the overall company’s strategy and the functional strategies sometimes are difficult to match. Moses & Åhlström (2008) identify various problems that can occur in cross-functional sourcing decisions, and cluster the identified problems into three groups: functional interdependency, strategy complications, and misaligned functional goals. These problems of supplier selection decision range from more company-specific (such as system-support) to more general (such as forced path dependency). Cross-functional sourcing decisions problems are related to information dependency, usage of ad hoc decisions, lack of designed system-support, and unstructured process-design related problems. However, research on such an in-house method of group purchasing supplier selection by decision support approach in practice is so far almost non-existent. Many studies have already been dealt with team-based supplier selection problems. For example, Amiri, et al. (2011) use fuzzy logic method to solve conflicting and non-commensurable decision making criteria to get a solution that is the closest to the ideal situation. Boran, et al. (2009) also use fuzzy weighted averaging operator to aggregate decision makers’ opinions for rating the importance of criteria and alternatives.

2.4 Practice-Oriented DSS approach

Harland’s (1996, p. 187) research on supply network strategies in the health sector revealed that "there is a wide variety of supplies purchased for healthcare, which involve many different relationships of different types being formed in complex networks of supply from original source to end customer."

A lot of literature supports the use of IT in the health care supply chain. McGrath & More (2001) stated that poorly integrated information systems, certainly comprise a main problem within the Australian healthcare sector. The studies on DSS solution design in healthcare include the perspectives of medical problem solving and health care system management. Some examples of DSS applications are: model-based method for medical decision making (Weiss, et al. 1978), clinical problem solving (Elstein & Schwarz 2002), and discovering reasoning strategies in medical decision making (Arocha, et al., 2005). There is a need to employ a practice-oriented DSS approach in which the decision maker’s involvement at group level is paramount in the selection criteria. For example, the selection criteria can be varied supplier to supplier and product to product. Decision makers need different inputs to reach an appropriate decision by including qualitative details of the potential suppliers. For instance, healthcare organisation procurement team requires different criteria set for particular product specification to evaluate potential suppliers. This understanding motivates us to explore requirements of a new approach to address group purchasing decision making strategies.

The practice oriented DSS approach can create a basis for developing a DSS that could maximise the benefit of group purchasing by selecting the best supplier(s) to fulfil different conflicting selection criteria and meet different functional group needs. We conceptualise a simplified selection approach of group purchasing in that the purchase personnel or team members can assess both the weightings and the utility function for each of the specific criteria. The concept is considered as a solution artifact and this thinking is embedded by a framework by March & Smith (1995) within the design science research paradigm.

3. RESEARCH METHODS AND ANALYSIS

The aim of this study is to resolve some of the supplier selection decision problems by the proposed DSS rule-based decision making process. This study aims to design a conceptual solution artefact through a set of constructs from the problem domain. The research is inspired by the decision science research because the primary aim of this study is to outline a conceptual approach as solution artefacts. We begin with a qualitative survey to outline problem definitions. By doing so, we categorise a set of properties (factors) which contribute to the issues of health care purchasing supplier selection. We then move to analysing these to establish a set of relationships among selection factors. Our central artefact is the solution prototype that is constituted through the problem understanding. This understanding is also validated in an ongoing action research program at an industrial company (Iivari and Venable, 2009; Järvinen, 2007). In order to fulfil the research objective we explore and structure the issues of group purchasing within a hospital context.

3.1 Survey on supplier selection

Under interpretative research paradigm we use data collected from questionnaire survey. Data collection was based on the procedures suggested by Fowler (2002); Alreck & Settle (2004), such as information needs, sampling design, instrumentation, data collection, data processing, and report generation. In addition, Marston & Straker (2001) procedures were used for both personal interviews and mail surveys.

Sample, respondents and data collection

Our sampling frame for the survey is composed of 40 public hospitals and 21 New Zealand District Board Hospitals (NZ-DHBs) purchasing and supply personnel. A list of purchasing and supply managers was obtained from the NZ-DHBs with contact email addresses. Postal addresses were obtained from the Ministry of Health website which provides the DHBs' and public hospitals' addresses.

The pre-test methods used in this research are: interviews and expert input. Interviews are conducted with the purchasing and supply executives from two major hospitals. All the interviews were completed between one and two hours. In addition, two senior executives, and three academics commented on the content, clarity of the instructions, and validity of the questionnaire. Results of pre-test are used to improve the pilot survey questionnaire. The pilot survey questionnaire was sent to 150 purchasing and supply personnel in hospitals. Respondents were asked to rate supplier selection factor (cost, past experience of reliability, lead time, reputation/brand, quality, customer service (specialist advice), response speed, flexibility (capacity), innovation, and financial position) on a scale of 1-5 (1 : not very important, 2: not important, 3: neutral, 4: important and 5 : most important). Descriptive statistics is used to analyse the data on supplier selection criteria. Analysis shows that six factors are identified as most important in health care supplier selection: quality, cost, customer service (specialist advice), past experience, lead time, and response speed (Msimangira, 2010).

The revised survey questionnaire with six supplier selection factors was sent to 350 purchasing and supply personnel in 21 DHBs and 40 public hospitals. The main contact was through the managers in charge of purchasing and supply in each DHB who then distributed the survey questionnaires to their subordinates. In addition, other questionnaires were sent to the 40 public hospitals listed on the Ministry of Health website. Of the 350 survey questionnaires sent to the potential respondents, 8 questionnaires were returned due to change of address and the contact person was no longer at the hospital. A total of 41 usable responses were received within two weeks representing 11.71% response rate. A reminder e-mail was sent to the purchasing and supply managers and the chief finance officers after two weeks from the first mailing, to remind their subordinates (non-respondents) to respond to the survey questionnaire. One week later, the potential respondents were contacted by phone to remind them of the importance of the study and requested to complete the survey questionnaire if they had not yet completed it. A total of 10 extra responses were received which increased the total responses to 51 (response rate of 14.6%). Further reminder e-mail sent to the purchasing and supply personnel achieved extra nine usable responses. Finally, a total of 60 usable responses were received representing 17.14% response rate. The results of the Levene's test evaluate the assumption, whether the population variance of the two groups are equal. The result shows that the variances are relatively equal, $p > 0.05$. Therefore, there is no significant non-response bias in the data received from the main study. Descriptive statistics was used to analyse the data on supplier selection criteria. A summary result of the supplier selection factors and their ranks are shown in Table 1. Results show the key factors used by purchasing and supply personnel in the public hospitals for selecting suppliers. Quality is the key factor in supplier selection, followed by cost and customer service (specialist advice). Our survey results differ slightly from Ho et al. (2010) literature review findings. In both the cases, quality is the most important factor. However our survey results show cost is the second most important criteria followed by customer service. On the other hand, Ho et al. (2010) ranked delivery attribute, as the second most important criteria followed by price/cost. Results show it is worthwhile to determine industry specific supplier selection criteria rather than using a generic one. Decision makers can identify the factors and rank them through Delphi or other available techniques.

Table 1. Supplier selection factors identified in healthcare industries

Factors	Mean	Std. Deviation	Rank
Quality of product	4.500	0.597	1
Cost	4.167	0.717	2
Customer Service (specialist advice)	4.117	0.804	3
Past experience	3.967	0.780	4
Lead time	3.950	0.699	5
Response speed	3.850	0.840	6

Source: Msimangira (2010).

3.2 Decision structure for supplier selection and concept demonstration

Applying the results of supplier selection factors in the systematic procedure, we prototype a system within a perspective of group purchasing. We validate our methodology with Siurdyban & Møller (2012) in which design science guidelines are applied for similar process design to achieving research objectives. The information systems as a design science research builds IT meta-artifacts to support concrete information system applications, as such it would require a stronger grounding in prescriptive theories (Iivari, 2007). In design science research, March & Smith (1995) defined design studies that focus research regarding different outputs or artefacts such as constructs, models, methods and instantiations based on research activities such as for building, evaluating, theorizing, and justifying the solutions artefacts. In this sense this study follows the design science method proposed by Hevner, March, Park & Ram (2004) in which seven guidelines is defined to fulfil our research objectives and the guidelines are to design as an artifact, problem relevance, design evaluation, research contributions, research rigor, design as a search process, and communication of research. We define the proposed practice-oriented DSS concept as an artefact (see above section 2.4). Then the second three guidelines for problem relevance, design evaluation and research contributions reflected on the section 3.2. Finally the guidelines of research rigor, design a search process and communication of research are reflected to the discussion on case demonstration on section 4.

3.2.1 Decision structure for supplier selection

Using these factors, we outline a decision structure for implementing group purchasing approach in healthcare industry. In a hypothetical scenario, the group purchasing team of a hospital requests tenders from the bio-medical instrument suppliers for purchasing an x-ray machine model (See Appendix A for a model specification). This purchase also requires site installation and maintenance for 5 years. There is a budgetary constraint that is of importance too. Management hopes to receive more than a strategic number of quotations from different dealers. There is a need to compare this information across the desired specification and price range. Management targets the best price and quality outcome for a required specification including better fit specifications, budget limits, suppliers' past experience, their lead time and response speed features. This hypothetical problem situation will be used to demonstrate how the system can be applicable for this problem.

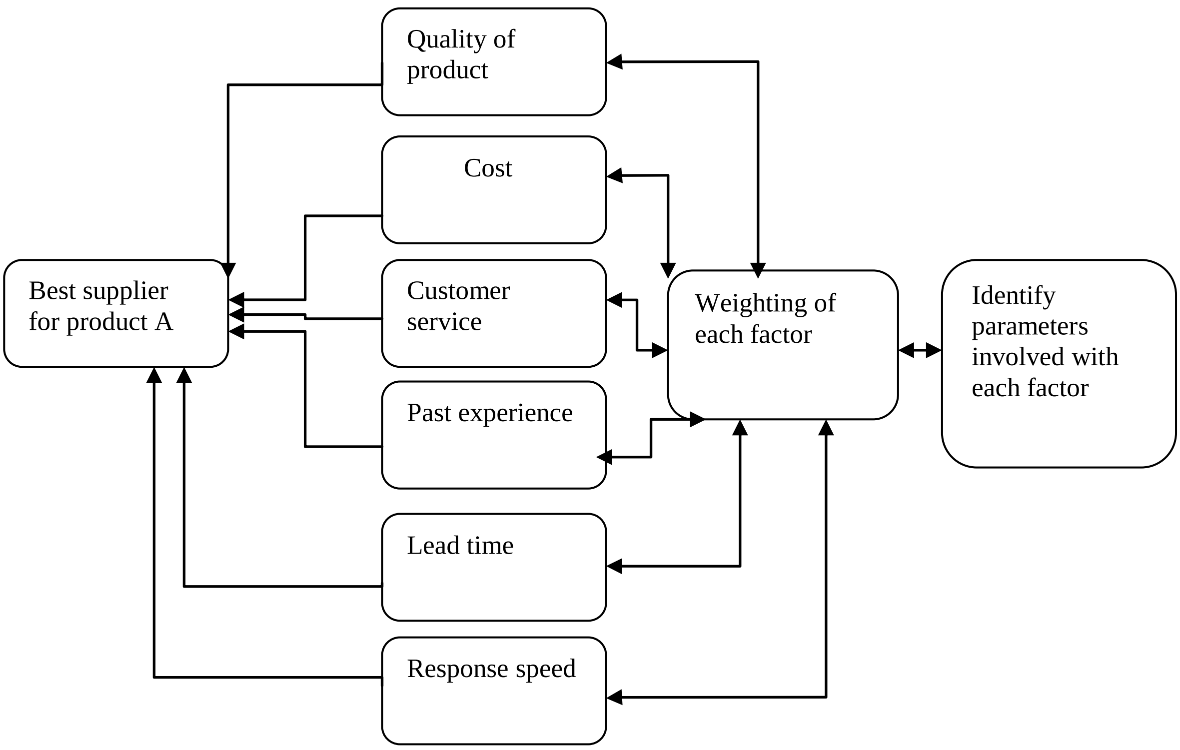

Figure 1. Decision structure for the hospital supplier selection problem

In this approach, we assume that weighting each factor for each criteria (for instance, product A may need cost factor as main criteria) will be estimated based on the best supplier. The preference of main criteria may differ based on the type of product. The detailed information on the specific criteria is existent and the impact of different values can be estimated by the purchase officers. Figure 1 illustrates how different elements of the approach are specified for assessing suppliers.

3.2.2 Proposed concept demonstration

The DSS model of Miah & Huth (2011) adapted to demonstrate our proof-of-concept approach in the paper has proven its applicability in improving decision making in an industry context. The solution approach enables operational decision makers who are contributing to the decision making to apply their specific knowledge, e.g. their functional expertise. The decision approach is different from group DSS approaches. Chen et al. (2007) suggest group decision support systems (GDSS) to assist specifically to support group decision making and the finding of alternative options to enhance decision making. However, the study by Chen et al. (2007) found that giving creative problem solving training to the group participants has positive impacts on team performance. In this design, the system provides an assessment of the current situation by determining the level of matches for appropriate supplier selection in a target purpose. The decision support approach promotes use of group knowledge or self-generated expertise in terms of key management skills to establish the required or desired state in current business conditions, utilising negotiation based understanding (e.g. rules of thumb) rather than use of traditional mathematical or statistics based approaches for supplier selections (Wu et al., 2009; Sanayei, et al., 2010). Figure 2 shows the model of the solution adapted from Miah & Huth (2011).

The concept of DSS has provisions for both managers and operation personnel. In figure 1, the knowledge categorizing is for managers and DSS application is for operation personnel e.g. purchase team members. Managers hold logical control over activities of group purchasing in which they can add or remove the selection criteria and provide instructions for handling special cases in purchasing. Purchase team can follow the instructions to operate smooth procurement system. A rule-based technique is utilised for decision making in the adapted approach to address the dynamic involvement of decision makers. In the process demonstration, figure 3 shows how preferred decision criteria is set and how the associated weights are sorted in the knowledge repository for further use in decision making.

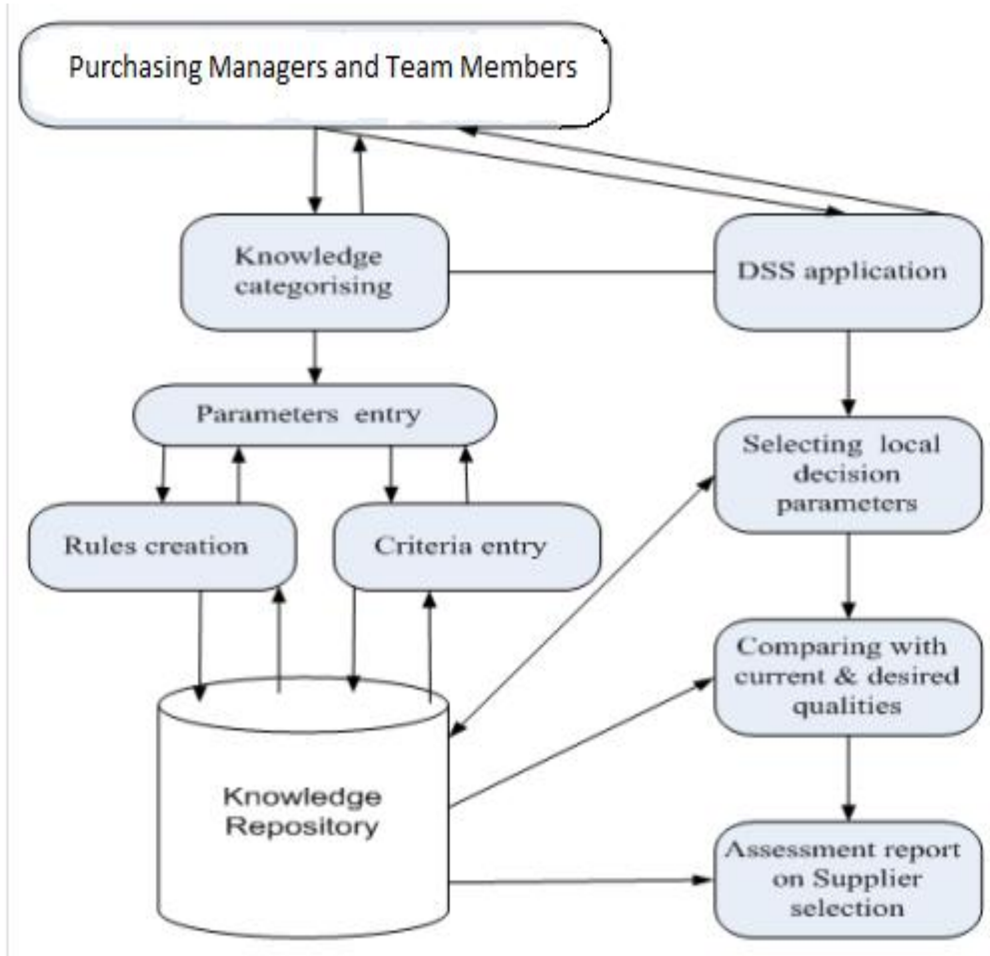

Figure 2. Decision support approach for supplier selection (adapted from Miah & Huth, 2011)

4. CASE DEMONSTRATION

As mentioned earlier in sub-section 3.2.1, a hypothetical case of purchasing an x-ray machine is used to demonstrate the outlined process. We assume that the purchase personnel are responsible for assessing both the weightings and the utility function for each specific criterion within a category. Through the specific set of criteria purchase personnel can evaluate potential suppliers for a particular product. Whereas managers can add, remove, or change criteria lists. Figure 3 illustrates common criteria added by a manager, before procurement team starts the supplier evaluation procedure.

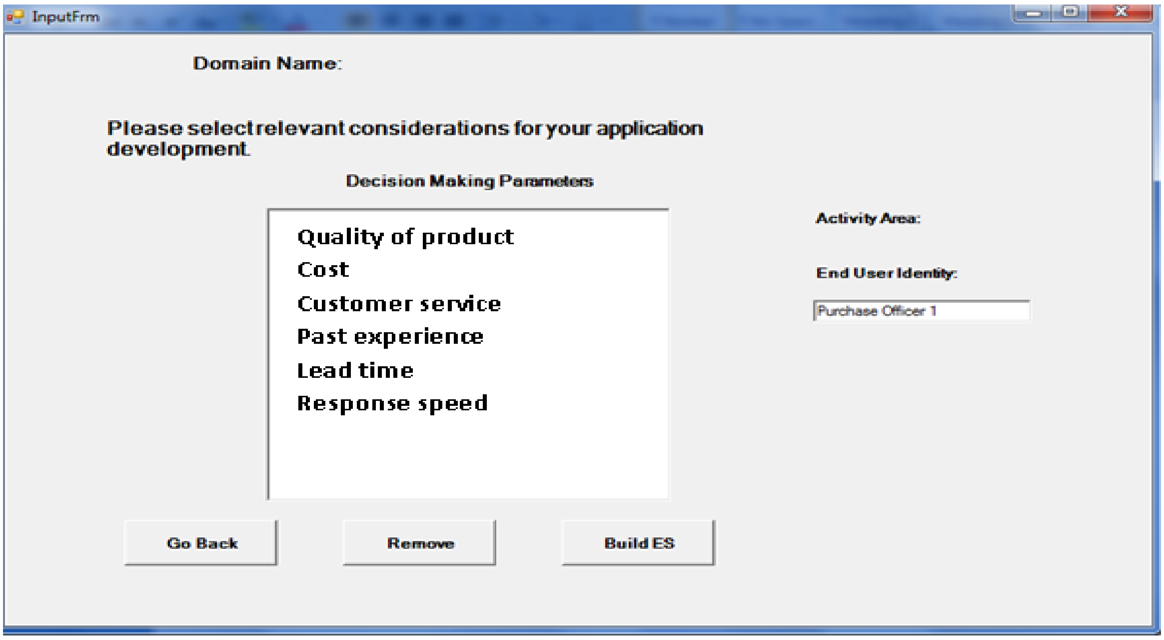

Figure 3. Parameters of supplier selection for purchasing x-ray machine

When all categories and selection criteria values are entered into the DSS model, procurement team can input the current value of the selected parameters of the criteria. The system then calculates the overall utility for all assessed suppliers, and suggests the supplier with the highest overall utility to be selected. For instance, a proposed specification of x-ray machine by supplier has costing figure and purchase team can capture this as an input. This can be done using available spreadsheet, but the DSS compares the input with the desired input that fulfils procurement conditions. For instance, overall height of the x-ray machine on purchase request is set to 1.6m. Procurement team would input the given height to find the difference between the desired and proposed specifications. On Figure 4, we illustrate how the current and desired state is compared to evaluate suppliers in this instance. This comparison can focus on both an 'ideal' supplier and the current best supplier. Figure 5 shows an example report that is generated as final outcome in which managers and team can see status of each supplier.

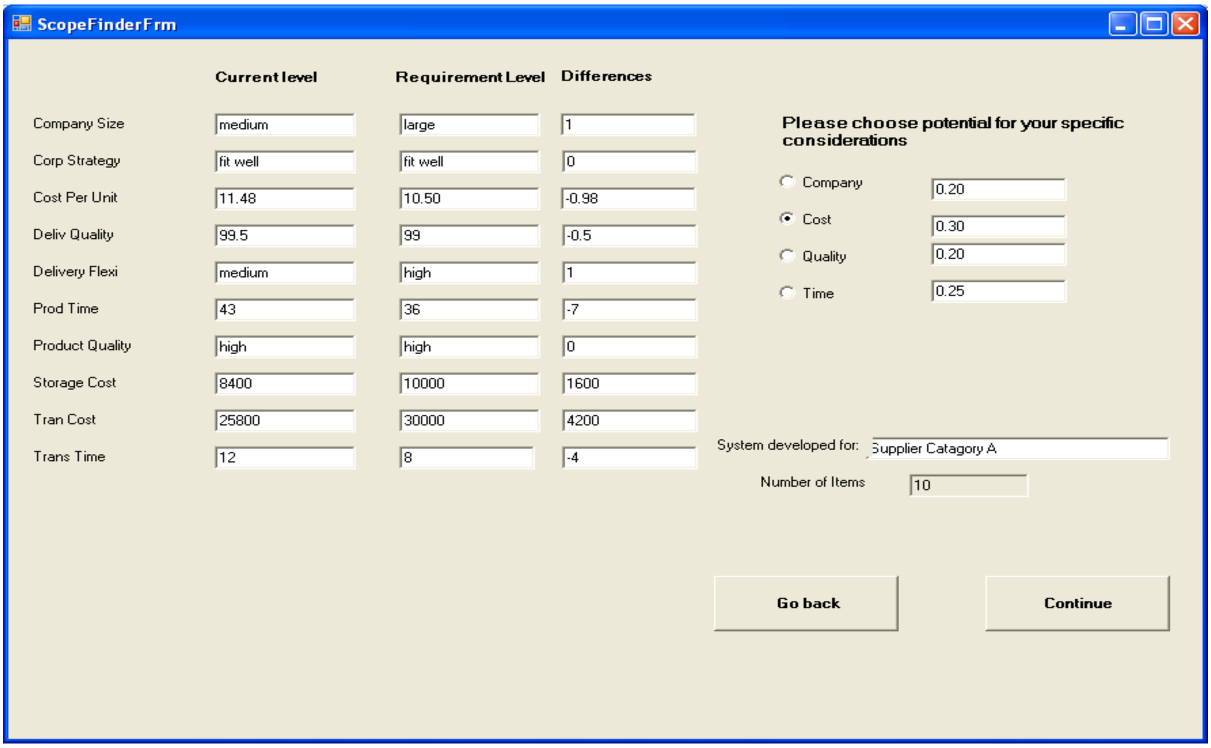

Figure 4. Comparison of current & desired criteria components offered by a supplier

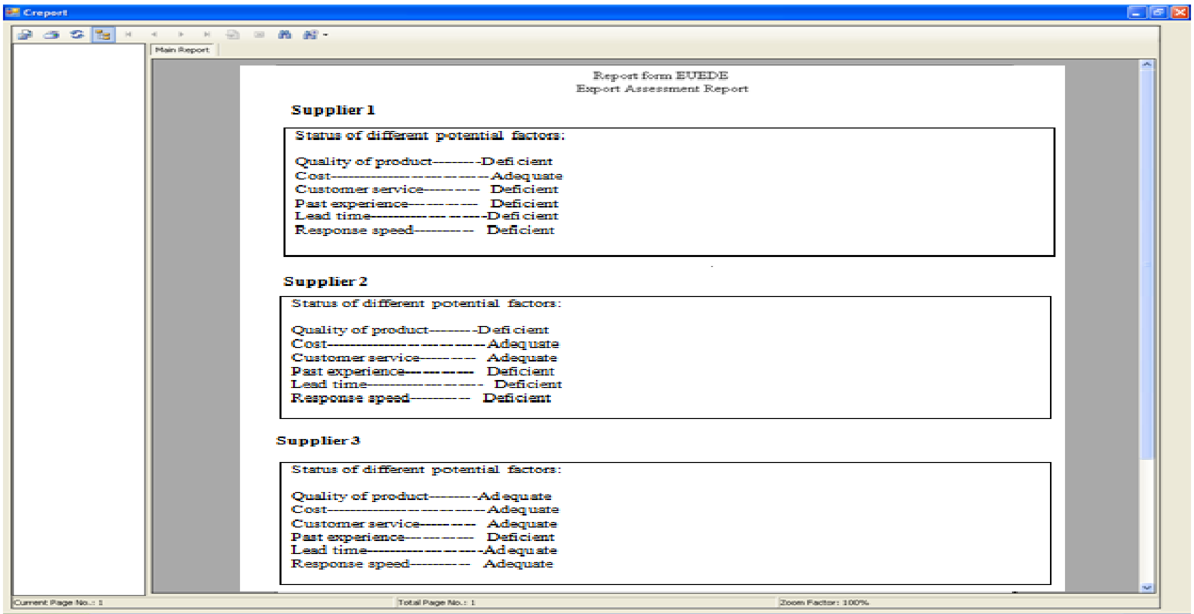

Figure 5. Generated report from the DSS as a final outcome

There might also be some kind of negotiation regarding one or more criteria involved. A team member may be interested to know the criteria for a specific supplier where the supplier underperforms and where an improvement will have the most impact so that this information can be used in the negotiation. A procurement team also can obtain details as to what extent the supplier should improve its performance in a critical criterion to reach a level which enables them to become suitable supplier for such product. Finally, procurement team can generate a report on a specific supplier for management reporting purpose. As model data, Appendix A shows factors of an x-ray machine that are important in purchasing decision making.

5. CONCLUSION AND DISCUSSIONS

The aim of our study is to develop a conceptual solution approach of decision support for multi-criteria supplier selection in health purchasing. The supplier selection in practice involves a diverse range of factors within multi-criteria opportunities. The selection process under traditional approaches is relatively complex and time consuming. However, our proposed approach promotes in-house methods of decision-making in which both procurement managers' and team members' involvement is ensured through their roles. The DSS concept provides the features for group purchasing decision making, in which decision makers' subjective preferences are valued. For example, managers hold logical control over activities of group purchasing in which the system features allow them to add or remove the selection criteria and purchase team can follow the instructions to operate smooth procurement system. At the same time, through the customisation options of the DSS, the decision maker's involvement at different management levels can be defined in the provision of criteria inputs through subjective judgements of group teams. For example, the inputs can be modified, added, or removed directly to help decision makers at group level to reach an appropriate decision by varying qualitative details of potential suppliers. The concept presented in this paper can assist health care purchasing decision makers through multi-criteria decision support for an effective solution. We use the data collected from the survey to gain an initial understanding of the problem. We identify the most important supplier selection criteria for the health care sector and our results are slightly different from Ho et al (2010) literature review findings that are generic to all sectors. Survey results show after quality, cost is the second most important criteria followed by customer service. Overall, it is worthwhile to determine industry specific supplier selection criteria rather than using a generic method in decision support application design.

The study promotes use of in-house methods in technology design for greater adaptation and better use of local resources for effective decision support. Therefore, we propose a proof-of-concept prototype for a practical case. The study focuses on designing a process of decision support for group purchasing adapting design science research methodology. The decision structure was developed and evaluated by a demonstration of hypothetical case data of procuring a hospital x-ray machine. We demonstrate case data through the DSS model features.

This model can be applicable to other types of hospital purchasing in other countries in a similar situation. This kind of model can be used for pre-selection (short-list) and final selection of suppliers. The proposed DSS model supports only a simple multi-criteria approach for group purchasing. For a complete solution with current analysis of the problem and decision support, further research is important. This research can also be extended by incorporating sustainable procurement issues during supplier selection. For a broader application design, the study can also be extended to identify the private sector supplier selection criteria for group purchasing decision support solution.

The proposed process addresses a complex supplier selection decision in group purchasing. It helps decision makers use multi-criteria purchasing options and optimises selection benefits. The computer-based decision support process addresses supplier selection issues and enables business organisations to continuously adopt new strategies and policies of purchasing management. The process also addresses some issues of cross-functioning decision making (Moses & Åhlström, 2008), in particular for the method of choice in supplier selection.

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Appendix A:

The factors that are important in purchasing decision making for an x-ray machine (the model data were collected from: http://www.pearlingtechnologies.com/id17.html).

WEIGHT	Approx. 210kg
DIMENSIONS - (incl. TV)	HEIGHT
Overall	1.70m
Lower Section	0.92m
Middle Section	0.21m
Upper Section	0.68m
X-RAY TUBE	Fixed anode, 65 – 85KVP
IMAGING SYSTEM	9” Image Intensifier CCD Miniature Camera 12” High Resolution TV Monitor
REJECTOR	Pushrod for vomit oysters
CAPACITY	1800 Oysters / Hour
CONVEYOR	490mm wide shelf, aligning vinyl belt
POWER	Maximum power consumption is 200VA Standard Model is 220/240/250V AC 50 or 60HZ Other voltages to special order
DEHUMIDIFY	One 25W lamp in both upper and lower sections total power consumption 50W
ENVIRONMENTAL	All components in lower section sealed against salt water and deck hose
WARRANTY	5 years onsite warranty parts and labour Exceptions: 12 months back to base (Perth) parts and labour

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