Tools and Techniques to assist in the analysis of requirements for Decision Support Systems

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Abstract
The success of a Decision Support System (DSS) can be influenced by many complex and intertwined factors which are often not clearly understood. This research investigates one such factor, that of the tools and techniques used by system analysts to assist them in the development of a successful DSS. By using a combination of quantitative and qualitative techniques it was firstly determined what tools and techniques were used by system analysts during DSS analysis activities, and second it was determined how and why system analysts used these tools and techniques. The outcome of this research is a series of findings that would assist not only a novice, but also a more experienced, systems analyst to more effectively determine the user requirements during DSS analysis activities.

Keywords
Tool, techniques, Decision Support Systems, Systems Analyst, Survey, Case Study

INTRODUCTION
The successful development of an information system can benefit the ultimate users of that system. However, the problem in the past has been that the return on investment for many implementations has been extremely low, if not negative (Alvalu and Joachimsthaler, 1992; Benbasat and Nault, 1990, Holland and Skarke 2001, Motiwalla and Fairfield-Sonn, 1998). A comprehensive literature review revealed that the reasons for the development of these unsuccessful systems are not well documented. This research has attempted to identify some of the reasons that can result in the successful development of a DSS system. This was achieved by concentrating on a specific part of the DSS development process, namely the DSS analysis activities. Focusing on only DSS analysis was done because it was recognised that this research could not determine all the reasons resulting in an unsuccessful system. More specifically, this research investigated the development tools and techniques that systems analysts use to determine the user requirements. Tools and techniques are procedures that can guide a person performing a given task during the development of an information system. In the literature there is a distinct lack of information about tools and techniques used during DSS analysis with any details specified in general terms rather than illustrating how such tools and techniques should be chosen (Marakas and Elam 1998; Vessey and Conger 1993). The overall premise of this research was that if the user requirements could be more accurately determined during DSS analysis activities, then there would a greater likelihood that such requirements would be more accurately modelled in the final DSS system.

This research was driven by three research questions:

1. What development tools and techniques are used during DSS analysis?
2. Why do systems analysts apply development tools and techniques during DSS analysis?
3. How do systems analysts apply development tools and techniques during DSS analysis?

METHODOLOGY
A research philosophy can be linked or associated with qualitative or quantitative research methods (Yin 1994). Quantitative methods are recognised as being useful for gaining standardised information from a large population base (Denzin and Lincoln, 1994). On the other hand, qualitative methods were best suited for tasks of discovery in describing and understanding people’s experiences, perceptions, knowledge and feelings and the meaning derived from such descriptions (Denzin and Lincoln, 1994). Many precedents have been set, to utilise both qualitative and quantitative research methods in the one research project (Klein and Myers, 1999; Miles and Huberman, 1994; Mingers 2001; Patton, 1990) and it was also considered appropriate that both quantitative and qualitative research methods be used for this research. Specifically the quantitative research method adopted was a survey, utilising a questionnaire technique and the qualitative research method used case studies. The combination of these two research methods complemented the data that was to be collected and even though it would have been possible to collect the required data using only quantitative methods considerably more time...
would have been required to collect the same type of data. For example, Pinsonneault and Kraemer (1993) state
that survey research is an ideal quantitative method when the aim is to determine additional data that can be used
in subsequent research. Whereas the use of qualitative research method enable more specific and richer
information to be obtained in a real world situation (Yin, 1989) compared to what could be obtained using
quantitative research methods only. In addition, the case studies results could be used as a form of triangulation
(Miles and Huberman, 1994) for Research Question 1 in that a different cohort was able to support the findings
of the surveys. The use of both quantitative and qualitative research methods was an important approach to gain
the maximum value from the data collected for this research. Therefore it was appropriate to include a case
study method, with the specific research design adopted as proposed by Yin (1994), to address Research
Questions 2 and 3.

DATA COLLECTION AND ANALYSIS

The data collection process had two aims with regards to addressing the questions in this research. First, to
determine what tools and techniques system analyst’s use during DSS analysis activities. Second, to determine
how and why system analysts use these tools and techniques during their DSS analysis activities. This was
achieved utilising survey and case studies to collect the initial data.

Survey one

As indicated above, a survey was considered the most appropriate means to determine what tools and techniques
were used during DSS analysis activities. However as there was a lack of specific information on what tools and
techniques were actually used by practitioners to determine DSS requirements, this survey was deemed to be
exploratory in nature because it ‘aimed at formulating more precise questions that future research can answer’
(Shanks et al, 1993). Further the survey only considered successfully developed DSS systems, with the
assumption that the tools and techniques used during the DSS analysis activities, contributed to this successful
system. It did this by attempting to establish a correlation between the tools and techniques used during DSS
analysis activities and the final success of the DSS. That is, the survey aimed to determine not only the tools and
techniques used by system analysts but also whether these resulted in the ultimate success (Garrity and Sanders,
1998; Rai, Land and Welker 2002) of the DSS development. The success of the DSS was determined using a
surrogate measure developed by Sanders and Courtney (1985). If a positive correlation could be established,
then the assumption could be extrapolated that these tools and techniques made a contribution to the success of
the DSS development.

Survey two

Analysis of the results obtained from the initial survey were inconclusive (see the Results section) as it had been
anticipated that the findings would have indicated what tools and techniques were used by system analysts in
determining user requirements, however this was not the case. Therefore a second survey was conducted to
determine what other factors contributed to the successful development of a DSS. In particular, survey two
investigated the informal techniques used during DSS analysis activities. Informal techniques differ from OLTP
(Online transaction processing) techniques investigated in survey one in that the procedures to carry them out
are often not clearly specified. Such informal techniques tend to be activities that one might intuitively carry out
to gather the required user information.

The structure of both surveys was similar and included questions on general demographic, multiple choice
questions using Likert scales, plus a series of semi-structured questions (Appendix A). The cohort from survey
one, originated from the 3,441 people who were invited to participate in this research because they had indicated
that they were system analysts at the Computer, Communications and Office Technology Exhibition in Sydney
Australia. Of the 621 people who eventually participated in this research, 171 (27.5%) returned valid surveys.
The target population for survey two was respondents to survey one. The use of the same cohort in survey two
as in survey one ensured that there was a degree of correlation with the results obtained. A total of only 48
(28.1%) valid questionnaires was obtained and processed. This low response rate, and the fact that the survey
was meant to be exploratory in nature, meant that only descriptive statistical analysis were performed on the
results.

Case studies

The two surveys provided a rich data source that was predominantly analysed using quantitative analysis
techniques to address Research Question 1. However, these results did not address Research Questions 2 and 3,
‘how’ and ‘why’ systems analysts use techniques during DSS analysis. It was apparent that a research method
was therefore required that would enable this research to address this ‘how’ question. It was decided that
qualitative research methods were the most suitable to achieve this as they assist in better understanding the social and cultural phenomena that the systems analyst operates in (Myers, 1997). In particular a case study method, using the interview technique, was ideal in addressing the ‘why’ and ‘how’ type of research question posed in this research (Yin, 1994). The aim of the case studies was therefore to determine why and how system analysts use the tools and techniques they did during system analysis activities to elicit user requirements for a particular decision support system. The process that directed the case study process was the creation of an initial set of propositions (Yin 1994). These initial propositions were created using information from three main sources (see figure 1). The first source utilised the aims of the research questions. The second source considered the results obtained from the two surveys, and the final source was the information collected through a comprehensive literature review. As a result of this process, an initial 17 propositions were proposed that reflected the current state-of-play with regards to tools and techniques used by system analysts during DSS analysis activities. These propositions were expressed in terms of what this researcher expected to expose after completing the case study research. Examples of these initial propositions included statements such as 'Diagramming techniques are an effective technique to elicit user requirements during DSS analysis', and 'The choice of techniques to be used during DSS analysis is defined in procedures that the systems analyst is able to follow' etc. These initial propositions became the foundation to generate the respective questions that were utilised in the case studies.

The case studies were conducted over a 12-month period of time. Each case involved conducting semi-structured interviews with practicing DSS system analysts in their work environment. Examples of the types of questions asked in the case studies can be found in Appendix B. Each case study took between 60 – 90 minutes to conduct with a total of 17 being undertaken. Once the first case study was completed, analysis of the collected data commenced (Atkinson 2002). Meta-matrices were used to integrate descriptive data from the different cases into a standard format (Miles and Huberman, 1994). In essence this grouped all the condensed data together into a format that allowed for easy interpretation to be made between them. The first step in this process was to code the data collected, however, before this could be started an initial set of codes was required. This was done by considering each proposition in turn, and then generating an appropriate code or codes to identify it. The overriding factor in allocating code/s to a proposition was to ensure that the introduced codes addressed as many aspects of the proposition as possible. At the end of this process a total of twenty-five codes was generated. As the case studies were analysed and coded, many additional codes had to be generated to effectively code all the data from the case studies being investigated although a further 3 cases were still conducted to validate this finding. At this time, a decision was made that sufficient data had been collected to adequately address the research questions and no further case studies were conducted.

A total of 94 codes were required to code all the data collected through the case studies. These 94 codes were then linked back to the initial 17 propositions; however it became apparent that not all the codes could be associated with a specific proposition. Therefore additional propositions had to be generated to cater for all the codes that were used to code the case study data. The outcome of this process was the specification of a total of 34 propositions (that is, the creation of an additional 17 propositions). These 34 propositions are further analysed in the following section of this paper.
FINDINGS

Surveys

The findings from survey one were analysed using standard quantitative research methods, including Spearman Rank Correlation and ANOVA statistical methods. These findings showed that on-line transaction processing (OLTP) tools and techniques were used during DSS analysis. An OLTP system refers to a distributed relational database environment (Turban and Aronsom, 1998). Interestingly, the most popular technique used during DSS analysis activities was found to be data flow diagrams (34% of respondents), followed by entity relationship diagrams (19.6% of respondents). However, it also was found that there was no significant statistical relationship \( r_s \) between the tools and techniques used during DSS analysis activities and the success of the DSS (Appendix C). That is, the OLTP tools and techniques that were used during DSS analysis activities were not perceived by the systems analyst to contribute to the ultimate success of the DSS. This was a significant finding as it was not anticipated, because one could have hypothesised that a system analyst would have used tools and techniques because they assisted him/her in the development of a successful DSS. However, this was not the case. Therefore the question that was still left unanswered by this survey was what tools and techniques actually do contribute to the success of the DSS analysis? In particular, the findings from survey one only partially answered Research Question 1; the 'what' component of what tools and techniques were used during DSS analysis activities. The implication drawn from survey one was that there were other factors, and potentially other types of tools and techniques, that contributed to the ultimate success of the DSS development process. Because the findings from survey one were inclusive, an additional survey was carried out to determine the informal tools and techniques used during DSS analysis activities.

The analysis of survey two utilised only very simple descriptive statistical tests because of the exploratory nature of this survey. The results from survey two were able to illustrate 'what' informal techniques were used during DSS analysis. It was found that the most significant informal technique identified was 'discussion with users'. That is, to determine the user requirements, systems analysts consulted with the end-users. Other informal techniques were used to a lesser extent during DSS analysis. Examples of some of these informal techniques included the use of prototyping techniques, attending DSS planning meetings, the use of data analysis techniques, attendance at other meetings, brainstorming techniques, common sense, and discussions with other systems analysts. The findings from survey two fully addressed the remainder of Research Question 1, that is, the 'what' tools and techniques are used during DSS analysis. These findings then became the basis for the structure of the case studies.

Case studies

The initial propositions that were developed to direct the case studies were further analysed to ascertain their validity. This involved considering each proposition in terms of the data collected though the case studies, and the literature, and then expressing this in terms of a finding (Atkinson 2002). The outcome of this process was the definition of a series of finding based on whether the case study data and literature supported the initial propositions proposed. During the analysis process it became apparent that additional findings were required resulting in a total of thirty-seven findings being proposed as a result of the above process (table 1).

<table>
<thead>
<tr>
<th>No</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The choice of techniques used during DSS analysis is not defined in procedures that the systems analyst is able to follow.</td>
</tr>
<tr>
<td>2</td>
<td>The choice of techniques used during DSS analysis is not guided by the analyst’s understanding of a particular methodology for the DSS development process.</td>
</tr>
<tr>
<td>3</td>
<td>The choice of techniques used during DSS analysis is directly related to the techniques utilised in the analysis of traditional information systems.</td>
</tr>
<tr>
<td>4</td>
<td>The choice of techniques used during DSS analysis is related to the intuitive nature and/or the experience of the analyst.</td>
</tr>
<tr>
<td>5</td>
<td>The choice of techniques used during DSS analysis is difficult to state.</td>
</tr>
<tr>
<td>6</td>
<td>The choice of techniques used during DSS analysis can be formally defined at a high level only.</td>
</tr>
<tr>
<td>7</td>
<td>The choice of techniques used during DSS analysis is determined by the analyst.</td>
</tr>
<tr>
<td>8</td>
<td>The choice of techniques used during DSS analysis is influenced by the presence of a sponsor for the system.</td>
</tr>
<tr>
<td>9</td>
<td>The choice of techniques used during DSS analysis is influenced by the time to complete the project.</td>
</tr>
<tr>
<td>10</td>
<td>The choice of techniques used during DSS system analysis needs to be able to determine the business requirements.</td>
</tr>
<tr>
<td>11</td>
<td>The choice of techniques used during DSS analysis is influenced by the importance the systems analyst places on working with the end-user to determine their requirements.</td>
</tr>
</tbody>
</table>
Finding

The choice of techniques used during DSS analysis is influenced by the level of experience the systems analyst has in performing DSS analysis.

The choice of techniques used during DSS analysis is influenced by the formal education the systems analyst has completed.

The choice of techniques used during DSS analysis is influenced by what the systems analyst deems most appropriate.

The choice of techniques used during DSS analysis is influenced by the knowledge the analysts have of the techniques available.

The choice of techniques used during DSS analysis is influenced by the analyst's knowledge of the business.

The choice of techniques used during DSS analysis is influenced by the formal education the systems analyst has completed.

The systems analyst must develop a close relationship with the user.

The choice of techniques used during DSS analysis must be appropriate to the user to understand.

The choice of techniques used during DSS analysis is determined by the knowledge the end-user has about what they require for their system.

An off-the-shelf type product cannot satisfy end-user requirements.

End-user requirements can only be partly determined by considering the existing system data and/or outputs from the proposed system.

The choice of which techniques to use during DSS analysis is determined by the newness of the task.

The choice of which techniques to use during DSS analysis is determined by the difficulty of the task.

The choice of which techniques to use during DSS analysis is only partially determined by the nature of the task.

The choice of which techniques to use during DSS analysis is determined by the importance of the task to the organisation.

The choice of which techniques to use during DSS analysis is influenced by how the technique assists the analyst model user requirements.

The main technique that is used to elicit user requirements during DSS analysis is 'Discussion with users'.

Diagramming techniques are an effective technique to elicit user requirements during DSS analysis.

A prototype is an effective technique to elicit user requirements during DSS analysis.

A DSS planning meeting is an effective technique to elicit user requirements during DSS analysis.

A Data Model is not an effective technique to elicit user requirements during DSS analysis.

Computer-generated information is an effective technique to elicit user requirements during DSS analysis.

Data dictionary is not an effective technique to elicit user requirements during DSS analysis.

Structured English is not an effective technique to elicit user requirements during DSS analysis.

Volunteered information can be an effective technique to elicit user requirements during DSS analysis.

Non-computer-generated information is an effective technique to elicit user requirements during DSS analysis.

Table 1 Findings from the analysis of the case study data.

These findings represent the outcome from the analysis of the data collected from the surveys and the case studies. The final process in this research was to group these findings back to the initial research questions. As such, the findings were used as the mechanism to validate the research questions. This is illustrated below.

Research Question 1: What development tools and techniques are used during DSS analysis?

This research found a number of techniques that were effective in eliciting user requirements during DSS analysis. These are presented under the following four headings: recommended techniques, techniques not recommended, partially recommended techniques and other possible techniques.

(a) Recommended techniques

The following techniques are recommended for use during DSS analysis because they are used extensively by industry practitioners:

- The technique of 'Discussions with users' was highlighted as being used extensively by analysts to elicit end-user requirements. In each of the cases investigated the systems analyst indicated that some form of verbal interaction took place with the end-user. This research strongly recommends that the technique of talking to, and discussing with, the end-users be adopted when conducting DSS analysis activities.
A prototype was also identified as a technique that was used by the systems analyst during DSS analysis. Although specific prototypes were not identified by name, it was recognised as a technique to improve communication and feedback between the user and the systems analyst, and to allow the user to visualise the system that was being developed. Therefore a prototype is a technique that the systems analyst can use while conducting DSS analysis. It is recommended that systems analysts while eliciting user requirements during DSS analysis use prototypes.

Planning meetings were seen as techniques to assist the systems analyst elicit user requirements during DSS analysis. The main benefit of the planning meeting was as a feedback mechanism between the analyst and the user. It is recommended that planning meeting be used by the systems analyst during DSS analysis activities.

Diagramming techniques were identified as an effective technique to elicit user requirements during DSS analysis. Such techniques can create a mental model of the system that can be shown to the user.

The use of computer-generated information was seen as a very important technique to elicit user requirements during DSS analysis. Computer-generated reports were the main source of information for this technique. Such information gave the systems analyst valuable background information about the current system and it is therefore recommended for use as a technique during DSS analysis activities.

Non-computer-generated information was identified as being valuable in eliciting user requirements during DSS analysis. Non-computer information includes hand-written notes and reports, and was seen as a method to highlight any shortcomings of the current system. Therefore it is recommended that systems analysts use the technique of using non-computer-generated data during DSS analysis activities.

(b) Techniques not recommended

A number of techniques were identified as being ineffective in eliciting user requirements during DSS analysis and their use is not recommended. Details of the techniques that fall into this category are given in this section:

- Although diagramming techniques were recommended for use during DSS analysis there are some types that are not recommended for use. In particular those diagramming techniques traditionally associated with OLTP system analysis were not seen as being of value during DSS analysis. An example of a technique is an entity relationship diagram. It is recommended that careful consideration be given to the most appropriate diagramming technique to be used during DSS analysis activities because not all diagramming techniques are appropriate.

- Other techniques that were highlighted as being ineffective in analysing DSS user requirements also fall into the category of structured techniques. Again, such techniques are normally associated with OLTP system analysis. Examples of such techniques include Structured English and a Data Dictionary. Although these techniques were highlighted by a number of systems analysts as effective in eliciting user requirements, this researcher believes that they were mentioned out of ignorance and there applicability is limited in assisting in the DSS analysis process.

(c) Partially recommended techniques

One technique that was found to be partially supportive in determining user requirements during DSS analysis was 'User volunteered information'.

(d) Other possible techniques

A number of techniques have been specifically quoted as being applicable for use with DSS analysis. These include cognitive maps and influence diagrams (Daelllembach, 1994; O'Donnell et al., 1994). Although such techniques were only mentioned in a few cases in this research, it is believed that lack of knowledge of such techniques is the reason for these not being used rather than a desire not to use them. It is recommended that systems analysts consider the use of such techniques in DSS analysis. It is also recommended that institutions responsible for training DSS systems analysts detail the advantages and disadvantages of such techniques to systems analysts while conducting DSS analysis.

On a side issue, it was highlighted by DSS systems analysts that it was not possible to use off-the-shelf products to satisfy end-user requirements.

Research Question 2: Why do systems analysts use particular development tools and techniques during DSS analysis?

This research identified why system analysts used particular tools and techniques during DSS analysis activities. These reasons were grouped in the categories of: systems analyst, user, task, and organisation.
(a) Systems analyst

The systems analyst will select techniques upon consideration of the following issues:

- The amount of experience the systems analyst had in conducting DSS activities was an important factor in determining why specific techniques were selected during DSS analysis.
- The level of formal education was found to influence the techniques to be selected by the systems analyst during DSS analysis. That is, the choice of why a particular technique is used during DSS analysis is related to the level of formal education attained by the systems analyst.
- The reason why a particular technique is used during DSS analysis is also related to the techniques that the systems analyst deems to be the most appropriate. However the systems analyst often had problems verbalising why they selected a particular technique.
- Four reasons were given as to why one particular technique was selected by the systems analyst over another one. The first reason was that the systems analyst was not aware of other suitable techniques to use. The second reason was that it was the technique another analyst recommended should be used. The third reason was because the systems analyst was aware of the techniques that should be used during DSS analysis. The final reason as to why a systems analyst would select one technique over another one was because it was dictated by the management of the company that that was the one to use.

(b) User

In this section the reasons why a systems analyst selects particular techniques for DSS analysis are presented in terms of the person using the DSS.

- A systems analyst will select a technique to use during DSS analysis if the end-user is able to understand the results generated by the technique. That is, the output from a technique should be able to be interpreted not only by the systems analyst but also by the end-user.
- The reason why a systems analyst will select a particular technique is related to how much the end-user knows about what they require for their system. That is the knowledge the end-user has about the system requirements influences the techniques that the systems analyst will use.
- The importance of working with the end-user was highlighted in the case studies as being an important technique in determining end-user requirements. This meant the systems analyst would use techniques that would assist the systems analyst to work closely with the user.

(c) Task

In this section the reasons why a systems analyst selects particular techniques for DSS analysis are presented in terms of the task.

- The systems analyst will use different techniques when analysing the requirements of a new task.
- The systems analyst will select different techniques when analysing the requirements of a more difficult task.
- The nature of the task was identified as a factor that would only partially influence the systems analyst choice of a technique during DSS analysis. This appears to contradict the findings given above; however it is a more general statement about the nature of the task and this would be the reason it is only partially supported.

(d) Organisation

In this section the reasons why a systems analyst selects particular techniques for DSS analysis are presented in terms of the organisation:

- The reason why a systems analyst will select a particular technique during DSS analysis can be due to the organisation dictating which ones must be used. In such cases the organisation has policies in place that will not give the systems analyst the option to select a technique to use during DSS analysis.
- The selection of the techniques to use during DSS analysis is related to the importance of the task to the organisation. The implication is that the systems analyst will be supported in completing the development of the DSS in being able to select the techniques required.
- The choice of the techniques to use during DSS analysis in influenced by the time available to complete the process.
- The choice of the techniques to use during DSS analysis is also supported by the presence of a sponsor for the system.
The techniques that are used during DSS analysis must be able to determine the business requirements of an organisation. That is the techniques must be able to model not only the task but also the requirements of the general business environment.

In this section the findings were used to address Research Question 2 ‘Why do systems analysts use particular development tools and techniques during DSS analysis?’

**Research Question 3:** How do systems analysts apply development tools and techniques during DSS analysis?

The third research question in this paper related to ‘how’ systems analysts go about selecting particular techniques during DSS analysis. The main categories identified were: systems analyst, user, task, organisation and methodology.

(a) Systems analyst

- A systems analyst will intuitively select techniques to use during DSS analysis. The systems analyst often found it difficult to verbalise the reasons for selecting a particular technique; suffice it to say the process was intuitive and also related to experience.
- The systems analyst finds it difficult to detail the techniques to be used during DSS analysis activities. This makes it difficult to be prescriptive in details as to how a systems analyst selects techniques during DSS analysis.
- The selection of which techniques to use during DSS analysis resides with the systems analyst. In some instances techniques are dictated by the organisation; however in general it is the analyst who will decide which ones will be used.

(b) User

- It was also found that it is important that the systems analyst develops a close working relationship with the user while determining user requirements. This close relationship ensures user-volunteered information is accessible.
- The choice of techniques used is related to how well they assist the analyst in modelling the user requirements.

(c) Technique

- Systems analysts indicated that they would not change the techniques they selected for use during DSS analysis. Even in hindsight, systems analysts would not change the techniques used during DSS analysis.
- The choice of techniques to use during DSS analysis can only be specified at a general level.

(d) Organisation

- The choice of which techniques the systems analyst will use during DSS analysis activities is influenced by the knowledge the analyst has of the business being modelled. If the analyst does not have this knowledge then techniques will be selected to assist the analyst determine this.
- The selection of techniques to use during DSS analysis is only partially influenced by taking into consideration the existing data and/or outputs from the proposed system.

(e) Methodology

- The selection process for the techniques to be used during DSS analysis was not defined in procedures that the systems analyst could follow. It was not possible for the systems analyst to refer to a series of steps to determine which techniques to use during DSS analysis.
- The selection by a systems analyst of techniques to use during DSS analysis is not guided by using a particular DSS methodology. This means that the systems analyst uses other approaches to select the techniques used in DSS analysis.
- The systems analysts in the case studies indicated that they selected techniques that are generally used in the analysis of traditional information systems.

**CONCLUSION**

This research was focused and driven by three research questions. In each case, these research questions posed issues that are relevant to systems analysts who are involved in DSS analysis activities and ultimately for the success of the systems they develop. The current literature does not provide the practical knowledge or theoretical support that a systems analyst requires to effectively apply development tools and techniques during such DSS analysis. This research has been able to provide systems analysts with information that would greatly
assist their DSS analysis. In particular the outcomes of this research are practical propositions and findings that
can be applied to 'real' DSS analysis activities. These outcomes were obtained analysing the statements made by
practitioners in the DSS field. As such these findings reflect the activities that are actually performed by systems
analysts and offers practical suggestions in carrying out DSS analysis. Therefore, it is recommended that
systems analysts when carrying out DSS analysis carefully consider these findings. This is an opportunity for
systems analysts who are not experienced in DSS analysis activities to utilise these findings to assist them in
performing such tasks.

This research will stimulate additional discussion and debate through the findings that have been proposed. It is
recommended that these statements become the basis of future research. In particular these statements need to be
further evaluated on a wider cohort of respondents to confirm their applicability. It is therefore suggested that
this research be validated by replicating the research conducted on a different cohort to determine if similar
findings are obtained. This research should be seen as part of a wider process that can be used to further assist
the system analyst in successfully conducting DSS analysis activities. The ultimate aim of such a process would
be to develop a mapping procedure to guide systems analysts when eliciting user requirements during DSS
analysis activities.

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APPENDIX A: FORMAT OF QUESTIONS USING IN SURVEY ONE AND TWO

<table>
<thead>
<tr>
<th>In some jobs, outcomes are</th>
<th>0-20%</th>
<th>21-40%</th>
<th>41-60%</th>
<th>61-80%</th>
<th>81-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>unpredictable - i.e. you don’t know what will happen.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>To what extent were the techniques you encountered in the analysis of this DSS new</td>
<td>extent</td>
<td>extent</td>
<td>extent</td>
<td>extent</td>
<td>extent</td>
</tr>
<tr>
<td>How similar were the day-to-day techniques you encountered in performing the analysis of this DSS</td>
<td>very much</td>
<td>mostly</td>
<td>quite a bit</td>
<td>very much</td>
<td>completely</td>
</tr>
</tbody>
</table>

If possible, list two techniques that offered you the most assistance during the analysis of this DSS (list in order of greatest assistance):

APPENDIX B: TYPES OF QUESTIONS USING IN THE CASE STUDIES

<table>
<thead>
<tr>
<th>Ref</th>
<th>Statement</th>
<th>Question</th>
<th>Prompt if necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompt 2: DSS analysis activities are the stage of the DSS development process where you determined the user requirements.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Were you responsible for conducting the analysis activities on the DSS you developed?</td>
<td>Yes or No</td>
<td></td>
</tr>
<tr>
<td>If the answer to Q3.1 is NO then the interview should finish, otherwise proceed to question 3.2</td>
<td>Unfortunately you are not really the right person to answer these questions – I am sorry for the confusion</td>
<td>If no – can you speak on their behalf?</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>So you were involved with determining and specifying user requirements for this DSS?</td>
<td>Yes or No</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>How many people are involved in DSS analysis activities?</td>
<td>Require a reasonably exactly number</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>I am now going to home in on this particular DSS – can you tell me a little more about this DSS you helped to analyse.</td>
<td>Prompt:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Size – how do you define it: large, small, medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. How Long did it take to develop??</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. What does it do?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX C: EXAMPLE OF RESULTS FOR SUCCESS WITH THE ANALYSIS OF THE DSS (USING SPEARMAN RANK CORRELATION)

<table>
<thead>
<tr>
<th>Test</th>
<th>Rs - corrected</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall satisfaction with the analysis phase versus task newness</td>
<td>.073</td>
<td>No</td>
</tr>
<tr>
<td>Personal satisfaction with the analysis phase versus task newness</td>
<td>.104</td>
<td>No</td>
</tr>
<tr>
<td>Overall satisfaction with the analysis phase versus task difficulty</td>
<td>-.053</td>
<td>No</td>
</tr>
<tr>
<td>Personal satisfaction with the analysis phase versus task difficulty</td>
<td>-.014</td>
<td>No</td>
</tr>
<tr>
<td>Overall satisfaction with the analysis phase versus task variability</td>
<td>-.161</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------</td>
<td>-----</td>
<td>---</td>
</tr>
<tr>
<td>Personal satisfaction with the analysis phase versus task variability</td>
<td>-036</td>
<td>No</td>
</tr>
<tr>
<td>Overall satisfaction with the analysis phase versus task standardisation</td>
<td>053</td>
<td>No</td>
</tr>
<tr>
<td>Personal satisfaction with the analysis phase versus task standardisation</td>
<td>188</td>
<td>Yes</td>
</tr>
<tr>
<td>Overall satisfaction with the analysis phase versus task authority</td>
<td>181</td>
<td>No</td>
</tr>
</tbody>
</table>

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