

**UNIVERSITY OF KWAZULU-NATAL**

**The Enhancement of Traditional Decision-Making with a  
Decision Support System**

**By**

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## Abstract

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Decision-making is a crucial part of management which is evident at all levels. Strategic decisions are taken by management and are vital to the functioning of the organization. It was important to gauge the current ability to make decisions and discover the shortfalls. Due to the amount of information, speed, and the immense amount of pressure to make good decisions, a new technological system to aid in this plight was found. This was in the form of a Decision Support System. This study investigated whether or not having a decision-making tool at the finger-tips of the managers would provide benefits, such as timely information, which could then be used for decision-making and could result in enhanced employee productivity at Toyota South Africa Assembly Hall Maintenance Department. It was not sufficient just to show the benefits of a new system. The system needed to be accepted first in order to obtain the maximum benefit of the system. The Technology Acceptance Model was used to find the relationships between the perceived ease of use, perceived usefulness and the attitude of the users toward the use of the DSS. To obtain the information from the future senior management of the Department, questionnaires were issued of which 79% were returned answered. The information was examined and analysed with Pearson's correlation, linear regression and literature comparisons, which found that perceived usefulness of the system plays a much greater role than the perceived ease of use in the acceptance of a system. To facilitate an improvement in the decision-making ability, it was recommended that a decision support system should be designed and installed as a long term investment. Further research needs to be undertaken to gain correct knowledge to originate a conceptual design and to bring this into operation. The design of the system was not evaluated and this proved to be a limitation to the study. However, to use the questionnaire to evaluate the design would have made the questionnaire more complicated and this would have been likely to have lowered the response rate, which would have jeopardized the study.

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# Chapter One

## Introduction

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### 1.1. Introduction

"The clearer the future picture is the clearer the decision making process. This means being a forward thinker is a critical skill in being a good decision maker and mover" (Groenewald, 2013). In order to allow for good decisions for the future, relevant and meaningful information is needed (Yadav, 2006). The robustness of the information and the format in which it is displayed plays a big part in allowing leaders to make crucial decisions. Decisions need to be taken when there is uncertainty, conflicting views, risk or future plans. Bad decisions could considerably harm a business, eventually leading to irreversible damage (Hammond et al., 2003). Strategic decisions are taken by management and are crucial to the functioning of the organization. It was for this reason that the current decision-making ability at Toyota South Africa Manufacturing Assembly Hall Maintenance Department was evaluated to discover if it could be enhanced.

Due to the amount of information, speed, and the immense amount of pressure to make good decisions, a new technological system to aid in this exercise was found. This was in the form of a Decision Support System (DSS). Having a decision-making tool at the finger-tips of the managers should provide numerous benefits, such as timely information, which would then be used for decision-making and this should also result in enhanced employee productivity. But it was not sufficient just to show the benefits of a new system. In order to obtain the maximum benefit from the system, it had first to be accepted by the users.

### 1.2. Motivation for the Study

This dissertation is important to the senior management of the Toyota organization as it demonstrated the advantages of enhancing the decision-making abilities of the employees. In addition, it showed the willingness of the employees to accept the new technology to enhance the efficiency of the company.

Financial gain due to machine uptime is a direct result of correct decisions made to maintain, repair or upgrade them. "Down time caused by malfunctioning machinery

can cost in the excess of R300 000 every 90 seconds,” Mr. M. van Vuuren stated in an interview on April 10, 2013. He was the Maintenance Planner of Assembly Hall Maintenance Department and kept records of all downtime and repairs that were done. He further went on to saying that this was an average cost of selling one vehicle, and the time it takes for one completed vehicle to be driven off the production line. Incorrect decisions could gravely impair the operation of the plant. Managers using the decision-making tool should be able to make quicker, reliable decisions, which would help middle management to plan maintenance efficiently. This has a trickle-down effect on the artisans who would be likely to have an increased confidence in the decisions made. By streamlining processes, the production would be increased thereby producing a higher number of vehicles. In the end, the customer would also benefit by getting a higher quality vehicle within a shorter time frame.

### **1.3. Focus of the Study**

The strategic decision-making ability of prospective users of the DSS were assessed, and grouped for each stage of decision-making. Such users were not asked to comment on specific instances of decision-making but the study chose rather to focus upon their approach to decision-making *per se*. The aim was not to home in on all the shortfalls of the users, but rather to show that the process could be enhanced.

The targeted technology was the DSS in general, rather than specific DSS programs. This was done due to the numerous software programs available. It would have been difficult to conduct a study that used preconceived software that may not cater for the specific needs of the Department. The use of the DSS was evaluated to show the benefits it would have in enhancing the decision-making abilities of the people being groomed as future management of Toyota Assembly Hall Maintenance.

The study provided a broad overview of the acceptance level and utilization of a DSS which uses the Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw., 1989). The users' attitude towards the use of the system was a deciding factor in the acceptance test. There are many more variables that play a role in estimating the level of acceptance however the crucial factor would be the way the user 'feels' about the new technology that decides how they will perceive it (Ford & Ford, 2010).

By looking at these points, one could reach a conclusion on whether the system would be accepted or rejected.

#### **1.4. Problem Statement**

Strategic decisions in manufacturing organisations need to be made effectively and efficiently to ensure that production is able to run seamlessly to meet and exceed targets set out. Due to the fast pace of operation at Toyota South Africa Assembly Hall Maintenance, decisions can sometimes be made ineffectively, which may or may not be the fault of any individual (Steers, Nardon, & Sanchez-Runde., 2013). . Mr. M. van Vuuren went on to state that the department average downtime was approximately 373 minutes per month. This equates to roughly R74 600 000 loss per month and R895 200 000 per annum, that is in the region of 2 984 vehicles not being produced. This affects the production rate negatively, decreasing the number of vehicles being produced, and targets are not reached. This negative effect cascades down to the middle management who have to deal with the production personnel seeking answers to the question of why the inadequate decisions were made in the first place. The artisans bear the brunt of the direct effect of failures within the present automated systems and peripherals. By not reaching the estimated target, the company's bonus scheme would be at stake. Furthermore, the company would have to prolong the delivery time to the customer. As a result of customers waiting longer for their vehicles, their perception of Toyota could change, making them turn to other dealers. Toyota would also lose by having to pay for each vehicle that does not make it on time for shipping due to payment being made per space. This means that, if the vehicle is not present at the specific shipping date, the ship leaves but Toyota would still be liable for the payment of the empty space. The introduction of a DSS could aid in the enhancement of the traditional decision-making processes in dealing with these issues.

#### **1.5. Research Sub-Questions**

The main aim of the study was to show whether the DSS could provide an improvement to the decision-making process. In order to achieve this there were other questions that needed to be asked. These were as follows:

- Is there an inadequacy in the current decision-making ability?

In order to move forward with the study, a distinct level of improvement needed to be shown after the application of the DSS.

- Would the DSS system be accepted by management at Toyota (SA) Assembly Hall maintenance?

No matter how effective a system may be, if there is no acceptance by the users, the system will not be utilized to its full potential, and it will ultimately fail to achieve its intended purpose.

After answering these questions, it is possible to ascertain the answer for the main research question:

**“How would the implementation of a DSS affect the current strategic decision-making process of Toyota SA Manufacturing Assembly Hall Maintenance Department?”**

### **1.6. Hypothesis**

- Hypothesis 1<sub>0</sub>: There is a possibility of improving the current decision-making ability of managers at Toyota (SA) Manufacturing Assembly Hall.
- Hypothesis 1<sub>1</sub>: There is no possibility of improving the current decision-making ability of managers at Toyota (SA) Manufacturing Assembly Hall.
  
- Hypothesis 2a<sub>0</sub>: There is a significant relationship between the perceived ease of use and the perceived usefulness of the DSS.
- Hypothesis 2a<sub>1</sub>: There is no significant relationship between the perceived ease of use and the perceived usefulness of the DSS.
  
- Hypothesis 2b<sub>0</sub>: There is a significant relationship between the perceived usefulness of the DSS and the decision-makers' attitude towards using it.
- Hypothesis 2b<sub>1</sub>: There is no significant relationship between the perceived usefulness of the DSS and the decision-makers' attitude towards using it.
  
- Hypothesis 2c<sub>0</sub>: There is a significant relationship between the perceived ease of use of the DSS and the decision-makers' attitude towards using it.
- Hypothesis 2c<sub>1</sub>: There is no significant relationship between the perceived ease of use of the DSS and the decision-makers' attitude towards using it.

- Hypothesis 3<sub>0</sub>: There is a possibility that the DSS can be used to improve the decision-making ability of managers at Toyota (SA) Manufacturing Assembly Hall.
- Hypothesis 3<sub>1</sub>: There is no possibility that the DSS can be used to improve the decision-making ability of managers at Toyota (SA) Manufacturing Assembly Hall.

## **1.7. Objectives**

Primary objective:

- To show that the DSS can be used to improve the decision-making process

Secondary objectives:

- To conduct a literature review on the strategic decision-making process and on the Implementation of a DSS;
- To understand the current decision-making skills;
- To ascertain the general awareness that decision-makers have of the DSS;
- To examine the attitudes towards the use of the DSS;
- To establish if a relationship exists between the users attitude towards using the DSS and the perceived ease of use of the DSS;
- To determine if a relationship exists between the users attitude towards using the DSS and the perceived usefulness of the DSS; and
- To identify the views of future managers on the proposed system.

## **1.8. Limitations of the Study**

### **1.8.1. Size of the population**

The population size was small due to focus being on the graduates groomed for senior management positions in the Assembly Hall Maintenance sector. This was to look at the future leaders now, and judge the changes that could be made in order to enhance the future of the company. The survey was localized to a singular department, and the results would show the outcome pertaining to this area only.

### **1.8.2. Administration of the questionnaire**

It was difficult to get the questionnaire to the relevant personnel timelessly, so it was in the best interest to get the departmental secretary involved to disperse the questionnaires.



### **1.8.3. Response-level to questionnaire**

The questionnaires were sent to all the respondents of the census, unfortunately not all were returned. However, it was still within the adequate sample size needed.

### **1.9. Summary**

This chapter presented the overview of the study, motivation for the study, and the hypotheses as well as the limitations of the study. It outlined the importance of decision-making and the reason for the study. The DSS was to be presented to the candidates being groomed for the future management of the of the Assembly Hall Maintenance department in the effort to understand what they think and to introduce them to the DSS concept now in order to be implemented later.

The next chapter goes on to give background information on decision-making and the different facets it encompasses. It then introduces the DSS, showing what it is, the advantages and disadvantages.

## Chapter Two

### Literature Review

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#### 2.1. Introduction

This chapter examines the literature on the decision-making processes and the involvement of technology in the facilitation of this process. Technology seems to move forward at a blistering pace, which changes the way organizations conduct business, although the strategic decision-making process appears to have remained stagnant. The managers rely on judgments and experience of the senior management. Quantitative and qualitative information needs to be analysed and assessed effectively and efficiently. The interpretation of this data would be based on their experience and intuition. This could be problematic given the volatility of the environments (Townsend et al., 2000). By incorporating technology into the process could aid in enhancing the managers' ability to make strategic decisions (Schuff, 2011).

The chapter is structured in the following way:

- Understanding the segments of the decision-making process;
- Grasping the concept the DSS;
- Relating the DSS to strategic decision-making; and
- Using the TAM to assess the user's perception of a technology's usefulness, and ease of use, and how this contributes to the acceptance of the new technology.

#### 2.2. Decision-Making

Decision-making has been variously defined as: "The process of making informed, intentional choices" (Marakas, 2003); "a commitment to action" (Mintzberg, 1973); "the product of intellectual processes resulting in the selection of a course of action between numerous options, leading to a final selection" (Saaty, 2008). Common to all these and to many others is the notion that it is about making a calculated choice (Pomerol, 2012). Decision-making is a crucial part of management, which is evident at all levels. As was pointed out in Chapter one, decisions are required at certain strategic moments and bad decisions can have a major detrimental effect on the

organisation (Hammond et al., 2003). By having incorrect and/or incomplete information this can lead to defective decisions (Forrester, 2003). Acquiring the correct, relevant information in a timely manner is vital to the making of sound decisions (Teradata, 2004).

Decision-making is usually an intellectual process that requires skills, knowledge and experience. It is said that that human creativity and judgment is needed, making it a humanized process (Angehrn, 1991; Solway & Botvinick, 2012). It is important to note that decision-making is not undertaken to achieve an end result immediately, but rather it is a step in accomplishing the goals set out. Decision-making relates to a specific problem, and it is a unique process adaptable for different scenarios. Since each scenario is different, the time to achieve the outcome will be different which could vary from a short time to a lengthy process that includes various amounts of data (Albright et al., 2010). Decision-making is a time-consuming activity (Kerzner, 2013).

Management at all levels is involved in decision-making that pertains to their jobs and criteria (Plunkett et al., 2011). Decision-making could be acknowledged as the primary function of management. Strategic decisions start at the top-level management. Actions would not be initiated without decisions at a high level to achieve a certain goal (Laroche, 1995).

Typically there are three levels of management that an organization consists of, and these are: operational management, middle or tactical management, and senior or strategic management (AlHussayen, 2009). Each level also has its own mechanism to extrapolate relevant data to make correct decisions. According to Laudon and Laudon (2006), each level can be seen as having an unstructured, semi-structured and structured process. Table 2.1 listed below, illustrates the levels of management with an example and the decision characteristic. It attempts to breakdown each level of management and illustrates the types of decisions that are made. It demonstrates that decision-making is an activity that is crucial to the functioning of each level of the organization.

<b>Decision Characteristics</b>	<b>Management Type</b>	<b>Example of decisions</b>
Unstructured	Senior Management	<ul style="list-style-type: none"> <li>• To improve the capital budget</li> <li>• To determine the long-term goals</li> <li>• To decide on entrance or exit from market</li> </ul>
semi structured	Middle Management	<ul style="list-style-type: none"> <li>• Departmental budget assignment</li> <li>• Designing a market plan</li> <li>• Corporate website update or creation</li> </ul>
Structured	Operational management Individual operations and teams	<ul style="list-style-type: none"> <li>• Restock inventory</li> <li>• Feasible overtime allocation</li> <li>• Determine special offers to customers.</li> <li>• Offset Credit to customer</li> </ul>

Table 2.1 The Three Levels of Management

Adapted from AlHussayen, T.F., 2009. *Organisational Decision Making Assessment and Improvement*. Dissertation. University of Manchester

Structured decisions are those that occur regularly, where predefined procedures can be followed to adequately handle the decisions. Semi-structured decisions occur when the situation allows for a segment to have a predefined procedure. Unstructured decisions are those that are non-routine with a high degree of uncertainty. These latter decisions require insight, correct judgment and vigorous assessment of the problem (Laudon & Laudon, 2006).

Current research outlines and investigates decision-making capabilities commonly used across all organizational levels. This dissertation will focus on the decision-making capabilities at a strategic level to narrow down the immense volume of information on decision-making.

### **2.3. Strategic Decision-Making**

According to Harrison (1996), the process of strategic decision-making has three definite process flows which contribute to the final goal. This can be seen in Figure 2.1 on the next page. The primary flow comprises the foremost aspects of the decision-making process. These processes cannot be avoided or overlooked without detrimental consequences to the total outcome. Information plays a vital role in assessing the situation which would enable the best outcome to be chosen (Yadav, 2006). The information needed would be from the external environment to enable the decision-maker to deduce the strengths, weaknesses, opportunities and threats to the company so that numerous alternatives could be considered (Brest & Krieger, 2010). The gap analysis enables the decision-maker to ascertain the cohesiveness of the changes that should be made. It allows for the objectives, determined by the managerial decisions, to be set or changed. A strategic choice is made and implemented after managerial objectives are constituted. Feedback would be needed from the external environment on the decisions made and this enables management to evaluate the choices and to take the necessary action to correct or enhance the decisions. The decisions are continuously monitored to ensure that the end result could be achieved even if there are unexpected changes in the external environment (Harrison, 1996).

The corollary flow consists of the subsidiary functions of the process. This would determine what functions can be overlooked or temporarily dismissed, but not without an impact on the total outcome. The corollary flow together with the primary flow improves the prospects for a successful strategic decision (Harrison, 1996).





Figure 2.2 Incorporation of Intuition into Decision-Making

Adapted from Darden School of Business, 2013. *Strategic Decision Making*. [Online]

#### 2.4. Information

Yadav (2006), state that the collection of information is imperative to evaluate the external environment in order to make the correct strategic decision. The information collected is used to reduce uncertainty. Uncertainty is the difference between the information required to complete a task and the information processed (Schönrok, 2010), or as Knecht (2013) articulates it, an inability to accurately predict the outcome of a decision.

The information collected can be classified as hard or soft. Hard information is data that can be quantified and analysed, such as numerical data, financial records and statistical information. Soft information consists of pictures, ideas, visions and constructive thought (Petersen, 2004). Frishammar (2003) talks about gossip and hearsay being classified as soft information, therefore one could conclude that soft information could be looked at as an individual person's view of the situation, thence, making it subjective. Petersen (2004) also states that in any decision there is definite chance that a combination of the two types of information is needed. Depending on the decision, the ratio of each will vary.

A decision-making process is displayed Figure 2.3 below that includes the types of information needed at each stage. It shows three major stages; intelligence, choice, and development. The boxes characterize decision-making stages which classify the type of information that ought to be obtained. The circles identify where choices are made by a decision-maker to monitor information gathering. The arrows indicate decision-making steps which identify actions called for by the decision-maker and others involved in the decision process (Citroen, 2009).

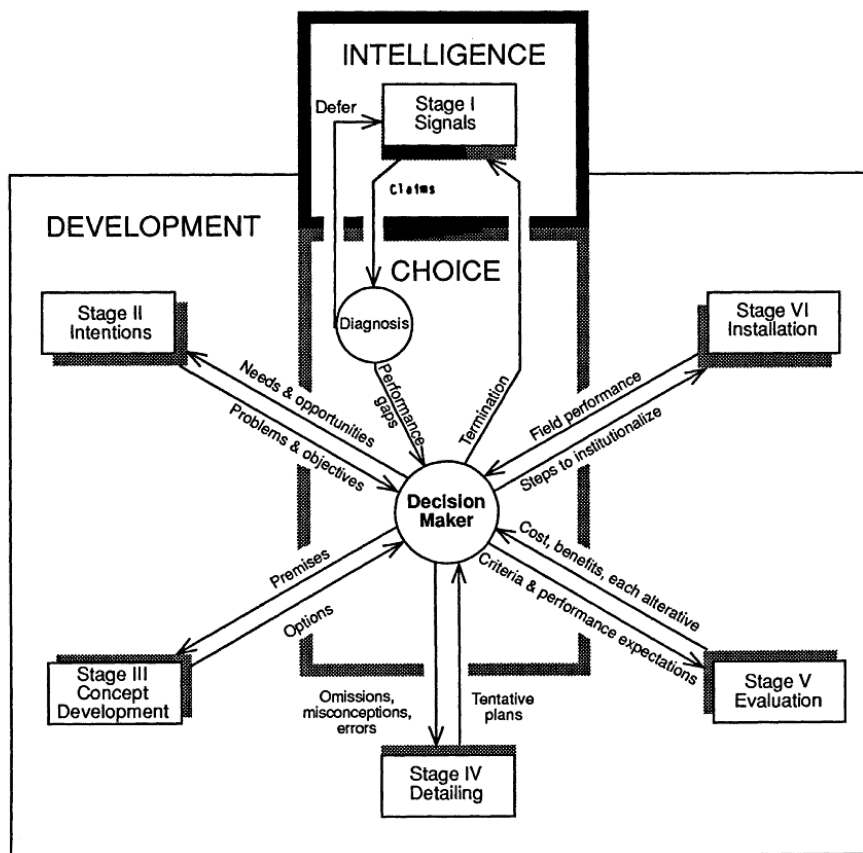


Figure 2.3 Role of Information in Decision-Making

Adapted from Nutt, P.C., 1993. 'The Formulation Processes and Tactics Used in Organizational Decision Making'. *Organization Science*, 4(2), pp.226-35.

The intelligence block is the area in which industry reports, and statistical data would be interpreted by the interested party. This information is used to warrant a call for action. A performance gap would emerge if there was a need for a decision to be made. If there is a need for a decision, the decision-maker specifies the opportunities



and needs, this activates the development block. Here the information gathered is to implement the decision; this includes hard and soft information. The arrows show the information flow between the decision-maker and the support team. The support team includes technical staff, other decision-making personal and managers (Citroen, 2009).

Development begins at the Intentions stage, when the decision-maker specifies the needs of the goal. The support team aids in clarifying the problem proposed, gives objectives and examines other problems that could arise. This stage is where the information is categorized and put into context for the situation. The relevant information is sorted into usable information. Here there may be a need for additional information along with perceptions and opinions that could aid with the decision. At stage 3, opinions are tested for errors and omissions. Alternatives are then generated and tested to grasp the outcome of each alternative in the fourth stage. Stage 5 is when the alternatives are processed and information is collected again to judge the decision. The alternative that is preferred to accomplish the goal is then implemented in the installation stage. The support staff continues to gather information to explore possibilities of different outcomes and monitor the decisions made to ensure that the required goal was not compromised (Citroen, 2009).

The system shows that decision-making was built on the gathering and flow of information. It is to exhibit that information collection and categorization would be an arduous, time-consuming task. It would need competent people that are able to work together to reach a common goal. The information collected would also be theoretical in certain cases as these would be possibilities of what could be the outcome of specific alternatives.

## **2.5. Intuition and Emotion in Decision-Making**

As mentioned in Figure 2.2, intuition plays a vital role in decision-making. There should be no misapprehension about intuition being a guessing activity, but rather it should be understood as a process of reasoning based on chunking that one has acquired after years of experience (Schwitzgebel, 2012). It takes years of experience in problem solving and certain tasks to be able to grasp the concepts, this adds to good intuition (Piotrowski, 2011).

Intuition is a part of all decisions, even those based on solid evidence and information (Griffin, 2011). At the base of the decision, the decision-maker has to use intuition to gather and interpret the information for the future outcome of estimated events (Betsch, 2008). The analytical approach does not distinguish between an expert and someone who has more experience. It assumes that data and ideas are similar, and treats information and knowledge similarly. However, unless data are interpreted accurately, they would be irrelevant (Zentall & Wasserman, 2012).

Interpreting data needs judgment or intuition as it is subjective to the view of the decision-maker, therefore the individual needs have a proficient understanding of the subject matter (Schwitzgebel, 2012).

Intuition is said not to be emotional, conversely Ray and Myers (1990) noted that wishful thinking, fear and anxiety could affect the integrity of the individual's intuition (Correia, 2012). It appears then, that emotion plays a role in strategic decision-making. Emotion is a nearly automatic and unconscious human response to environmental effects (Kim, 2012), therefore intuition may not be emotional, but emotion would be embedded in intuition. When there are threats or opportunities in the external environment, the decision-makers' emotive perceptions are unconsciously incorporated into cognitive functioning. Emotional aspects can influence the decision-maker's choices by affecting the individual's cognitive decision-making options (Kim, 2012).

Figure 2.4 shows a model developed by Kim (2012) that depicts the involvement of emotion in strategic decision-making. With regards to emotions, there are five stages that a person goes through when making a decision:

### **2.5.1. Cognitive Assimilation of Strategic Environment and Affective Perception**

The first stage encompasses gathering information from the external and internal environment. The initial collection of information is to gauge the situation, of the problem and the alternatives. The information gathered needs to be balanced between internal and external sources. Decision-makers then interpret the information and due to cognitive limitations, they simplify ambiguous and complex information through mental labelling (Kim, 2012). A hostile environment could be described as one which has high complexity and low munificence (Rosenbusch et

al., 2011). An opportunistic environment could be classified as one that can be understood easily, and one over which one has the ability to control. Internally, a similar system would be found with environments being labelled from threats to opportunities. From here the decision-maker needs to set out a list of priorities. According to a cognitive theory of emotions, emotions can be viewed as interruption mechanisms in a cognitive system, which directs an individual's attention and rearranges priorities (Kim, 2012). Emotions can interfere with rationalization and objectivity. The decision-making process has been plagued with the issue of emotions, according to Yukalov and Sornette (2010), due to the complementary relationship between emotions and rationality. This would imply that decision-making is an interaction between cognitive computations and emotion, not just rationality (Judge & Ilies, 2004).

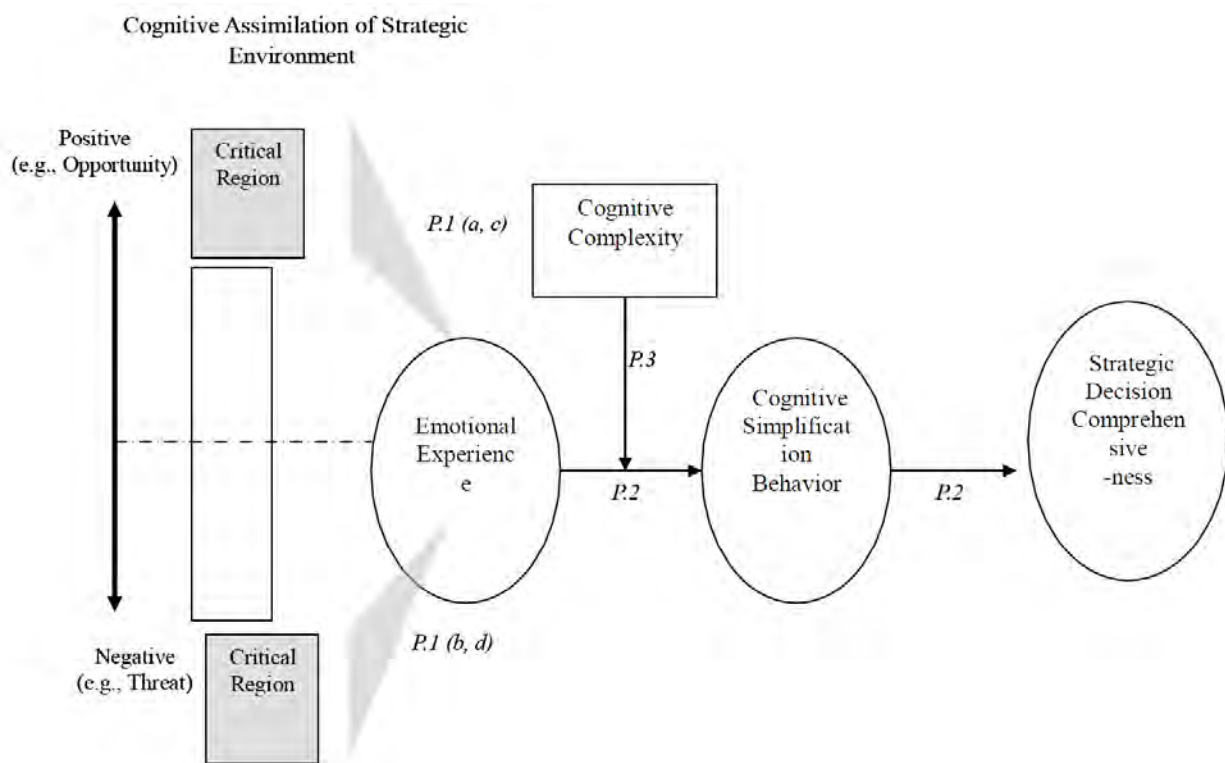


Figure 2.4 Emotional Involvement in Decision-Making

Adapted from Kim, H., 2012. *Emotion and Strategic Decision-Making Behavior: Developing a Theoretical Model*. International Journal of Business and Social Science, 3(1), pp. 105-113

### **2.5.2. Emotional Experience and Cognitive Functions of the Strategic Decision-Making**

From the literature, it is implied that emotions can influence an individuals' choice, which could weaken their ability to make strategic decisions. When a person has a positive outlook, one can expect a favourable outcome, while a negative outlook will yield an unfavourable evaluation (Shmotkin, 2005). In the negative situation, the decision-maker would try to simplify the situation to make the problem more manageable. To do so, a person may use prior experience and intuition, to aid the decision-making process. By doing this, the individual could skew the data causing a bias in interpreting the data. This would inevitably lead to a systematic biasness (Jamieson & Hyland, 2006).

From this, it appears that emotion plays an unintentional role in the making of decisions by individuals. It is important to note that it could be to the benefit or detriment of the end goal. The decision-maker needs to understand the situation and needs to guard against being overwhelmed by the environmental effects. Intuition needs to be used wisely and consequences need to be understood. By not having the correct information and using intuition and emotion, one could make erratic and regrettable decisions (Sordoni, 2012).

### **2.6. Risky and Uncertain Situations**

To achieve a strategic decision, the decision-maker needs to strive for an end goal, yet many of these are not consistent with the environmental changes, which results in inefficient performance (Mitchell, 2010) . Mitchell (2010) states, "In a hostile environment decision-makers are more prone to be disorganized, haphazard, desperate, and even panic-stricken ... they are not able to manage their decision-making processes as well because of the threats that exist in the environment." It is however evident that uncertainty and risk would be inherent within all strategic decisions (Mayo & Spanos, 2006).

Lipshitz and Strauss (1997) propose a three-pronged approach, reduce the risk, quantify the residual data, and use the data acquired to formulate a strategy to gain a path to a decision. The first step would be the collection of data. The increased amount of information collected would decrease the amount of risk (Hall & Citerbaum, 2012). This would be the initial stage of collection. Unfortunately there

could be a point when there is no longer information available; one would have to use existing information to extrapolate data that could aid in the process (Anderson, 2012). There is also assumption based on intuition and emotion. This could aid the situation, or lead to devastating consequences. The data collected could be ambiguous, irrelevant or worthless. There was further evidence that showed collecting additional information does not improve the quality of the decision made when environmental uncertainty is extremely high (Zhang et al., 2012). This would cause some decision-makers to limit the variability of their sources and disperse the risk among the others in assisting with the task.

To quantify the data collected and reach a decision, a system of scenario planning could be used. There are more options but this, it appears would be the widely-used approach (Rao, 2012). With scenario planning, the decision-maker creates a list of possible events, unlike normal planning, when the scope is identifiable, a decision can be made from numerous alternatives. A descriptive view of the differences is shown in Figure 2.5 below.

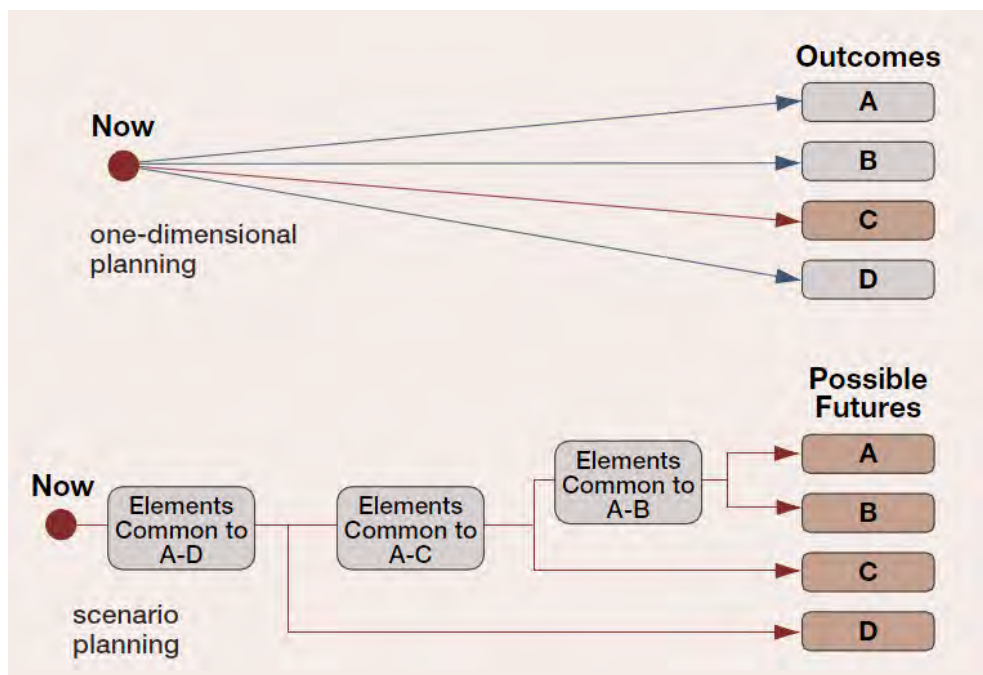


Figure 2.5 Normal Alternatives vs. Scenario Planning

Adapted from Marra, R., 2009. *Scenario Planning: Making Strategic Decisions in Uncertain Times*. Southwest Hydrology, May/June, pp.22-32

Scenario planning looks at the critical uncertainties of specific issues. A variety of scenarios are fashioned based on an amalgamation of uncertainties. It would be impossible to account for all the possibilities, just the main issues would be highlighted as critical to obtain the desired end goal. These only would be taken into consideration. An implementation pathway can be developed by identifying and sequencing all the projects and initiatives that would be needed to realize each future scenario. After several pathways are established, certain areas would overlap to create common elements (Marra, 2009). This approach would be to identify the common elements that would enable a decision to be made that could achieve the required goal (Schwartz, 2003). This takes time, experience and a group of individuals to assist in extrapolating data. Companies like Unilever create and train teams to handle uncertainty (Roden, 2009).

## **2.7. Emergency Decisions**

Uncertainty can clearly be noticed in situations of emergencies. This is due to the inherent unstable nature of the circumstances. At this stage, information needs to be assimilated very quickly. Decision-making is crucial at those times (Huder, 2013). The time frame that an individual has during a moment of crisis would be limited. During this time, it was found that the decision-maker starts to look at the generalized outline of the entire situation instead of an in-depth analysis of the root cause (UNHCR, 1990). The decision-maker would use selected information which by itself is deemed to be important, it is a matter of intuition (Griffin, 2011). This would introduce the garbage can model. This is where ideas, scenarios, problems and solutions are dumped by the decision-makers as they are generated (Huse, 2007).

These decisions have a sense of urgency, which could cause the incorrect resources to be being utilized (Wang, 2011). The next issue is the limitation of information at this time with regard to the quality and quantity (Center for Chemical Process Safety (CCPS), 2010). Assumptions are further made that could cause dire consequences to the process (Kapucu & Ozerdem, 2011). The limitation of the information can decrease the accuracy of the decision-maker's ability to take all aspects into consideration (Wickens, 1992). In an emergency, individuals are required to deal with substantial amounts of data and information, with extreme time constraints, when making decisions. This information could sometimes be faulty or incomplete, which could lead to stress and to unfortunate decisions.

## **2.8. Stress in Decision-Making**

"Problem solving and decision making in demanding real-world situations can be susceptible to acute stress effects which manifest in a variety of ways depending on the type of decision. The negative effects of an overload of acute stress include intentional tunneling, working memory loss, and restrictions in long term memory retrieval, with simple strategies being favoured over more complicated ones. The underlying assumption is that stress can lead to errors, poor performance and bad decisions. However, acute stress does not necessarily always have a detrimental effect on decision making; rather stress may affect the way information is processed. Some of those changes in strategy in response to stress are in fact adaptive. They reduce and select the information being attended to and processed, in response to high time pressure and reduced cognitive capacity" (Flin, 2004) (American Spelling retained as in the original). This extract exemplifies the overview of the relationship between stress and decision-making.

The most apparent symptoms of stress on decision-making would be the inability to assimilate new information, the effect on the process of thinking, loss of concentration, hasty decision-making, hindered short-term memory, and the inability to plan initial actions (Bourne & Yaroush, 2003). Flin (1997) speaks about the devastating effects of stress on decision-making, such as, tunnel vision, decision bias, and an excess of reliance on past experiences. Decision-makers may try to formulate ideas that cannot be accomplished at that point in time or they may try to simplify a situation that is not simple, or ignore crucial information and formulate a minimal amount of alternatives. Baumann, Sniezek, and Buerkle (2001) also concur with the biasness of an individual when at high stress levels, by commenting on the effect that stress can have on fair evaluation of the situation.

As mentioned earlier, stress can negatively impact upon decision quality and affect the individual's use of intelligence (Flin, 2004). The cognitive resource theory confirms these theories (Vecchio, 1990). However Flin (2004) goes on to state that stress may not always have a negative effect on a situation. It may cause the decision-maker to react faster, with an increased amount of energy and motivation and improved memory function to recall passed experiences.

Figure 2.6 below shows a graphic representation that represents the correlation between performance and pressure. As the pressures of the situation increases, it may allow the individual to perform at their optimum. At this point, they may be the most efficient at making the best decisions and looking at all alternatives available.

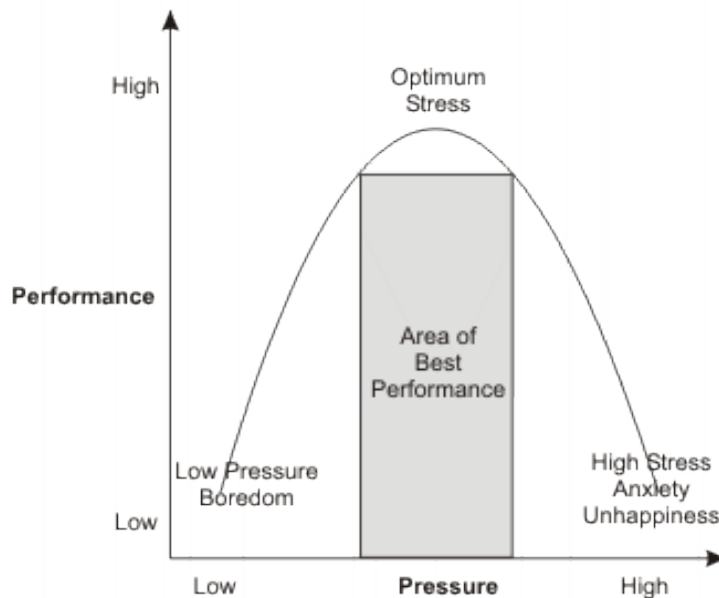


Figure 2.6 Performance vs. Pressure with repercussions

Adapted from MindTools, n.d. B. *Job Stress Management Resources*. [Online]

When the stress levels increases and the individual passes the optimum point, their ability to cope deteriorates (Flin, 1997). Every individual has their own peak performance point depending on their experience, knowledge and ability to remain calm. This means that one person may be totally calm and collected, whilst another person is completely insecure and uneasy in the same set of circumstances (Flin, 2004).

## 2.9. Groupthink

Stressful situations and intricate decisions could involve integrating a large amount of information in different areas of expertise in a short amount of time. One person can only cope with a limited amount of information and theorize relevant perspectives accordingly (Bloom et al., 2012). These situations call for a group of individuals to examine the information, offer input, and formulate alternatives to a



definite end goal. Better decisions can come from a group as compared to a single individual. This is evident in large companies that have boards to take strategic decisions (MindTools, n.d. A).

A group of individuals working as a cohesive group is called groupthink. Groupthink occurs when the members of the group do not express their own opinions or critiques of other individuals' judgments. Their need to conform overpowers their ability to make appropriate decisions and choices. This problem has dire consequence at a strategic level. The model shown in Figure 2.7, proposes an underlying link of groupthink tendency and flawed decision-making.

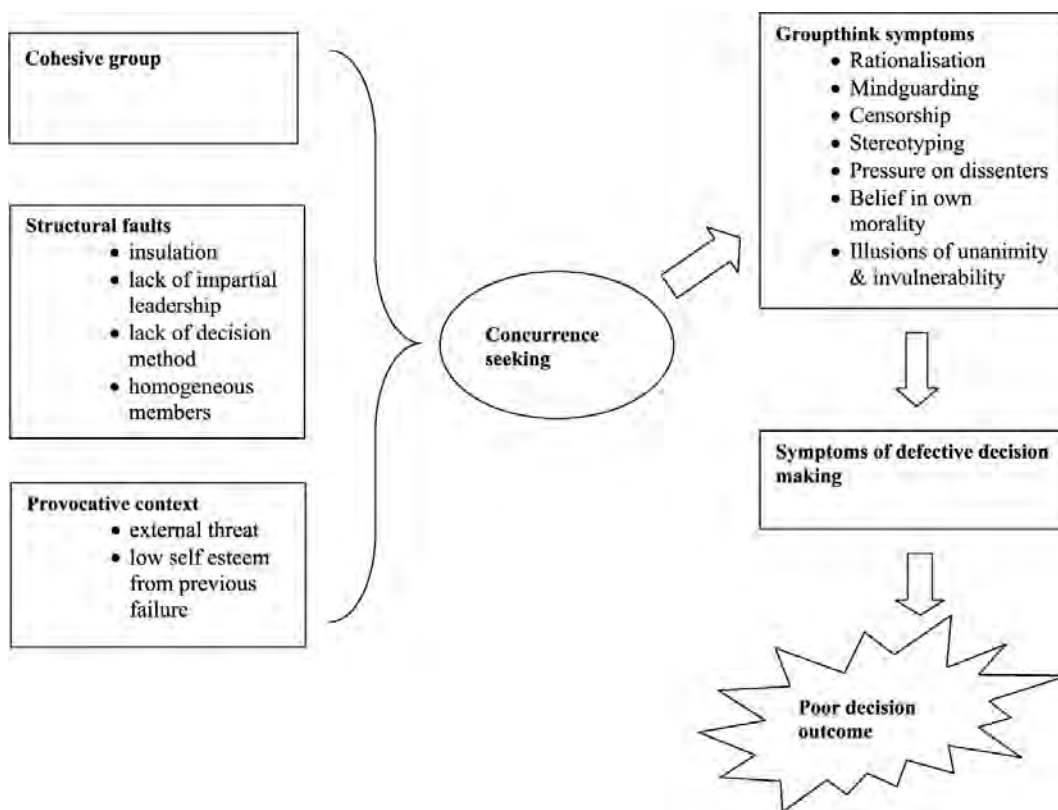


Figure 2.7 Groupthink Model

Adapted from Abrahamson, E., 1991. Managerial fads and fashions - the diffusion and rejection of innovations. *Academy of Management Review*, 16(3), pp.586-612.

Albright, S.C., Winston, W.L. & Zappe, C.J., 2010. *Data Analysis and Decision Making*. Ohio: Cengage Learning.

Holzer and Schwester (2011) showed that symptoms such as collective rationalization of information cause errors in the comprehension of the information present. Members with dissenting points of views are looked down upon and there is a tendency to discard information that does not harmonize with their opinions. As these defects become more prominent, the probability of deficient decision-making increases. Neck (1996) summarizes the causes as follows, "...incomplete survey of alternatives; incomplete survey of objectives; failure to examine risks or the preferred choice; failure to reappraise initially rejected alternatives; poor information search, selective bias in processing the information at hand, and failure to work out contingency plans."

Anxiety is caused by stress that is also evident in the groupthink model. This allows for exposure to inaccuracy in the comprehension of information. It puts the participants of the group in a detrimental emotional state that allows for the threat of exposure.

The symptoms of groupthink can be summarized as follows (Holzer & Schwester, 2011):

- **Rationalization:** A member of the team convinces everyone that a route is the most suitable, even if the information available is to the contrary.
- **Peer Pressure:** Team members pressurize other members to conform to their opinion.
- **Complacency:** The group feels a sense of grandeur that their decisions are correct due to a common agreement between all members.

**Moral High Ground:** all members believe that their decisions are of a moral standing and that they could not make immoral decisions. In this situation, the pressure to conform would be great due to each member not wanting to seem immoral.

- **Stereotyping:** The team perceives outsiders as having inferior views to their own, thereby discrediting feedback and ideas from other sources. This lowers the number of alternatives to obtain a good decision.
- **Censorship:** members feel that their views are wrong, and try not to give their feedback in order to conform. Also, information that is gathered would be depicted in a form to conform to the team's belief.

- **Illusion of Unanimity:** due to members of the group trying to confirm, not many people speak out, this gives the illusion that all individuals of the group agree with the outcome.

Of all the considerations when leading a strategic team, the most important maybe to understand is groupthink and to build a team culture that will encourage healthy dissent in the decision-making process. The responsibility for this task clearly falls on the strategic leader, who is responsible for the team's culture, and must be especially attuned to the tendency toward groupthink. A strategic leader must know what constitutes groupthink, be aware of the characteristics of a group experiencing it, and avoid groupthink with a deliberate process which not only welcomes dissent, but in fact elicits it while encouraging alternative thinking in the decision-making process. This starts with an understanding of groupthink (Fuller & Aldag, 1998).

## **2.10. Decision Support Systems**

From the numerous factors mentioned above, it is clear that decisions are a vital part of growing a company. With the changing pace of the environment, it is becoming more difficult to make decisions based solely on human response. This would be the reason that many companies use a Decision Support System (DSS) to aid with the decision-making in conjunction with the decision-maker (Schuff, 2011).

### **2.10.1. Definition of a DSS**

Marakas defined a DSS in 2003 as "...a system under the control of one or more decision makers that assists in the activity of the decision making by providing an organized set of tools intended to impose structure on portions of the decision making situation and improve the ultimate effectiveness of the decision outcome." In 2005, the DSS was defined as "...an approach for supporting decision making" (Turban et al., 2001). In 2008 the definition emerged as a "computer-based system that supports decision making activities including expert systems and multi-criteria decision analysis" (Morge & Mancarella, 2008). A DSS is a generic term used to describe a computer-based system that improves a person's or groups' ability to make informed decisions. In essence, the DSS is a support system for decision-making. Figure 2.8 expands on the characteristics mentioned in the explanations above.

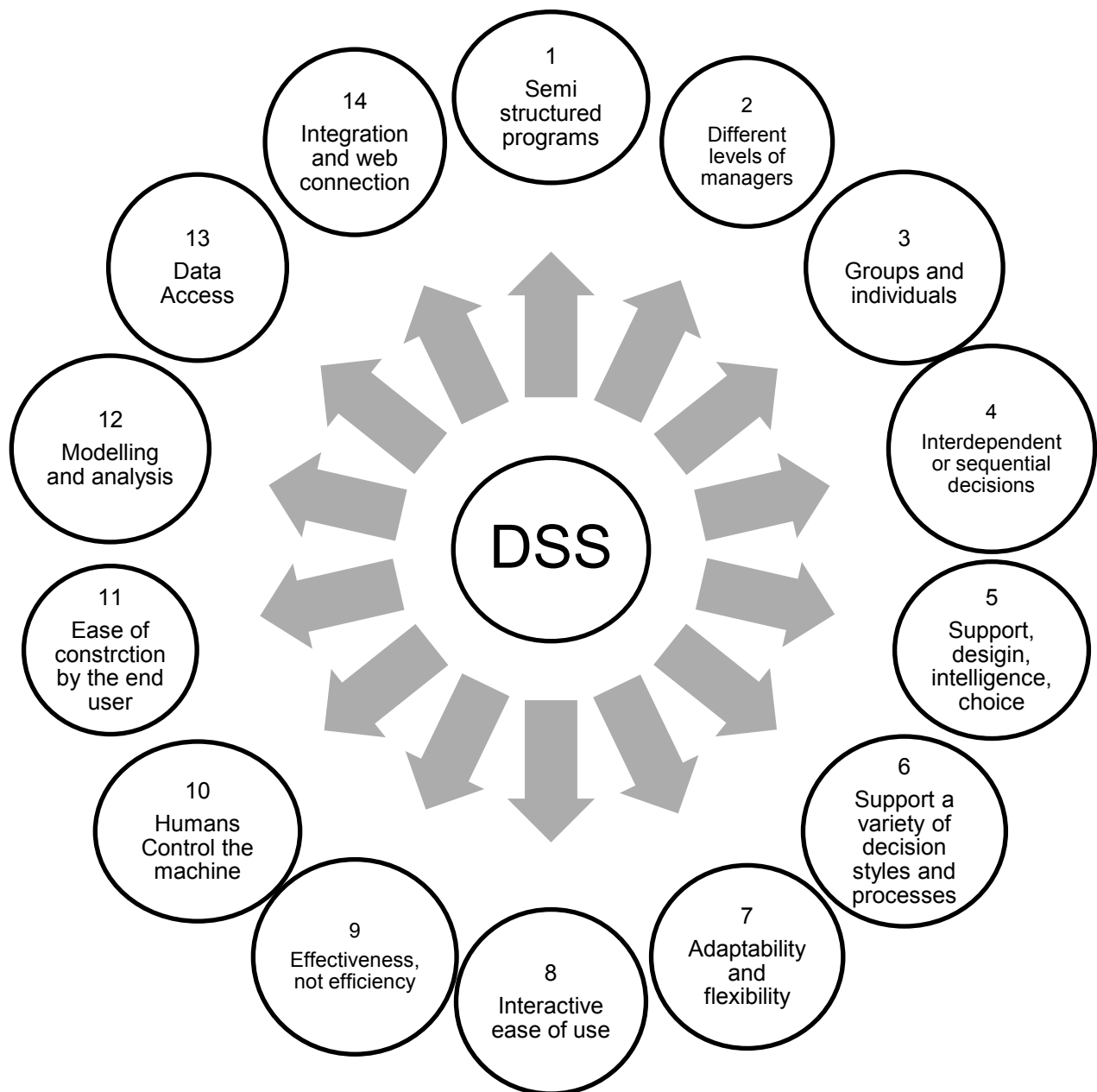


Figure 2.8 Characteristics of a Decision Support System

Adapted from Turban, E., Aronson, J.E. & Bolloju, N., 2005. *Decision support systems and intelligent systems*. Prentice Hall International.

Turban (2005) explains that a DSS usually assists in combining information and human judgment to formulate decisions in structured and semi-structured situations (1). It is able to support management decision-making on all levels (2) which includes the capability of individual or group decision-making (3). The system allows decisions to be made on a regular basis or once off, depending on the repeatability of the situation (4). This decision-making process gains information from the intelligence, design, choice and implementation stages (5). A diverse range of styles and processes are available when using a DSS (6). Since the DSS is a flexible system, new data can be added, removed or edited at any time to respond to the issues at hand (7). This allows the decision-maker to confront and react to issues as they occur.

Turban (2005) later goes on to say that the DSS is an interactive tool that was to be used to aid in decision-making, therefore it needs to be user friendly. This includes graphic interfaces and ease of navigation (8). This increases the effectiveness of the system. Most new DSS applications use Web-based interfaces. The effectiveness of a decision can be improved with the use of a DSS with regards to time, information and accuracy, rather than the effectiveness which is the cost of making the decision (9). This is to aid the decision-makers in making the correct decision, not to replace them (10).

The decision-maker can develop and/or modify the steps of the programme to solve problems presented to allow the DSS to use different models and strategies to devise various alternatives for the decision-maker to take into consideration (12). With regards to information, Turban (2005) indicates that the DSS would be able access a variety of data sources, formats and types (13). This system would be able to operate as a stand-alone system or networked in the organization using a web based technology (14).

For the purpose of this study a DSS is an interactive computer-based system that aids the decision-maker in formulating decisions by using models, knowledge and analytical methods to define the problem. Thereafter, it provides solutions through analysing, exploring and choosing from a list of various decision alternatives in their semi-structured and unstructured forms.

### **2.10.2. Abilities of the DSS**

Antunes and Costa (2012) concur that the above characteristics of a DSS would greatly increase the possibility of the decision-maker considering a decision alternative that would provide an improved outcome in a timely and efficient manner. Especially given the pace at which managers need to operate, the information and resources available needs to be current and factual. The DSS can aid by creating a process whereby it could be context-specific, allowing decisions to be made with regard to a specific task. This would aid in the adoption and matching of the environment changes to activities for a specific time which would lead to a company attaining competitive advantage by allowing the manager to make better strategic decisions. Allowing information to filter through from all facets of the organizations allows the DSS to increase the control of the organization by removing the silo effect. From this activity, decision-makers are able to make better informed decisions that would be more beneficial to the company (Respício, 2010).

The most effective way to handle a great deal of information would be with technology. Kaplan and Norton (2000) spoke about the information needed to make strategic decisions. They were concerned with the following questions: "How will the organization sustain its ability to learn and grow?", "What business processes do we and must we excel at?", "How do we appear to our customers and how should we appear to our customers?", and "How do we appear to our stakeholders and how should we appear to our shareholders?" Scorecards can be incorporated in to the DSS which makes it possible for managers to gain diverse information pertaining to key areas.

Viscusi, Batini and Mecella (2010) states that information and resources constitute the greatest challenge for the decision-maker. This is in line with the findings of Schönrok (2010), Knecht (2013) and Citroen (2009). There would be a sizeable quantity of data required for strategic decision to be made. Issues could arise due to data analysis and required knowledgeable judgment regarding immense amounts of information. The DSS uses a process of detecting significant patterns due to pre-recognised rules, which aid in the evaluating of the raw data. By monitoring customers and their behaviour, sales, stock anticipation and other crucial aspects that affect the company, a DSS has the ability to create a competitive advantage. A DSS has the capability of finding patterns and concealed relationships which have

the potential to lead to an increase in revenue. This implies that the DSS has the ability to remove the frustration that lay solely on an individual to deliberate over a large amount of information when making decisions. This allows for a feeling of satisfaction on the part of the decision-maker with the perception of having made a well-informed decision (Power, 2009). Inevitably, this would lead to the belief that the decision-makers' stress levels are reduced, and, as mentioned several times before, stress is a huge hindrance to decision-making.

A study undertaken by Tagil *et al.* (2013), found that the presence of a DSS can be seen to reduce the stress in a manager. This was done by using nine physicians with limited experience from eight nuclear medicine departments, and placing them in situations first without a DSS then after a rest period, went through similar situations with a DSS. The conclusion was significant with regard to the reduction of stress levels. As established earlier, with lower stress levels, a person can function and think at a better level (Flin, 2004).

A further issue of significance is that DSS curbs the phenomenon of groupthink. Typically in a group, one person talks at a time and many people don't comment or they conform to fit in. With a DSS, all members comment on the issues at the same time on their workstations (computers). By having all the input at once this speeds up the decision-making process. The system can then formulate alternatives and highlight issues which allows the team to communicate in a unified voice (Stair *et al.*, 2009).

By not using the DSS for strategic decisions, the organization could waste resources, lose opportunities and/or overlook information. Strengths, opportunities, weaknesses and threats can be identified and capitalised upon quickly, based on the information contained in the system and models incorporated therein. Interdependencies between operations that previously operated in silos can be identified by the DSS. This would aid in making strategic decisions because this system encompasses all divisions of the organization (Nowduri, 2012).

### **2.10.3. Difficulties Associated with DSS**

Decision Support Systems are not only endowed with great possibilities, they can also have negative outcomes. The system needs to be built for the specific tasks that it would be used for, with all aspects regarding rules and strategies taken into consideration in the design phase. Social, political, and emotional aspects should also be considered, but the DSS needs to strengthen the concept that there is a greater vision in operation (Mili, 1988).

The startup-cost of a DSS is great, not forgetting the time that would be taken to update the database with all the past data that would be needed for the decision process to be a success (Marakas, 1999).

Unforeseen circumstances could occur at anytime given that the system is fully electronic and software-based. Since the DSS has a variety of past information, it does have the possibility to overload the decision-maker with excess information that could lead to a poor outcome. Due to models, rules and other variables, issues may arise that can't be accounted for or explained (Power, 2004).

Since the DSS gives alternatives for decisions, managers could get the impression that they are not needed. To reiterate, the DSS is merely a tool that is used in conjunction with human intervention. It then takes time and effort to convince managers of this fact. Managers then feel like their roles are being rendered obsolete and all they are needed for would be to undertake clerical work (Power, 2002).

The fact that the DSS gives alternatives for a decision-maker to consider, can impede the ability of the individual to think for themselves, causing cognitive biasness (Holyoak, 2005). The blame for incorrect decision-making can be seen to fall solely on the DSS. However this happens for two main reasons: (1) not enough information inputted for the situation to be fully understood, and (2) the decision-maker did not consider the alternatives completely (Schuff, 2011).

Winograd and Flores (1986) state, "Once a computer system has been installed it is difficult to avoid the assumption that the things it can deal with are the most relevant things for the manager's concern," as cited by Klein and Methlie (1995). This causes



the threat of managers using the system inappropriately after becoming accustomed to the system. Training would be a good way to overcome this possibility.

Since the DSS has a storage that can be adapted to a particular application, information can be stored efficiently for that application. It allows the decision-maker to have better control over the data and faster access to it. It can be stored efficiently for that application making the process faster, cheaper and easier. This is great until the needs of the application change. Then the database needs to be rebuilt with the relevant updated data. This costs money and effort.

#### **2.10.4. Purpose of DSS**

The DSS is designed to assist in the stages of decision-making. It was thought that the DSS was best suited to identifying problems and to supplement managers' understanding, enabling them to make correct decisions, by having the correct tools to allow them to interact with information from internal and external databases (Devi, 2009). By creating more time at this stage, a positive environment could be created, allowing for a reduction in stress. The problem identification is limited to the information that the databases contain to assess the situation, but is still larger than that which the human brain can hold (Devi, 2009). This would enable the decision-maker to create representations of situational actions. By running mathematical and formulated algorithms, the DSS is able to create alternative scenarios for the situation based on the given information that the system contains (Asemi et al., 2011). This allows for multiple alternatives to be created quickly. DSS would also be effective in evaluating alternatives (Blios, 1980), as it has the ability to simulate the effects of the decisions (Mallach, 1994), allowing the decision-maker to choose the most appropriate alternative. The system also allows for feedback from the decisions made (Babu & Sekhar, 2012), creating a system that can track errors and aid in creating alternate paths to facilitate corrective actions.

#### **2.11. Acceptance of DSS**

As new technology, the DSS need to be accepted by people in a company to improve productivity, however, sometimes it can be used to the detriment of the company (Abrahamson, 1991). Fichman (2004) created a framework that evaluated the economic value of technology on a company; however, this could only be used when individuals used the contemporary technology. Even when the technology was

utilized, human error can be a great factor that leads to a system failing or succeeding in escalating the productivity of a company. Without advancements in technology, an organization could be stagnant and less competitive (Howard, 1995). It is important to note that according to Henderson and Divett (2003), it was found that most system failures are caused by behavioural errors rather than software or hardware inadequacy.

### 2.11.1. The Technology Acceptance Model

The “Theory of reasoned Action” can be used to recognise the aspects of intentional behaviour. The theory finds that an individual believes that the intention to act in a certain way will lead to a given outcome. There are two types of belief: behavioural and normative. A behavioural belief influences the attitude towards performing a behaviour, while a normative belief affects the subjective norms associated with the behaviour (Fishbein & Azjen, 1975). Davis (1989) adapted this theory for the use of technology, which is known as the Technology Acceptance Model (TAM), shown in Figure 2.9.

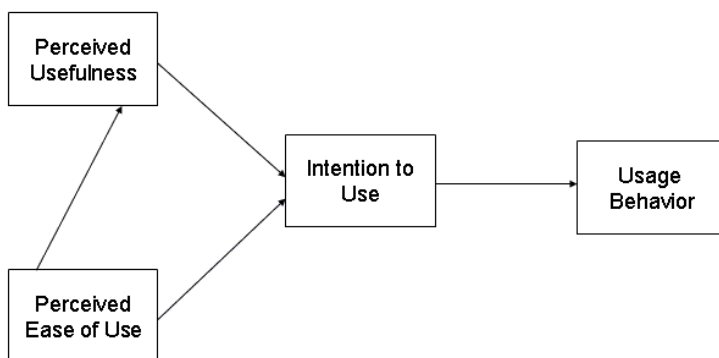


Figure 2.9 Technology Acceptance Model  
Adapted from Davis, F.D., 1989. ‘Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology’. *MIS quarterly* , 13(3), pp.319-40.

The two aspects associated with this model are the perceived usefulness and the perceived ease of use. An individual’s belief on the extent of effort to use a system is known as the perceived ease of use. An individual’s belief in the competency of a system to enrich the experience and performance of accomplishing an activity is

known as the perceived usefulness (Davis, 1989). Davis (1989) showed perceived usefulness manifesting itself in terms of six notions:

- 1) A certain technology can be used to accomplish tasks faster;
- 2) A certain technology can improve job performance;
- 3) A certain technology can improve productivity;
- 4) A certain technology can increase effectiveness;
- 5) A certain technology can make it easier to accomplish a task; and
- 6) The technology would be useful to the individual.

It was noted that the perceived usefulness was directly impacted on by the perceived ease of use. As technology advances the operation of the instruments changes, so it was believed that if the user perceived it as easy to use, the perceived usefulness would increase. TAM proposes that an individual's perceived usefulness and their attitude toward using a system has a direct impact on their intended behaviour. The perceived usefulness was influenced by perceived ease of use and external variables, such as documentation, support and training (Kigongo, 2011).

### **2.11.2. Attitudes of the Decision-Maker**

#### **2.11.2.1. Decision-Maker Characteristics**

Some of the key successes in the use of the DSS are the motivation of the individual to use the system and a positive attitude towards the system (Scheepers-Hoeks et al., 2011).

#### **2.11.2.2. Decision-Maker's Style**

The data from the DSS can be viewed in different ways, which affects the way the system is perceived (Lilien et al., 2004). This would imply that the users' fondness of systematic processes and abstract models, and their reliance on common sense and experience could affect the outcome of their perceived outcome of the DSS (Goodwin et al., 2006).

#### **2.11.2.3. Cognitive Style**

The cognitive style does not affect the DSS performance as much as it affects users' attitude toward the DSS. The users should be able to adjust their preferences to enable them to fully appreciate the DSS (Elbeltagi, 2000).

#### **2.11.2.4. Personality Characteristics**

The personality traits believed to impact on the DSS implementation included, locus of control, risk taking, defensiveness and need for achievement. It was also found that risk-taking behaviour could be associated with the use of a DSS (Goodwin et al., 2006). This could also be associated with self-efficacy, which could be regarded as one's ability to organize and execute required decisions on one's own, and this would be an important factor in the perceived use of the DSS. There could be issues with regard to knowledge or complexity barriers on initial adoption of the DSS (Eastin & LaRose, 2000).

#### **2.11.2.5. Decision-Maker Training**

Training can improve the efficiency and performance of the users that are utilizing the DSS. The importance of training can be crucial in unlocking the full potential of a system (Kalpana & Bhuvaneshwari, 2011). Training can make the user more efficient in making correct decisions with the aid of the DSS.

#### **2.11.2.6. Decision-Maker Experience**

It was found that although there was a positive relationship arose between the user's experience and the success of a system, this was not always the case (Al-Khalid & Al-Jabri, 2009). The greater the level of education and experience one has, the more the individual expects from the system and the less satisfied they are with it (Goodwin et al., 2006). By having prior knowledge and experience, one could grasp situational concepts quicker and one would be able to function more efficiently.

#### **2.11.2.7. Decision-Maker Involvement**

By having the individual involved increases the success factor of the DSS. By increasing the knowledge and understanding of the DSS, one may be able to involve users in the DSS, thereby increasing productivity (Kalpana & Bhuvaneshwari, 2011).

#### **2.11.2.8. Decision-Maker Attitudes and Satisfaction Related to DSS**

The overall feel and attitude towards the system can allow for new users to have a positive or negative outlook towards the DSS. This would play a major role in the way that the decision-maker then perceives the new instrument and this can cause a user to stop using the system, or it could alternatively encourage new users to get involved.

### **2.11.3. Relationship between the Attitude of the Decision-makers and the Perceived Usefulness**

As Davis (1989) proved in the TAM, the first step was to unearth the possible relationship between the perceived usefulness and the perceived ease of use of the system along with the impact it had on the user's attitude towards using the technology. The level of an individual's trust could be influenced by the perceived usefulness (Eriksson et al., 2005). The most influential factor in determining usage of a system was found to be usefulness, which was significantly greater than the relationship that Davis (1989) found (Pikkarainen et al., 2004). Education, experience and familiarity are important factors in persuading individuals to see technology as useful, and to improve their attitude towards using it (Lymperopoulos & Chaniotakis, 2005). The level of education could be used as an indicator of the ability of the individual to learn. Many existing studies have validated the effect of perceived usefulness on attitude (Chen et al., 2002). The belief was that the positive attitude towards using the new information system was determined by the user's perception of usefulness, therefore attitude could be seen as the key determinant of actual usage of the new technology.

### **2.11.4. Relationship between the Perceived Ease of Use and the Attitude of the Decision-Makers**

The attitude towards the system would be determined by the ease of use perceived by the user (Fishbein & Azjen, 1975). TAM states that perceived ease of use has a positive impact on using the new system (Davis, 1989), but complication with respect to the understanding of the system could discourage the user (Rogers, 1995). The user would be afraid to use a system that they deem to be complex which could negatively impact on their attitude. The individual needs to be able to identify processes, be familiar with the systems and have optimistic and credible interactions the technology to allow for a perceived ease of use. Ultimately, their efficacy level needs to be high (Lunenburg, 2011).

### **2.11.5. Acceptance and usage of the system**

To predict the adoption of new technology, TAM examines the attitude of the user towards using the technology. The attitude concept used in this model was to represent the attitude towards the behavioural attributes of using the technology. An individual's attitude is a significant factor that affects one's behaviour in accepting

and rejecting technology. This implies that a positive relationship needs to be present between the:

- perceived ease of use and the perceived usefulness of the DSS;
- perceived ease of use and the user's attitude towards the DSS; and
- perceived usefulness and the user's attitude towards using the system

By producing these positive relations, it can be stated that there would be a high possibility of acceptance of the new technology. If any criteria do not have a significant positive relationship, it can be assumed that the users would not completely accept the new systems. It would call for more research to ascertain what caused the users to reject the technology. The TAM suggests that the users overall attitude towards the technology ultimately determines whether or not the user utilizes the technology (Davis, 1989).

## **2.12. Summary**

It can be deduced that decision-making is vital to a company's success with bad decisions causing devastating effects (Hammond et al., 2003). The chapter outlined the different decision types and homed in on strategic decision-making. It also delved into the stages of decision-making with the actions that need to be taken to achieve a good decision.

Thereafter an introduction to the DSS was offered to give an insight into its technology. An outline of the system was given and how the ideals and theory behind it provide a competitive advantage to a company was explained. How the decision-maker's ability could be improved with the use of a DSS was also explained. Then to conclude, it was pointed out that the traditional way of decision-making is far from being redundant, in that skilled people with knowledge and intuition will always be needed. Nevertheless, the assistance of a DSS could be a great asset to a company to improve the decision-making process and outcomes.

The TAM was explained to ensure that acceptance of the system by the individuals was important. There is always a possibility of failure with regards to rejection of technology and the perceived use of it. Decision-makers need to be trained and get involved for the system to work efficiently.

## **Chapter Three**

### **Research Methodology**

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#### **3.1. Introduction**

In this chapter, the reasons for using the specific participants in the study and the formulation of the data collection instrument are explained, along with the research method employed. The interpretation of knowledge depends on the techniques used for collecting and analysing the data (Sam & Makor, 2011). A review of literature on research methodology was undertaken to determine the most appropriate strategy to use to obtain the information needed for this study.

#### **3.2. Aims and Objectives of Study**

The aim of this research was to gauge the acceptance of a DSS to aid with the decision-making processes by carrying out research with relevant end users to understand the knowledge that people have and how this can be influenced. This should hopefully facilitate the movement into a new generation of problem-solving in a fast-paced environment.

The primary objective is:

- To show that the DSS can be used to improve the decision-making process

The secondary objectives are:

- To conduct a literature review on the strategic decision-making process and on the Implementation of a DSS;
- To understand the current decision-making skills;
- To ascertain the general awareness that decision-makers have of the DSS;
- To examine the attitudes towards the use of the DSS;
- To establish if a relationship exists between the users attitude towards using the DSS and the perceived ease of use of the DSS;
- To determine if a relationship exists between the users attitude towards using the DSS and the perceived usefulness of the DSS; and
- To identify the views of future managers on the proposed system.

### **3.3. Participants and Location of the Study**

The participants of this study were the middle management and graduates who were being groomed for the management positions at the Assembly Plant Maintenance Department. These were the future decision-makers of Toyota. These participants were chosen to assess the current situation of the future leaders, in order to show them the possibilities of the DSS. Since the DSS would need development, and be proposed as a future plan, they would be ideal candidates to carry forth the idea.

The study took place at Toyota South Africa Manufacturing and localized to the Maintenance Department at the Assembly Hall and personnel directly related to decisions affecting the Maintenance Department. This was done in the hope of conversing with the more technical minded individuals that understand the technological advancements in the problem-solving sphere. This is also the area of the manufacturing that needs to make fast decisions and in extremely stressful conditions in order to ensure that the manufacturing of the vehicles is successful.

### **3.4. Data Collection Strategies**

Firstly, research was done to find out whether similar information had already been obtained in previous studies or not. This would save time and costs to use trusted secondary data (McCaston, 2005). However there was no record of previous research done in this field at Toyota SA, therefore primary data was needed.

A descriptive study was chosen, using quantitative analysis via a structured questionnaire. This was deemed useful and appropriate for the following reasons:

- Information was needed from numerous stakeholders, and this information was vital to an understanding of their perceptions;
- The information needed was familiar and specific to the respondents; and
- The range of responses that was likely to occur was known (Callahan & Hertberg-Davis, 2012).

Due to the population size, non-probability sampling was selected (Tansey, 2007). It was estimated that this would take approximately a month to receive feedback from the time of issue. The reality was that it took 9 weeks to get all the information from the census.



### **3.5. Research Design and Methods**

#### **3.5.1. Description and Purpose**

The investigation carried out was to gauge the perception of people towards the introduction of a DSS. By identifying the perceptions of people in the decision-making positions, the researcher hoped to put forth a plan to design a DSS or to gather more information about it if needed.

#### **3.5.2. Construction of the Instrument**

The research instrument used was a questionnaire. This was to enable the researcher to analyse and measure influencing factors that could influence adoption of the DSS. It was also used to understand the current decision-making capabilities of the respondents. The questionnaire was a simple instrument that was clear and straightforward, so people could understand the process and would be willing to complete the survey (Lambert, 2012). The questionnaire was able to reach a large number of people and was cheap to administer (Kara, 2013). Respondents also had a lengthier timeframe to read the questions and to give thoughtful answers. However, this did mean that participants took too long to return the questionnaires (Kara, 2013). Since many people answer the exact same questions, it would enable the researcher to make a good comparison of the factors being researched (Lambert, 2012), but Kara (2013) states that people are open to interpretations, and although the questions are the same, people may answer differently depending on the understanding of the questions. It is for this reason that the questions tried to be as non-ambiguous as possible.

The questionnaire was divided into five sections:

- A. The respondent's ability to make decisions;
- B. The respondent's perceived use of the DSS;
- C. The respondent's perceived ease of use of the DSS;
- D. The attitudes of the user towards the system; and
- E. This section was left open for the respondent to add any additional views to be taken into consideration.

The first four sections used the Likert Scale, and the last section was an open-ended question for participants to record their own views. This approach was used as the

participants' response to any one item was not significant, it was rather the outcome for each group that was important. This could now be done by summing up each group and creating a rating scale (McNabb, 2013).

There are undeniable drawbacks to this system, such as the scale. The measure is whether the respondents are more or less favourably disposed towards a topic, but not an exact value representing how much. There is no way of proving that the five positions of beliefs in the Likert Scale are equally spaced (Kothari, 2008). Each person could feel differently about each point, and no two people could have the same strong agreement or strong disagreement as another. It is therefore just a mean value that is looked at to standardize and equalize the results in order to extrapolate information and to theorize a hypothesis.

The reason for choosing the Likert Scale was to prompt the ease of answering and the ease of constructing the questionnaire. The Likert scale was also a reliable test, as the respondent had to answer each question in the survey, which provides more information and data. Kothari (2008) and Kumar (n.d.) agree on this point. By placing an 'x' in the relevant place for each question, it made it quicker for persons to answer every point without feeling too overwhelmed by the number of questions.

#### **3.5.2.1. Assessing the Decision-Making Ability**

The first section was made up of 20 questions that gave insight into the way the respondents approached and executed decisions. Books by Schlaifer (1969), Raiffa (1968), Tribus (1969), Winkler (1972), Keeney and Raiffa (1976), Moore and Thomas (1976), Kaufman and Thomas (1977), and Holloway (1979), and LaValle (1978), discuss the methodology of decision-making in specific arenas and fields. For the purpose of this study a general idea of decision-making was needed that emphasized each of five generic stages that were chosen which encapsulate the entire process:

1. Establish a positive environment and define the decision problem;
2. Consider the impact of possible alternative solutions;
3. Determine the decision-maker's preferences;
4. Determine optimum alternatives; and
5. Implement and evaluate the decision.

The questions were structured against traits for making good decisions, and based on the concepts discussed in Figure 2.1. The first stage was creating a positive environment with a structured method of approaching a situation (Jureta, 2011; Malloch, 2009). Attempting to make a decision that has no irregularities can be costly, time consuming, and deplete resources. One cannot always have a perfect outcome as it could be detrimental to the end target, a balance needs to be established (Koper, 2012). Always trying to find the perfect solution could lead to elevated stress levels which increases the likelihood of the individual starting to panic, their ability to cope deteriorates and the outcome could be flawed (Flin, 1997).

The next stage would be to formulate alternatives with the correct and relevant information (Yadav, 2006). Many possibilities need to be looked at, not just the first one that seems good (Brest & Krieger, 2010; Wang, 2011). To generate many alternatives it is always beneficial to ask others for help, but not to the point where one is reliant on their opinion and groupthink becomes evident (Holzer & Schwester, 2011). The decision-maker needs to be aware whether the decision being made is practical or idealistic (Pomerol, 2012).

Thereafter, the alternatives need to be evaluated by standards and practicalities. To make a good decision, sometimes intuition can be a good place to start, but not a method one should rely on (Elbeltagi, 2000).

The penultimate stage was to make a decision on one of the alternatives. A clear, logical and appropriate way of thinking is needed to ensure all elements that could affect the outcome are considered (Malloch, 2009), however this does not mean wasting valuable time trying to be a perfectionist. The decision-maker needs to evaluate the decisions on a timely basis to ensure the correct outcome is being achieved, if not certain elements may need to be modified or changed (Malloch, 2009; Koper, 2012).

The last stage would be to implement and monitor the change affected by the decision made. If there are not acceptable outcomes, it is vital that provisions are made for the first decision not to be taken as permanent (Kline, 2010).

From these points, 20 questions were formulated and weighted from 1 to 5 to achieve a score that enabled the researcher to assess the decision-making ability of

the respondents and to categorize them into three groups, namely, poor, adequate, and excellent.

### **3.5.2.2. The Perceived Usefulness and Ease of Use of using the DSS**

Section B looks at the perceived ease of using the new DSS software. This is a vital point that would enable the researcher to estimate the openness of the respondents to use of the system. Looking at the Structured System Analysis and Design report put forth by Duffy (2011), one could extrapolate points that need to be assessed before a system is installed. It was important to understand the repercussions that could ensue with regard to the affect installation will have on the end users.

Section C tries to deduce the amount of improvement that the DSS could achieve through the eyes of the respondent; that is, the perceived usefulness of the system. These are the major items that need to be considered because it has a large influence on the decision-maker when making decisions. The advantages are as described by Powers (2002) in his book titled: *Decision Support System Decision support systems: concepts and resources for managers*. These are used as guidelines to determine the end users' thoughts on the improvements a DSS could bring about.

The reliability of the perceived ease of use and perceived usefulness constructs were later confirmed by Adams (1992) who focused on appraising the psychometric properties of the two scales, while they examined the relationship between ease of use, usefulness and system usage. The results showed that the validity of the two scales were very high.

### **3.5.2.3. The Attitudes towards Using the System**

Section D looks at the characteristics of the individuals and how their attitude towards the system could affect the DSS. Assessing the attitude towards the DSS that people have is crucial in identifying the acceptance of the system (Lu et al., 2000; Budhiraja, 2011). Different people view data in various ways to understand and evaluate information. A good understanding of the system is essential in utilizing the system to its full potential (Respício & Burstein, 2012). The attitude of the user plays a colossal role in the acceptance or otherwise of the system (Chan & Song, 2010). The questions are based on these points using the five-point Likert-type scales. The range was from 1 – strongly disagree to 5 – strongly agree.

#### **3.5.2.4. Respondents Opinions**

This section was left open to the respondents to write down any additional points that they thought were necessary and which would cover aspects that the researcher had failed to consider.

### **3.6. Recruitment of Study Participants**

Due to the spread of the population, it was necessary to ask the senior manager for assistance in contacting specific people to aid in the completion of the survey. The surveys were originally proposed to be electronic, but on trials it was found that candidates did not have access to the internet. This was the first stumbling block that was encountered. The survey was then transferred to a paper-based system. The surveys were printed and given to the department secretary, who graciously agreed to assist with the dispersal and collection of the surveys.

The respondents chosen for this study were by and large the graduates being groomed to take over posts of decision-makers. These were the future of the company and could provide a great indication of the forthcoming capabilities of the people.

The next group chosen were people in the Assembly Plant Maintenance Department who were involved in strategic matters and in the passing on of crucial information to the relevant personnel. These people have the ability to relate the technical aspects of the DSS to adaptations of the theoretical possibilities of using such systems. The last group chosen were the people that already had positions of decision-making power. These people are the current drivers of decisions. These two groups made up the management sector.

Collectively these are people from the Assembly Plant and they are directly or indirectly connected to the Maintenance Department.

### **3.7. Presentation and Validation**

The questionnaire was an adapted version of a questionnaire by Elbeltagi (2000) and an online survey by MindTools (n.d. C) to evaluate a person's decision-making ability. Using these as a bases for the evaluation of section A, this was then compared to international standards of what acceptable decision-making skills were. The subsequent sections attempt to gather additional information that was needed

from respondents to determine the importance of each aspects of the enquiry to the respondent in an attempt to draw a holistic conclusion.

The questionnaire was sent to ten participants to read through and give feedback on. These people were interviewed by the researcher to enable a one-on-one conversation to understand their reaction to the survey and to engage in a discussion about their views on the survey and its questions. By doing this, it was possible to assess their concentration levels during the questionnaire – which gave insight into the perceived lengthiness of the instrument. Their points were taken into consideration when improving the survey. The interviews were carried out at different times to enable a frank discussion to take place and a chance to eliminate groupthink. It also allowed them autonomy to give their honest opinions. From their review it was found that:

- Certain words were ambiguous;
- Statements were not clear;
- Text was too small;
- The DSS needed to be additionally explained.

These points were taken into consideration and the relevant adjustments were made. The next issue that arose was the lengthy cover letter. The letter was then altered from the original to enable a better conveyance of information in one page.

### **3.8. Administration of the Questionnaire**

The secretary sent out the census to all the people in the population. It was easy to get in contact with these people as she was in constant communication with the relevant personnel for exchange of information. She was also given a brief rundown on task at hand and on the survey details. Any further technical queries were directed to the researcher.

### **3.9. Analysis of Data**

After collection of data, it was found that there was a profusion of information. The task thereafter was for the researcher to utilize this raw data to serve the purpose of the questionnaire.

The data can be statistically analysed to verify if the hypotheses generated by the researcher. This can be used to describe the characteristics of people, or test

relationships between variables. The data analysis techniques used were described in terms of inferential and descriptive statistics.

### **3.9.1. Descriptive statistics**

Descriptive statistics are applied to analyse data and to summarize it in such a way as to allow for patterns to surface. It is important to note that descriptive statistics do not allow for conclusions to be drawn from outside the data being analysed. It is a way for the data to be described (Sekaran & Bougie, 2009).

In order to make sense of the data obtained, weightings were allocated to each choice. When this raw data had been calculated, it had to be processed correctly to obtain meaningful results (Boslaugh, 2012).

Predefined score groups were used to allow for the interpretation of the results. For a graphical representation of the size of the first and third quartile, the minimum, maximum and median values, box plots were used. This was useful for analysing the data set to show any outliers that may exist in the data set (Mitchell, 2008).

### **3.9.2. Frequencies**

Frequencies refer to the number of times various phenomena occur. The percentage and cumulative percentage of the phenomena can be calculated from these values (Sekaran & Bougie, 2009)

### **3.9.3. Means and Standard Deviation**

The means and standard deviation was useful to compare a particular result with one global result representing all the results, that is, one result which is formed by taking into account all other values.

The mean would be calculated by summing up all observations and dividing this by total number of observations, while the median is the centre value of the data set after arranging it in ascending or descending order. The spread of the data was also assessed to understand the variability of the results. The spread was determined by the mean and size of the population (Sekaran & Bougie, 2009).

Measures of dispersion or spread were used to further describe data sets. Standard deviation is one of the most commonly used measures. The standard deviation gives

information on how the values of the data set deviate or vary from the mean of the data set (Sekaran & Bougie, 2009).

#### 3.9.4. Inferential Statistics

Inferential statistics consist of procedures for making generalizations about a population by studying the data from the sample. From the sample data characteristics, inferential statistics were used to draw conclusions about the population characteristics.

Inferential statistics can be classified as non-parametric and parametric. Parametric statistics are based on the assumption that the population was normally distributed, whereas non-parametric statistics make no assumption about the population.

#### 3.9.5. Correlation

Correlation does not make any assumption on whether one variable was dependent on the other or not; neither does it delve into the interdependency of each variable. The statistical model estimates the degree to which the two variables are associated. One can say that the correlation analysis tests for interdependency of variables (Schneider et al., 2010). Pearson Correlation was used to show whether or not the two variables had a linear relationship. Pearson correlation is represented by two letters: The letter “r” for a sample and the Greek letter rho ( $\rho$ ) for a population and. The equation used was:

$$r = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2} \sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2}}$$

Equation 3-1 Pearson’s Correlation Coefficient Equation

The formula contains  $X_i$  and  $Y_i$  which are the data points of the variables, and  $\bar{X}$  and  $\bar{Y}$  are the sample means of  $X_i$  and  $Y_i$  respectively. Results are between -1 and 1. -1 represents a perfectly negative correlation between the two values, whilst a result of 1 represents perfectly positive correlation between the two variables. If there is no relationship between the two variables, a value of “0” would be obtained. 0, -1 or 1 are usually impossible to get. As the variation of the data points increase around the best fit line, the value of “r” gets closer to zero, however the equation does



differentiate between dependent and independent variables (Sekaran & Bougie, 2009).

The accepted correlations are as follows:

- Perfectly Correlated: -0.1 or 0.1
- A high correlation: 0.5 to 0.9 or -0.5 to -0.9
- Medium correlation: 0.3 to 0.4 or -0.3 to -0.4
- Low correlation: 0.1 to 0.2 or -0.1 to -0.2
- No correlation: 0

### **3.9.6. Linear regression**

Regression describes the dependency of one variable on the other. There is an assumption that there was a one way casual effect from one variable – the explanatory variable, to the other – the response variable (Schneider et al., 2010).

The regression line allows for the estimation of the dependent variable Y from the independent variable X. The slope (b) of the line is called the regression coefficient, which indicates the measure of the contribution of the dependant variable, Y, has on the independent variable, X (Seber, 1997). The equation can be seen below.

$$Y = bX + a$$

Equation 3-2 Linear Regressing Line Equation

To sum up, the linear regression method attempts to reveal the best fit relationship between data points, while the association between the variables is measured by the correlation coefficients. Correlation and line regression play allow for easy interpretation of quantitative analysis (Twomey & Kroll, 2008).

### **3.10. Summary**

The research conducted was done in order to gauge the decision-making capabilities of specific individuals at Toyota South Africa Assembly Hall Maintenance Department and associated personnel, with specific reference to their acceptance of the new system. The chapter discussed the population, questionnaires and methods used to interpret the results. In addition, the validity and reliability testing were discussed. Meticulous coverage of these topics created a strong groundwork for the dissertation and indicates the exactitude used in producing the results.

## Chapter Four

### Presentation and Discussion of Results

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#### 4.1. Introduction

This chapter will present the findings from the surveys and discusses the results obtained in relation to the aims and objectives of the study, and endeavours to show that the DSS can positively contribute to the strategic decision-making process in the context of Toyota (SA) Manufacturing Maintenance Department operations.

Techniques discussed in preceding chapters will be used for interpretation of the raw data. This section has been developed in four parts to:

- Show the response received from the census
- Demonstrate the prospect of improving the current decision-making ability
  - Hypothesis 1<sub>0</sub>: There is a possibility of improving the decision-making ability
- Show the acceptance of the new system
  - Hypothesis 2a<sub>0</sub>: There is a significant relationship between the perceived ease of use and the perceived usefulness of the DSS.
  - Hypothesis 2b<sub>0</sub>: There is a significant relationship between the perceived usefulness of the DSS and the decision-makers' attitude towards using it.
  - Hypothesis 2c<sub>0</sub>: There is a significant relationship between the perceived ease of use of the DSS and the decision-makers' attitude towards using it.
- Illustrate the potential enhancement of the current decision-making process by a DSS
  - Hypothesis 3<sub>0</sub>: There is a possibility of improving the decision-making ability with the use of a DSS.

This structure was chosen so that it would be straightforward to manoeuvre through interrelated sections.

#### 4.2. Census Feedback

The total number of people in the census was 180, with a response of 143 correctly filled questionnaires. According to the Sample Size table, a sample of approximately 130 was needed. With a sample size of 143, makes it possible to have a confidence level of 99% with a marginal error of 5%. Figure 4.1 shows the sample responses obtained as a percentage of the entire population.

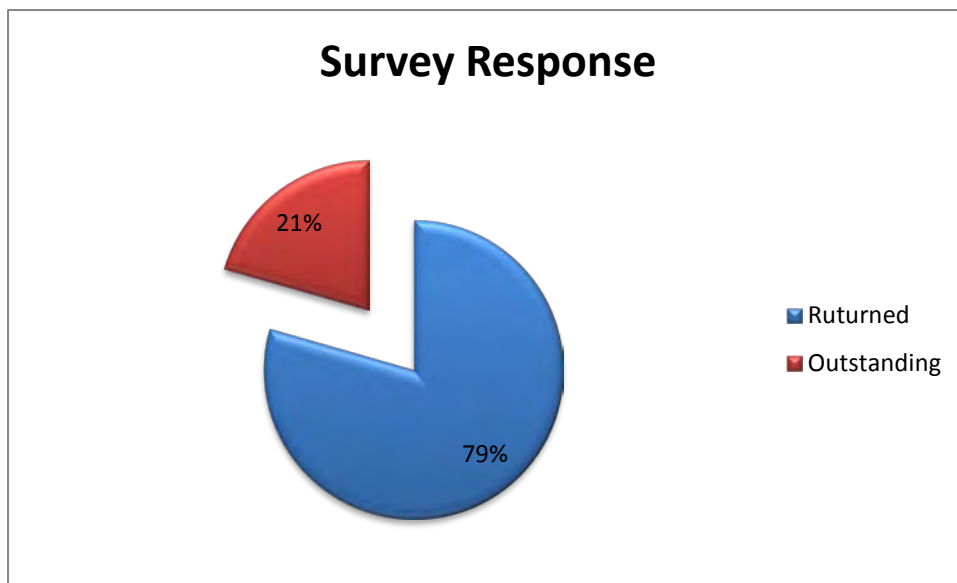


Figure 4.10 Survey Response

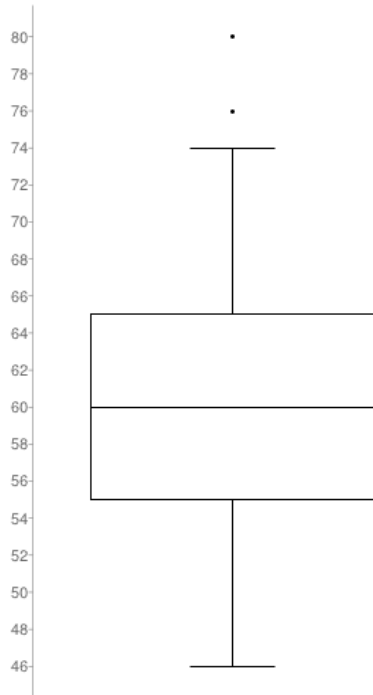
#### 4.3. Decision-Making ability

This section presents an overview of the decision analysis related to the respondents. From the information obtained, the scores were tabulated to find to find the range, average, median, standard deviation, minimum and maximum value.

The information from table 4.1, shows that the data was spread around 60. It was important to understand if there were any outliers in the dataset. These are points in the set of data that differ from the rest of the data points. The major reason for detecting outliers was the potentially strong influence they could have on the data. This could lead to erroneous conclusions being drawn (Caroni, n.d.). A box plot, Figure 4.2 was created to explore this phenomenon. The two outliers that were present were the two highest scoring respondents. These were the only two that had above average decision-making skill. So it shows that there are people of outstanding decision-making ability, but only approximately 1% of the sample.

Min	Max	Range	Average	Median	Standard Deviation
46	80	34	60	60	7

Table 4.1 Decision-Making Descriptive Results



Population Size	Median	Minimum Value	Maximum Value	First Quartile	Third Quartile	Interquartile range	Outliers
143	60	46	80	55	65	10	80; 76

Figure 4.2 Box Plot for Decision-Making Results

By grouping the results obtained into poor, adequate and excellent, it is abundantly clear that the majority of the decision-makers are of adequate ability. These results can be viewed in Figure 4.3. This was expected as the population contained majority of the graduates. It also shows that 1% of the sample has excellent skills to make decisions.



Figure 4.3 Decision Categories

The outcome of each item used in the survey is displayed in Appendix 01. From these frequencies of each item, it was possible to get the relevant data used to analyse the decision-making ability of the respondents. This was done by evaluating each variable against indications from the literature to draw a conclusion of the capability for improvement.

As explained in an earlier chapter, the decision-making process was broken down into five stages that were rated individually to obtain a better understanding of where problematic issues arose. Table 4.2 shows the five stages and the items related to it.

#### 4.3.1. Establish a Positive Environment and Structure the Decision Problem

The environment was shown to be the strongest factor impacting upon the respondents. Figure 4.4 shows that 60% did not want to make decisions and tried to avoid them. This was instantly a 'red flag' to show that there was a problem that existed with regards to making decisions. By not wanting to complete a task, and merely trying to get the event over and done with could lead to dire consequences. It was important to find any patterns in the data that could lead to an understanding of what could cause such a feeling in the participants.

Stage 01		Stage 02		Stage 03		Stage 04		Stage 05	
Item	%	Item	%	Item	%	Item	%	Item	%
1	86	3	72	2	51	4	51	10	62
6	68	8	59	9	57	5	58	14	65
7	67	17	57	18	71	11	54		
12	60			19	70	16	62		
13	72								
15	56								
20	80								
Total	489		188		249		225		127
Total %	70		63		62		56		64

Table 4.2 Stages of Decision-Making

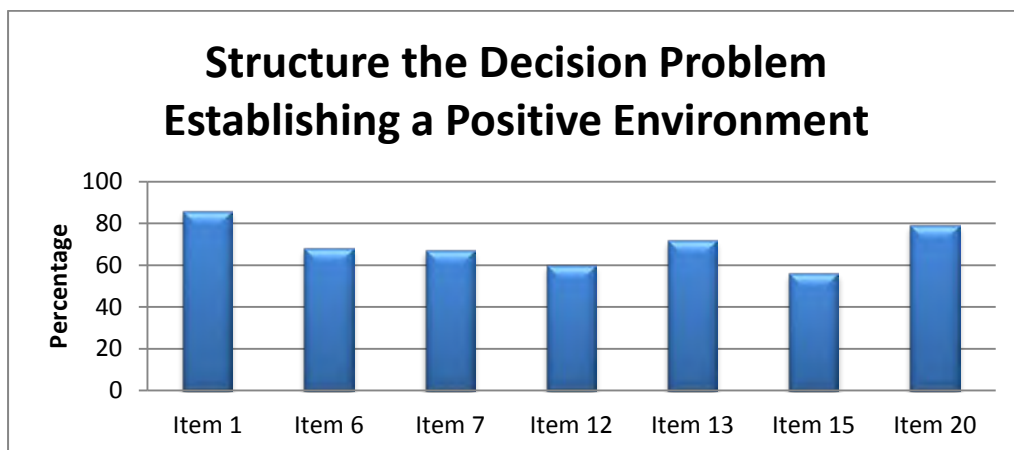


Figure 4.4 Percentage outcome of Stage 1

It is significant to note that 68% of respondents remain calm in a stressful situation and 67% feel in control when information and time is limited. As Flin (1997) explained, as the stress levels increases and the individuals pass the optimum point, their ability to cope deteriorates and becomes prominent. Symptoms of stress in decision-making manifests themselves as inability to assimilate new information, an affect on the process of thinking, loss of concentration, hasty decision-making, impaired short-term memory, and a deficiency in the capacity to plan initial actions (Bourne & Yaroush, 2003). This could have a bearing on the hesitance of the individuals to make decisions. Decision-makers may try to formulate ideas that cannot be accomplished at that point in time, or they may try to simplify a situation that is not simple, ignore crucial information and formulate a minimal number of alternatives. Mayo and Hollander (1991) explained this phenomenon and state that the individual may simply not be able to handle the tasks allocated to them due to the external environmental threats.

Only 58% of the respondents were able to remain calm when decisions needed to be made in a hurry, however the fact that respondents claim that they remain calm when decisions need to be made in a hurry does not necessarily mean that they do in fact remain calm. Not being able to remain calm and able to cope with stressful situations can lead not only to making the incorrect decisions, but also to having subordinates losing trust in the leader.

80% of respondents have a deliberate procedure for approaching decisions and 72% plan in advance. This shows that the respondents not included in this percentage, guess and assume processes to get a desired outcome.

#### **4.3.2. Consider the Impacts of Possible Alternative**

The information needed to undertake this consideration would be from the external environment to enable the decision-maker to evaluate the strengths, weaknesses, opportunities and threats to the company so that numerous alternatives could be considered (Brest & Krieger, 2010). Certain situations call for a group of individuals to examine the information, offer input, and formulate alternatives to a definite end goal. Better decisions can come from a group as compared to a single individual. This is evident in large companies that have boards to take strategic decisions (MindTools, n.d. A). Figure 4.5 shows the percentage outcome for stage 2 of

decision-making. Some 72% of the respondents admit to consulting with others, but 57% avoid taking advice over their decisions. This evidence brings about conflicting views, and does not yield a clear outcome. One view could be that the respondents acknowledge that consulting in a group could lead to new ideas but they wish to stay firm to their beliefs in how to accomplish a desired outcome. This would imply that they are not subject to groupthink. This may be a great achievement and is a trait of a great decision-maker but it also implies that they are not open to innovative approaches. It could also mean that the decision-makers confer with others only to reaffirm their thoughts or to ensure everyone feels part of a team, thereafter disregarding the new input and go in with their initial ideas. These conflicting views create a conundrum in drawing a clear conclusion with regards to groupthink in the current situation.

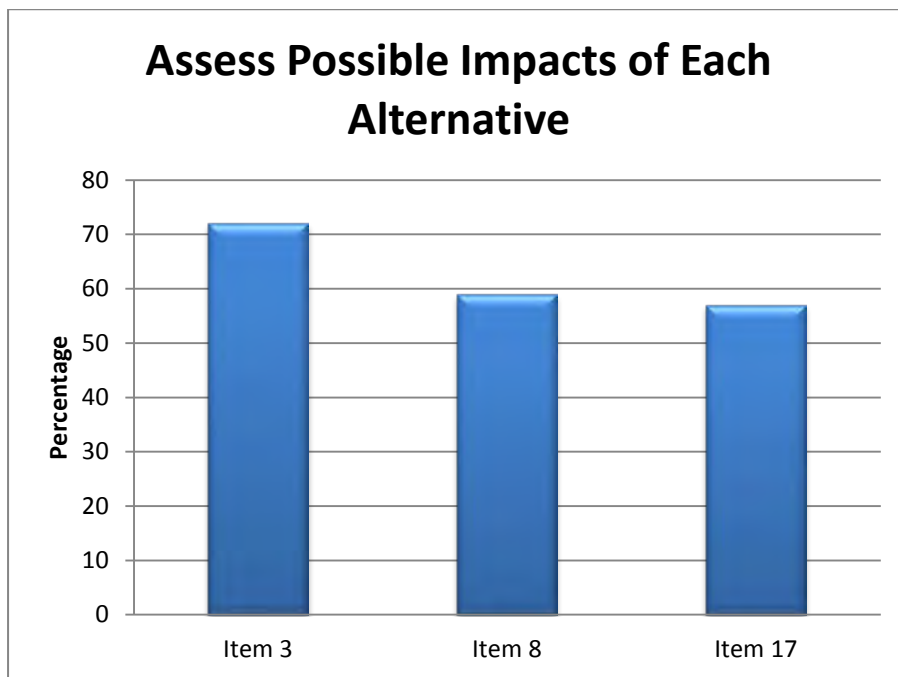


Figure 4.5 Percentage outcome of Stage 2

A decision-maker needs to be aware of whether the decision being made is practical or idealistic (Pomerol, 2012), but only 59% of the respondents considered this. It proves that respondents value unachievable ideals rather than practical implications of applications. The outcomes could be skewed and decisions having to be made in emergencies would not be made correctly every time.



### **4.3.3. Determine the Decision-Maker's Preferences**

Although facts and information are needed to make informed, good decisions, sometimes, experiences and pure 'gut-feel' could be a crucial differentiator between a good decision and a great one (Khatri & Alvin, nd). 51% of the respondents agree with this. The decision-maker needs to understand the situation and should not be overwhelmed by the environmental effects. Intuition needs to be used wisely and consequences understood. By not having the correct information and using intuition and emotion, one could make erratic decisions (Sordoni, 2012). It was already established that the respondents are negatively affected by the environment, thus rendering the respondents' 'gut-feel' questionable.

The implications that could occur need to be considered as this plays a major role in the decision being made. 57% of respondents are aware of this and claim to be aware of all implications. This finding again fits into prior finding of respondents guessing and assuming processes, showing that there was a large question mark hanging over whether or not these respondents have a complete grasp of the situation. This reiterates the importance of the interrelation of each step in the decision-making process.

From the alternatives produced, it is important to take the pros and cons into consideration, 71% of respondents claim to do this. However, it was noted that it was inconsistencies in preceding steps that lead to incomplete alternatives. On a positive note, there was a possibility that the respondents did have a certain amount of ability to comprehend the best way forward from the situation that they were in.

70% of respondents believe that practicalities are more important than principle, which can be seen as a person making a pragmatic decision as a manager or as a leader. The statement by Bennis (2009), "Leaders are people who do the right thing; managers are people who do things right," portrays this situation perfectly. It is important that respondents keep in mind that at a strategic level, it is vital to make decisions as a leader, allowing the day-to-day decisions to be made by the manager. Figure 4.6 shows these results graphically.

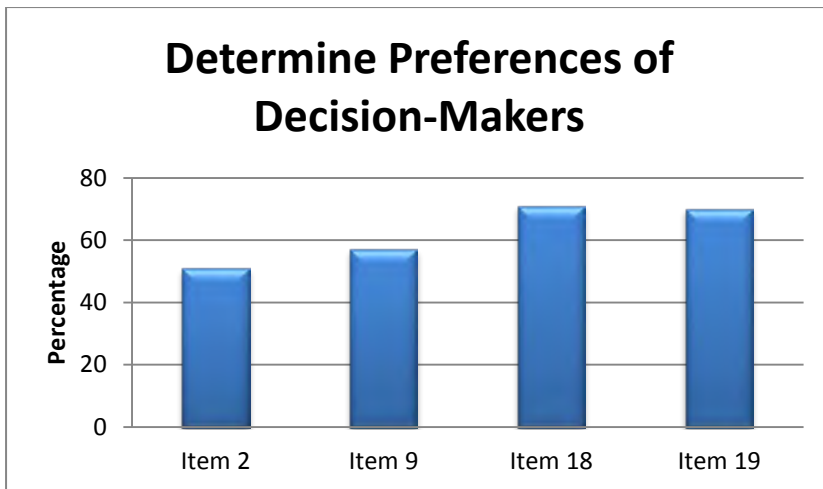


Figure 4.6 Percentage outcome of Stage 3

#### 4.3.4. Determine Optimum Alternatives

To achieve a reputable outcome, many possibilities need to be looked at, not just the first one that seems good (Brest & Krieger, 2010; Wang, 2011). Since only 58% of the respondents choose the first option, it can be assumed that there were possibilities when further judgment was needed. One cannot always try to have a perfect outcome as it could be detrimental to the end target. A balance needs to be struck. If the decision-maker always tries to achieve this, that person may stumble if unforeseen problems arise (Koper, 2012). Therefore a decision-maker needs to be able to judge their decisions and not keep changing decisions on every detour, rather only adapt when there was a major shift in desired outcome. The respondents show that 51% stick to their decisions regardless the outcome. This can show that the respondents are sure of their decisions, but also not able to make correct shifts in patterns when the process starts to deviate from the desired outcome. It could also indicate that such respondents are obdurate and inflexible.

By choosing the safe option (54%), a decision-maker feels free from the stress that comes with restricted time and increased pressure, and this allows them to make a decision quicker and easily (Maule et al., 2004). However, this may not be the correct path. As discussed earlier, the feeling of stress may lead to adverse implications (Flin, 1997; Mayo & Hollander, 1991).

Groupthink appears at this stage again in the form of respondents making up their own mind about things regardless about what others think. It is important that

decision-makers are able to achieve this task. As mentioned before, groupthink causes individuals to conform to others' opinions and individuals are not able to make up their own minds (Janis, 1982). Some 62% of respondents are able to share ideas with others but at the same time preserve their own locus of control. Once again, the figure below represents graphically the statistics spoken about above

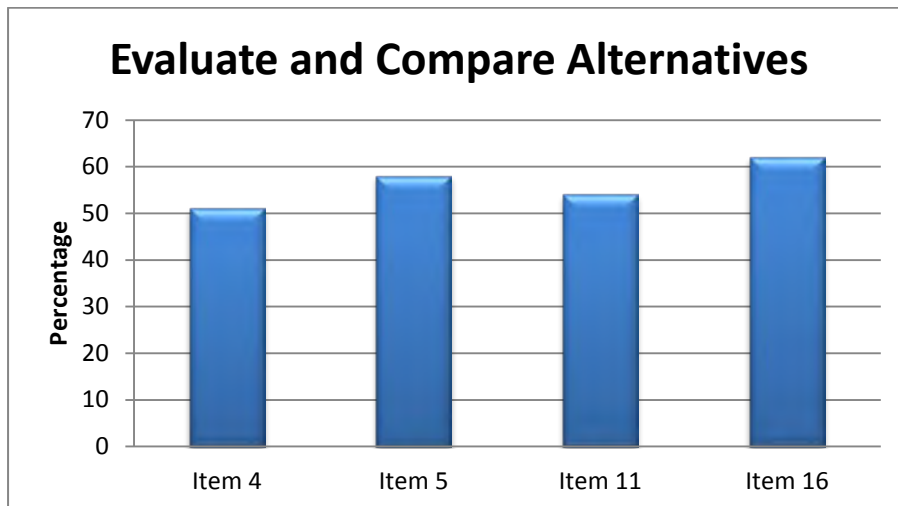


Figure 4.7 Percentage outcome of Stage 4

#### 4.3.5. Implement and Evaluate the Decision

Feedback is crucial when decisions are made, this enables the decision-maker to evaluate the choices and to take the necessary action to correct or aid the decisions. The decisions are continuously monitored to ensure that the end result could be achieved even if there are unexpected changes in the external environment (Harrison, 1996). Only 65% of the respondents believe in doing this. An assumption can be drawn that the respondents who do not keep checking on the processes after a decision has been made and they take it for granted that the outcome will be achieved. Achieving the outcome with an above average decision can rarely be achieved, and therefore the desired outcome will not be accomplished. One can then draw a conclusion that a substandard decision was made.

If the respondent does notice any deviations from the desired route, that person needs to be able to correct the actions, which would mean changing their mindset. 62% of the respondents confessed to not changing their minds very often. This could

be the reaction from them not getting feedback from their decisions, thereby assuming that the outcome was reached, and therefore not needing to change their minds. Figure 4.8 shows these results graphically.

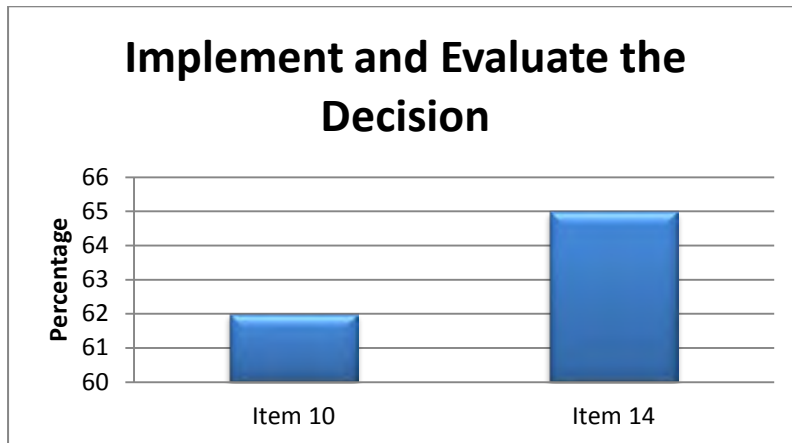


Figure 4.8 Percentage outcome of Stage 5

#### 4.3.6. Hypothesis 1<sub>0</sub>: There is a possibility of improving the decision-making ability

The respondents have many shortfalls that can be detrimental in making strategic decisions. Figure 4.9 shows the combined percentage of each stage. When each item was interrogated, it was found that the ability of the respondents were questionable. Their abilities as decision-makers could be improved to allow for a more efficient and effective decision-making process that allows for feedback that, in turn, allows the decision-maker to stream line the system, thereby allowing for a smoother operation and future prospects. From the information gathered and explained above, one can accept Hypothesis 1<sub>0</sub>.

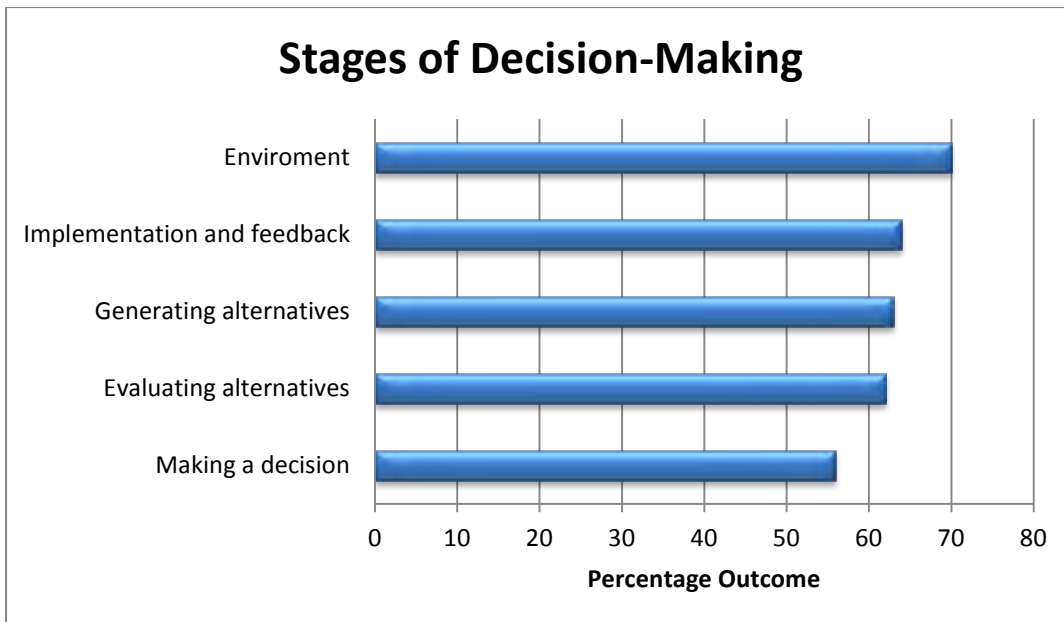


Figure 4.9 Overview of the Decision-Making Stages

#### 4.4. Acceptance of the System

For this system to function correctly, it needs to be welcomed by the users. As Davis (1989) explained, the perceived usefulness and perceived ease of use impact upon the attitude of the decision-maker towards using the DSS. Using the TAM as a basis of this hypothesis, it can be reasoned that the attitudes of the decision-makers also play a role. Kigongo (2011) agrees by stating that the perceived usefulness was influenced by perceived ease of use along with external variables, such as documentation, support and training.

From this belief, three hypotheses were created:

- Hypothesis 2a<sub>0</sub>: There is a significant relationship between the perceived ease of use and the perceived usefulness of the DSS.
- Hypothesis 2b<sub>0</sub>: There is a significant relationship between the perceived usefulness of the DSS and the decision-makers' attitude towards using it.
- Hypothesis 2c<sub>0</sub>: There is a significant relationship between the perceived ease of use of the DSS and the decision-makers' attitude towards using it.

By proving that these items have a strong correlation, one can assume that there would be a possibility of the acceptance of the new system, which has been said to be the initial stage of usage (Abrahamson, 1991).

#### 4.5.1. Perceived Ease of Use of the DSS

It was found that there were a large number of responses that agreed with the perceived interaction with the DSS. Table 4.3 shows that the standard deviation is quite large for the range, this implies that the data has a large spread. However, it should also be noted that the results are stronger towards the right, implying a high-perceived ease of use of the DSS.

Min	Max	Range	Average	Median	Standard Deviation
6	30	24	21	21	5

Table 4.2 Perceived Ease of Use of the DSS Descriptive Results

Appendix 02 illustrates the responses per item in the questionnaire to get a better understanding of the perceptions of the respondents. The figure elaborates on the data, and shows the perceived feeling of the respondents towards each item being evaluated

#### 4.5.2. Perceived Usefulness of the DSS

For the benefits to the company of a DSS respondents seemed to have mixed feelings for certain aspects, but a positive outlook as can be seen from the depiction below in Table 4.4. The standard deviation is not so large in comparison with the data set and here again it shows that the there is strong tendency to the right of the data.

Min	Max	Range	Average	Median	Standard Deviation	Variability
7	35	28	24	25	6	5

Table 4.3 Perceived Usefulness of the DSS Descriptive Statistics

Appendix 03 contains the feedback of each item of the perceived usefulness of the DSS. These details are the direct count of the responses collected. It provided the basis for assumptions made at later stages.

### 4.5.3. Affects of Users' Characteristics of the DSS

For issues that respondents feel that would affect the usage of the DSS, there was a wide spread of data in the upper part of the range. One could assume that the respondents were looking at outcomes from different viewpoints.

Min	Max	Range	Average	Median	Standard Deviation	Variability
22	60	38	41	42	7	6

Table 4.4 Characteristics of Individuals Descriptive Statistics

Appendix 04 contains a graphical representation of each item of the users' characterizes towards the DSS. These details are the direct count of the responses collected.

### 4.5.4. Conceptualization of Relationships

Using the information for the perceived usefulness, perceived ease of use and the users' characteristics, relevant relationships were found between items. This aided in proving, or disproving certain hypotheses.

Pearson's correlation test was used to assess the relationship between the sections. The direction and strength of the relationships can be determined using this technique. These results are displayed in Table 4.6 below. The double asterisk signifies a strong positive relationship between variables.

Correlation	Perceived Ease of Use	Perceived Usefulness	Decision-Makers attitude
Perceived Ease of Use	1		
Perceived Usefulness	0.6 **	1	
Decision-Maker's Attitude	0.5 **	0.6 **	1

Table 4.5 Correlation Matrix

**4.5.4.1. Hypothesis 2a<sub>0</sub>: There is a significant relationship between the perceived ease of use and the perceived usefulness of the DSS.**

It was established from the findings that a significant positive correlation existed between perceived ease of use and perceived usefulness ( $r = 0.5$ ), which would imply that as the user finds it easier to operate the system, their perception of the usefulness of the system also intensifies. That can be interpreted as the employees perceiving the new technology to be capable of improving their job performance. However, if the system was to be too complex, the users would find it difficult to use, thereby decreasing the perceived usefulness.

Looking at the linear regression, two tests were done, one with perceived ease of use being the independent variable and the other with perceived usefulness being the independent variable. The results are shown below in Figure 4.10 and Figure 4.11 respectively.

Sample size: 143

Mean  $x$  ( $\bar{x}$ ): 20.80

Mean  $y$  ( $\bar{y}$ ): 24.40

Intercept ( $a$ ): 9.12

Slope ( $b$ ): 0.73

Regression line equation:  $y = 9.12 + 0.73x$

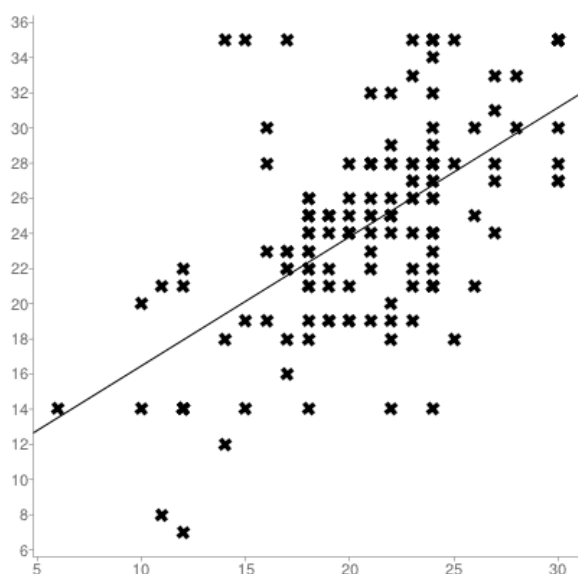


Figure 4.10 Relationship between Perceived Usefulness (X) and Perceived Ease of Use (Y)



Sample size: 143

Mean  $x$  ( $\bar{x}$ ): 24.40

Mean  $y$  ( $\bar{y}$ ): 20.80

Intercept (a): 9.24

Slope (b): 0.47

Regression line equation:  $y = 9.2 + 0.47x$

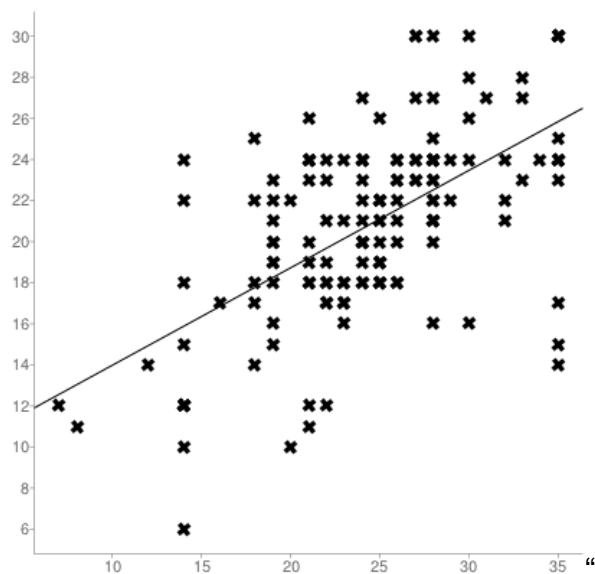


Figure 4.11 Relationship between Perceived Ease of Use (X) and Perceived Usefulness (Y)

These figures show that there was a strong positive relationship in both scenarios, however, the vital difference was that variance in perceived ease of use was due to 73% variance of the perceived usefulness of the system. Moreover, a 47% variance in the perceived usefulness was caused by the perceived ease of use. One could conclude that the perceived usefulness plays a larger role in the ease of use of the system, which ultimately leads to the acceptance of the system.

The data indicated a strong positive linear relationship between the perceived ease of use and the perceived usefulness. This relationship proves that if a person feels that a system is easy to use, they will find it more useful. The correlation does not

factor in the possibility of software glitches, incorrect translations of outputs or hardware malfunctions, but rather it reflects the overview of the existing scenario as an acceptance of technology if it is easy to use. These findings reaffirm the previous study done by Davis (1989), who established that a company that has a strong positive perception of the usefulness of a system would be more likely to use it than a company that has a weaker perception of usefulness. Furthermore, it is suggested that technology perceived to be easy to use is considered as useful, as suggested by the existing direct relationship between perceived ease of use and perceived usefulness (Ndubisi & Jantan, 2003). Therefore, Hypothesis 2a<sub>0</sub> can be accepted.

**4.5.4.2. Hypothesis 2b<sub>0</sub>: There is a significant relationship between the perceived usefulness of the DSS and the decision-makers' attitude towards using it.**

From the information collected, it was ascertained that a significant positive relationship existed between the perceived ease of use and the user's attitude towards the use of the system ( $r = 0.6$ ). This would mean that as the user's perception of the usefulness of the system increases, so will their attitudes towards using the system, and vice versa.

The regression model shows a strong positive relation between the perceived usefulness (X) and attitudes toward the system (Y). Figure 4.12 illustrate that 74% of variance in perceived usefulness was due to attitude. The remaining 23% was due to individual variation and might be explained by other factors that were not taken into account in the analysis.

Sample size: 143

Mean x ( $\bar{x}$ ): 24.40

Mean y ( $\bar{y}$ ): 41.43

Intercept (a): 23.44

Slope (b): 0.74

Regression line equation:  $y = 23.44 + 0.74x$

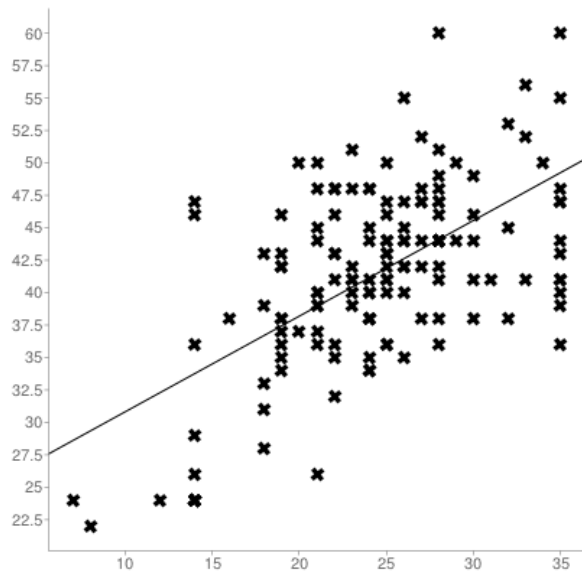


Figure 4.12 Relationship between the perceived usefulness (X) and attitudes toward the system (Y)

The results revealed a correlation coefficient significant and strong enough to indicate a positive linear relationship. It showed that the individuals would formulate a positive attitude if the technology proves to be useful, and vice versa. It was also stated that external aspects play a role in the perceived usefulness of the system such as the workplace environment and functionalities (Davis, 1989). Davis further went on to affirm that the adoption of technology would be extremely high if the perceived usefulness was high, regardless of the perceived ease of use. From these points the Hypothesis 2b<sub>0</sub> can be accepted.

**4.5.4.3. Hypothesis 2c<sub>0</sub>: There is a significant relationship between the perceived ease of use of the DSS and the decision-makers' attitude towards using it.**

The findings from table 4.6 show a significant positive correlation between the perceived ease of use and the user's attitude towards using the system ( $r = 0.5$ ). This means that the user's attitude towards using the system was significantly influenced by their perceived ease of use.

The regression model shows a strong positive relation between the perceived ease of use (X) and attitudes toward the system (Y). Figure 4.13 illustrate that 78% of variance in perceived ease of use was due to attitude. The remaining 22% was due

to individual variation and might be explained by other factors that were not taken into account in the analysis.

Sample size: 143

Mean  $x$  ( $\bar{x}$ ): 20.80

Mean  $y$  ( $\bar{y}$ ): 41.43

Intercept (a): 25.15

Slope (b): 0.78

Regression line equation:  $y = 25.15 + 0.78x$

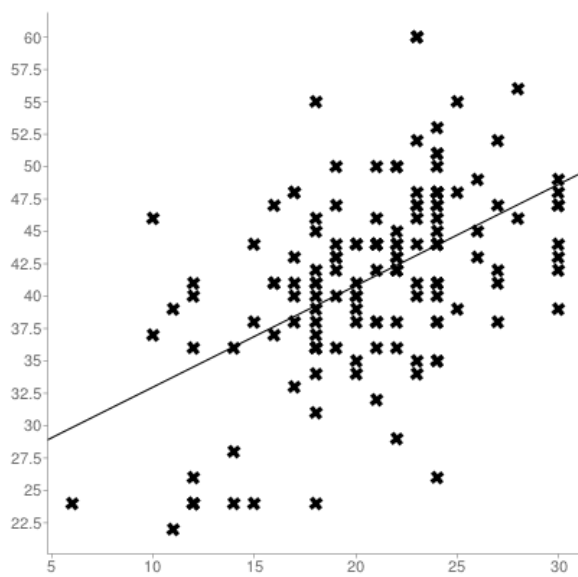


Figure 4.13 Relationship between the perceived ease of use (X) and attitudes toward the system (Y)

From the data collected, a significant and strong positive linear relationship was attained between using the system and the perceived ease of use of the system. The more frequent the use of the system by users the easier it should become to use the system. This finding was inline with that of Davis (1989), who showed that perceived ease of use not only predicts attitudes towards systems, but was also the forerunner of perceived usefulness, meaning that as a system becomes easier to use, the more the user would utilize it, hence increasing their job performance. Therefore, Hypothesis 2c<sub>0</sub> can be accepted.

#### **4.5.4.4. Conclusion of Acceptance**

The research examined the relationship of the user's attitude towards using the DSS, perceived usefulness of the DSS and the perceived ease of use of the DSS. A strong predictor of usage was the perceived usefulness as compared to perceived ease of use. This means that although the perceived ease of use of the system was important, the usefulness of the system had a greater impact to the decision-makers using the system. From the positive results obtained, it has been proved that the system would be accepted.

#### **4.6. Hypothesis 3<sub>0</sub>: There is a possibility of improving the decision-making ability with the use of a DSS**

This section uses the outcome from the prior two sections, that is, the decision-making ability and the acceptance of the system, to show the improvement that the DSS can have on the organization. From these results comparisons are drawn to highlight the functionality and abilities of the DSS in conjunction with experts from the literature.

Firstly, it was proven that there was a gap present in the ability to make strategic decisions. The process was segmented into five areas and analysed to show the discrepancies and the areas that needed to be improved. By doing so, an outline of the entire process was formed to draw a comparison with the usefulness of the DSS.

Secondly, the most important element to consider when introducing new technology is the acceptance of it by the users. The TAM allows for the acceptance to be tested and scrutinised. The results found that there was significant evidence to prove that the new system would be accepted and used. It also confirmed the study done by Pikkarainen, Pikkarainen, Karjaluoto, and Pahnla (2004) that the most significant factor that affects usage was the perceived usefulness.

Lastly, from the literature it was established that the DSS was shown to improve problem identification (Devi, 2009) and it could adapt to matching the environmental changes to activities (Respício, 2010). The DSS would greatly increase the possibility of the decision-maker considering a decision alternative that would provide an improved outcome in a timely and efficient manner (Antunes & Costa, 2012). When time and information is limited at times of crises and emergencies, this could cause extreme problems. The DSS overcomes this by incorporating previously

inputted data, and choosing alternatives from previous cases with similar attributes. It also has a graphic interface to make the system user friendly (Olcer & Majumder, 2006). Multiple scenarios can be created and simulated to test the outcome (Asemi et al., 2011) which can decrease stress levels (Asemi et al., 2011; Tagil et al., 2013) helping the user to think clearer (Flin, 2004).

The information explained above is portrayed below in a manner that can be used to prove the hypothesis:

- The decision-making ability could be improved – proved
- The system would be accepted – proved
- Literature shows the abilities of the DSS in real life situations – assessed by experts, therefore it can be inferred as proven

From this it can clearly be seen that there is a need for improvement, there is technology available that can assist, and the users are willing to accept it. Therefore, to conclude, it can be stated that from the information collected that it can be proved that the DSS would enhance the strategic decision-making process. This implies that the principle Hypothesis 3<sub>0</sub> can be accepted.

#### **4.7. Summary**

This chapter presented the various statistical analysis tools used and the corresponding results to test the relevant hypotheses of the research, thereafter interpreted these results. Direct links were made to literature from the information obtained to draw relevant information when numerical data could not be manipulated mathematically. For the other variables Pearson's correlation coefficient was used to obtain the relationship between relevant variables, and linear regression to ascertain the extent to which the relationship exists. The intention was to link the results of the research and the literature to the objectives of the study. This was done by proving the relevant hypotheses to enable a conclusion to be drawn.

## Chapter Five

### Conclusion and Recommendations

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#### 5.1. Introduction

The object of this research was to examine the current ability of managers and future managers to make decisions and the potential effects of the DSS usage. It was not in any way to imply that the decision-making skills of Toyota was lacking, but rather how it could be enhanced. Toyota has strived to be one of the top motor manufacturers in the world and their abilities are not in question (Toyota, n.d.).

The research model commenced by looking at each fragment, including the decision-making ability, the TAM which included perceived usefulness, the perceived ease of use, and the users' attitude towards using the system, and thereafter perceptions over all to create the general vision. Several findings were revealed in the duration of the research. In vying to achieve the end goal, certain limitations were also identified.

#### 5.2. Has the problem been solved?

The objectives formed the framework of the research.

The primary objective was:

- To show that the DSS can be used to improve the decision-making process

The secondary objectives were:

- To conduct a literature review on the strategic decision-making process and on the Implementation of a DSS;
- To understand the current decision-making skills;
- To ascertain the general awareness that decision-makers have of the DSS;
- To examine the attitudes towards the use of the DSS;
- To establish if a relationship exists between the users attitude towards using the DSS and the perceived ease of use of the DSS;
- To determine if a relationship exists between the users attitude towards using the DSS and the perceived usefulness of the DSS; and
- To identify the views of future managers on the proposed system.

The literature explored the decision-making stages and gave in-depth knowledge of factors affecting the ability to make good decisions. It went on to describe the DSS along with the pros and cons of implementing the system. Thereafter the acceptance of the system was examined.

Questionnaires were formulated that interrogated the current decision-making ability of the relevant personnel, the perceived use of the DSS, the perceived usefulness of the DSS and the attitude of the potential users towards the use of the system.

From the response, it was concluded that the ability of the decision-makers could be improved by the use of DSS. Furthermore, the new system was perceived to be accepted by the users.

### **5.3. Implications of this Research**

The study showed that there was a gap in the ability to make decisions. By moving forward with the present level of decision-making ability, could cause dire problems at a later stage. From the literature and the responses it was determined that the adverse effects can cause the production level to slow down, thereby increasing the stress levels of the decision-makers to correct their decisions. When stress levels increase to a high level, one cannot make clear judgments (Flin, 2004). This would therefore compound the problem. Decision-making relies on information (Yadav, 2006), in the current fast-paced environment it is difficult to review all the information and the decision-maker usually relies on their intuition. This could be beneficial or detrimental to the decision (Shmotkin, 2005; Jamieson & Hyland, 2006). There is a definite need to improve the current status of the decision-making ability.

There are possibilities to improve the current situation by implementing a DSS. The DSS could identify problems swiftly thereby creating more time for the decision-maker, allowing for a reduction in stress. All the information would be contained on a database that the DSS has full access and on which the alternatives are based (Devi, 2009). This would imply that all information would be taken into consideration when determining multiple alternatives and scenarios (Asemi et al., 2011). These scenarios and alternatives can be simulated by the system to foresee certain affects that would be caused by the decisions made (Blios, 1980; Mallach, 1994). This would allow the decision-maker to remain calm and choose the best alternative. In



the event of unforeseen circumstances, the system has the ability to make alternate paths to facilitate corrective actions (Babu & Sekhar, 2012).

This would directly improve the decisions being made; improved decisions would impact positively on the production rate. Improving the production rate would enable the targets to be met or even surpassed, ensuring the bonuses to be paid. An efficient production rate implies artisans have less breakdowns to attend to giving them more time to attend to improvements. The managers have fewer backlashes from production members about ineffective decisions. Senior management are less stressed due to the extra time and assistance from the DSS. The increased production rate would also imply that the customer gets their high quality vehicles sooner, maintaining their loyalty. Toyota SA also has the added benefit of saving the R895 200 000 per annum of prospective revenue.

For the system to work at its full capacity, it needs to be accepted by the users. The TAM was used to show the level of acceptance of the system. The perceived ease of use of the DSS had a strong positive relationship with the attitude of the user towards the DSS. There was also a strong positive correlation between the perceived usefulness and the attitude towards using the system. The perceived usefulness was shown to be a strong predictor of actual usage. Therefore it could be stated that the system would be accepted, allowing for the DSS to be utilized to its full capabilities in order to enhance the decision-making process.

#### **5.4. Recommendations to Solve Research Problems**

To install a DSS in the organisation is not an easy over-the-counter option, although many claim it to be. The system is a customizable data system that caters for the exact needs of the organization. The installation of the system needs to be planned out as a long term strategy to correctly implement and utilize the system, hence the population chosen consisted mainly of the graduates who are the future senior personnel.

To achieve this goal, a detailed analysis needs to be done to understand the expectations and functionality of the system. Including the relevant people in the design phase would be helpful to use their expertise and allow them to encourage others to understand the advantages of the DSS. As the system is being designed,

training needs to be planned and carried out. This is to ensure that the user would understand the system and be able to utilize it when it is ready.

The immediate problem highlighted was the ability to make decisions. Unfortunately all decisions cannot be halted whilst the new system is put in place. To address this issue, the management could be restructured to give more manpower to the thought process in decision-making to relieve the stress on the individuals. However, this would allow for groupthink to be possible. Since these are unstructured decisions, it would be difficult to create manuals based upon past actions to aid with future planning. An environment could be created to allow for the perception that not all failure is wrong. This could enhance the thought process, but could also lead to poor ideas. Management can be sent on courses to be taught how to cultivate internal confidence, a positive outlook when facing challenging choices and they can be encouraged to develop the capacity to listen to all alternatives free from bias.

Although these options for improving strategic decisions in Toyota are possible, none are permanent solutions. People leave, become complacent or decide that they are always correct. The DSS provides a more permanent and less uncertain procedure. It is a long-term goal that can be achieved and will be able to aid with the decision-making process even if the people who started with it leave. The new individuals need to be trained and can maintain or exceed efficiency levels.

### **5.5. Recommendations for Future Studies**

Considering the outcomes as well as the limitations of the study, there are a number of potential opportunities and issues that lend themselves to future research in areas related to DSS adoption and utilization. One can gauge the understanding of the implementation of the DSS from the CEOs and COOs, if the population could include them. By encompassing the topmost management, it would be crucial to observe the acceptance of the system. If senior management rejects the DSS, the new system would definitely fail, as it would need the backing of management to succeed.

The research looked at the decision-making ability, acceptance, and user's attitude toward the use of the DSS. The study could be extended to look at the following factors:

- Problems related to using the DSS
- Management acceptance of the system

- Effects of the DSS on the organizational culture
- Tasks deemed as important when using the DSS
- The effect of age, race, gender and religion on the effective deployment of a DSS

The instrument used to measure the constructs was based on numerous questionnaires used for similar studies, but of a different nature. The questionnaire did not cover every facet of decision-making and the DSS, but rather looked at the broad overview of the enhancement it could provide. The next survey could ask more in-depth questions on the DSS and strategic decision-making to allow for a better collection of data to truly understand the perception of the users.

There was no mention of the design of the DSS or how the information would be processed and displayed. This would be a great research topic to undertake to discover the needs of the DSS in a company. It would allow for feedback from multiple divisions on what would be expected of the system and it would not give complete autonomy to the design engineer and senior management to design the system. This was not added on to this study due to the complexity of the questionnaires, which would deter prospective respondents from completing the survey.

The questionnaires were paper based due to the lack of access to the internet by the respondents. It would be helpful to create an offline html or excel document that could be emailed directly to the users which they could answer and return.

## **5.6. Conclusion**

Taking into consideration the limitations and draw-backs encountered during the research, there was enough evidence from the data collected to extrapolate crucial information. It was able to prove that the ability to make strategic decisions needed improvement and it outlined temporary solutions that could aid the situation. The ultimate aim was to determine the effect of implementing a DSS on the current strategic decision-making process in Toyota South Africa Manufacturing Assembly Hall Maintenance Department. Along with the information collected, it was established that the DSS would indeed enhance the current decision-making process.

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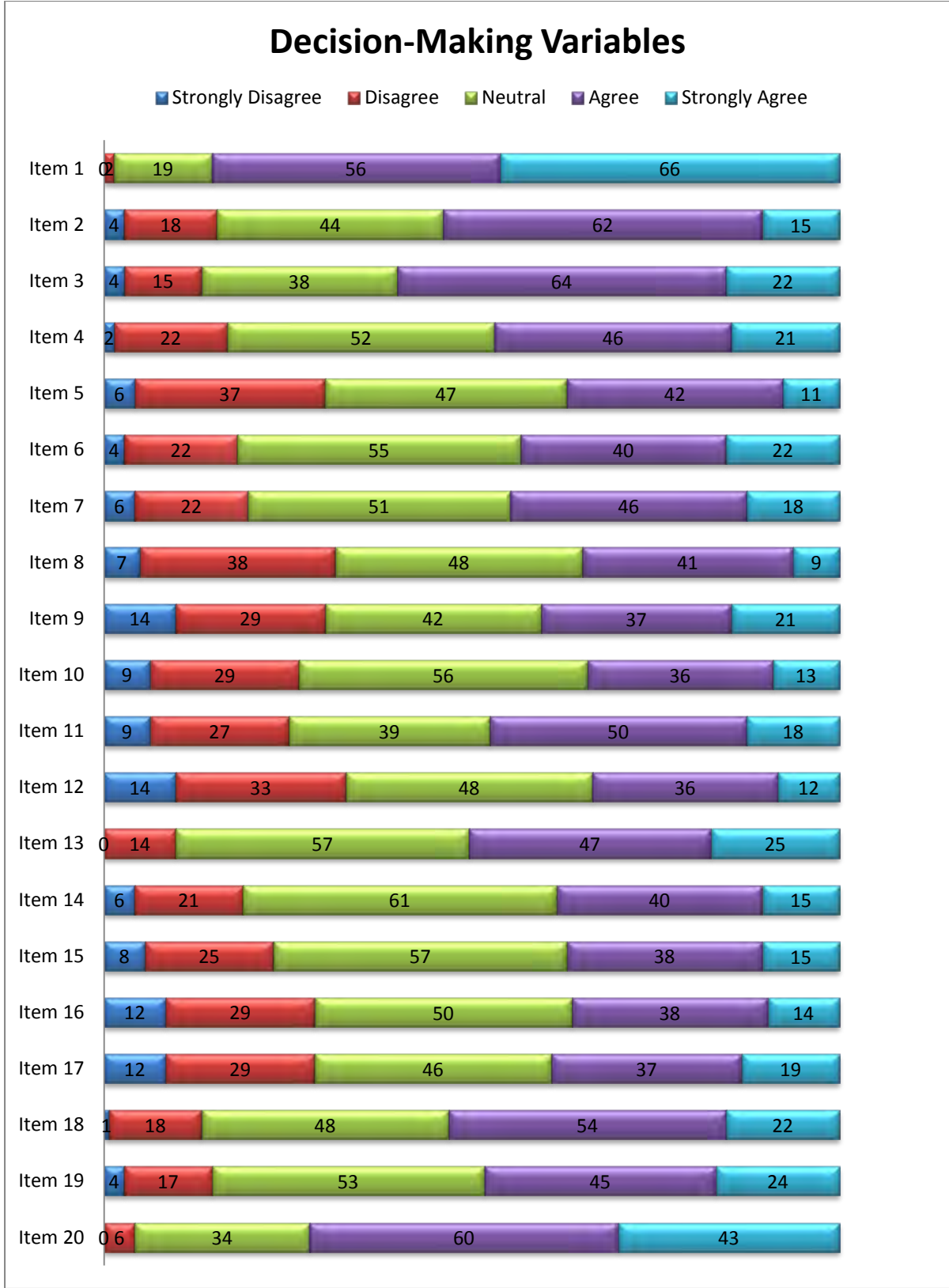
Zentall, T.R. & Wasserman, E.A., 2012. *The Oxford Handbook of Comparative Cognition*. Oxford University Press.

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## Appendix 01

### Decision-Making Variables



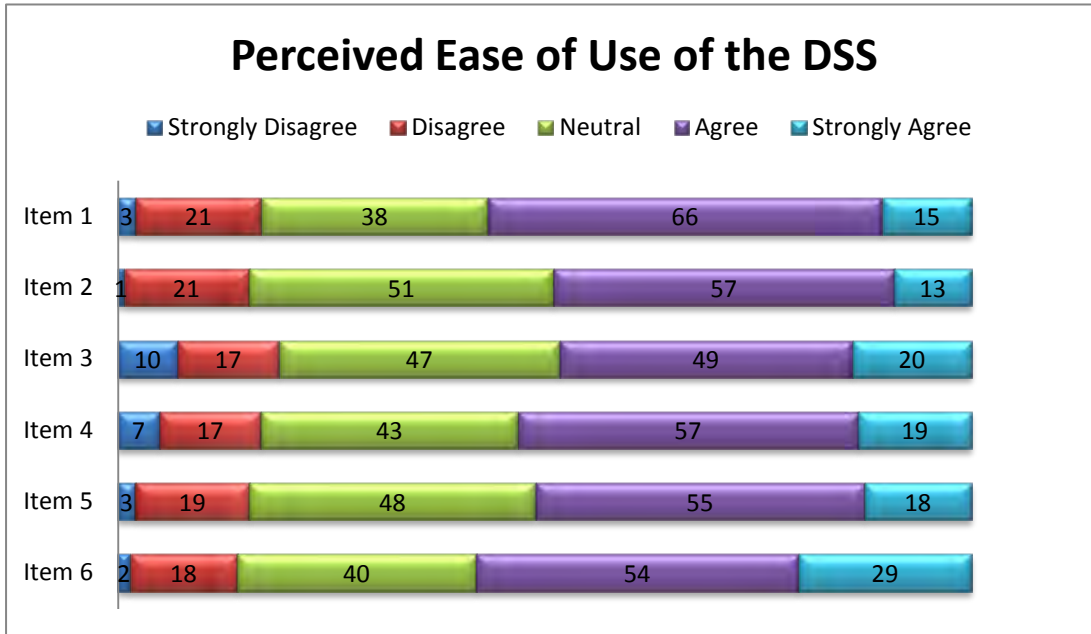
**Key:**

- Item 1: How often do you make decisions?
- Item 2: How often do you rely on gut feel or intuition?
- Item 3: How often do you consult with others?
- Item 4: How often do you stick to your decision through the end regardless of the outcome?
- Item 5: How often do you choose the first option that just about does it?
- Item 6: How often do you remain calm when decisions need to be made quickly?
- Item 7: How often do you feel in control of a situation when time and information are limited?
- Item 8: How often are your decisions governed by your ideals regardless of practical difficulties?
- Item 9: How often do you make decisions without considering all the implications?
- Item 10: How often do you change your mind about things?
- Item 11: How often do you take the safe option if one is available?
- Item 12: How often do you avoid making decisions if you can?
- Item 13: How often do you plan well ahead?
- Item 14: How often do you carry on looking for something better even if you have found a course of action that is just about OK?
- Item 15: How often do you find it difficult to think clearly when you have to decide something in a hurry
- Item 16: How often do you make up your own mind about things regardless about what others think?
- Item 17: How often do you avoid taking advice over decisions?
- Item 18: How often do you work out all the pros and cons before making a decision?
- Item 19: In your decision-making, how often are practicalities more important than principle?
- Item 20: Is your decision-making a deliberate logical process?

## Appendix 02

### Perceived Ease of Use of a DSS

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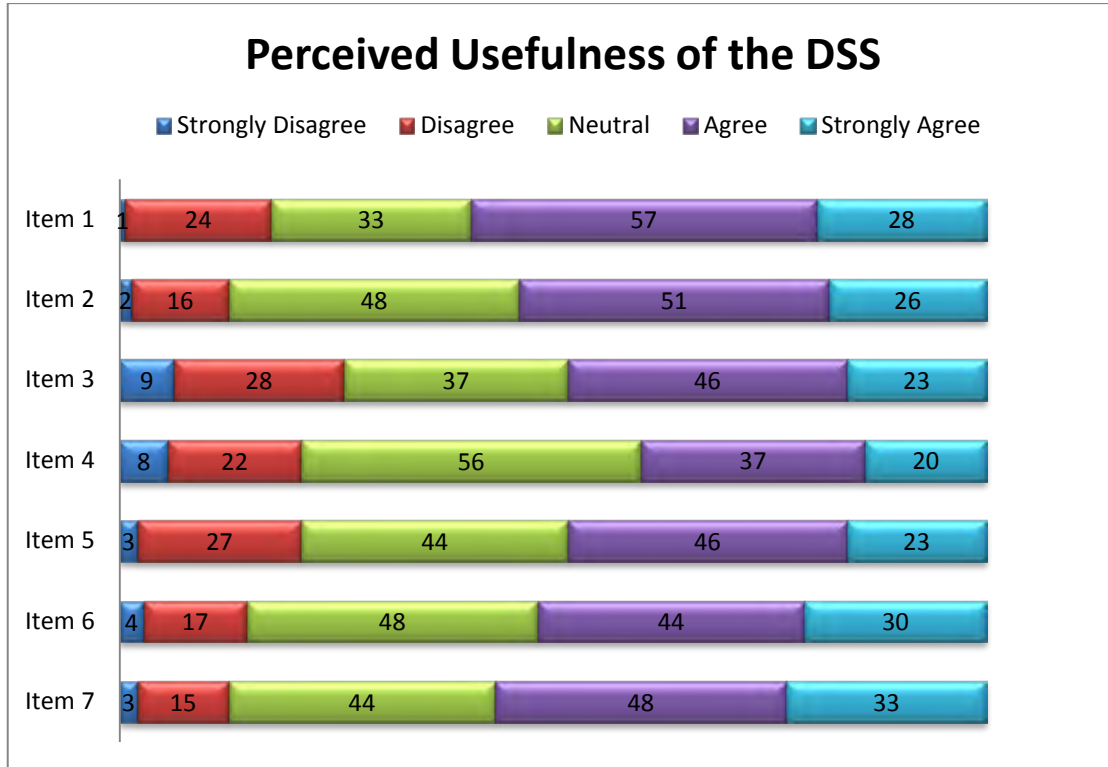
#### Key

- Item 1: Ease of learning DSS software
- Item 2: The interaction with DSS software is clear and understandable
- Item 3: The interaction with DSS software does not require a lot of mental effort
- Item 4: The interaction with DSS software does not require a lot of time to get the information that I need
- Item 5: The interaction with DSS is flexible
- Item 6: It would be easy for me to become skilful at DSS usage.

## Appendix 03

### Perceived Usefulness of the DSS

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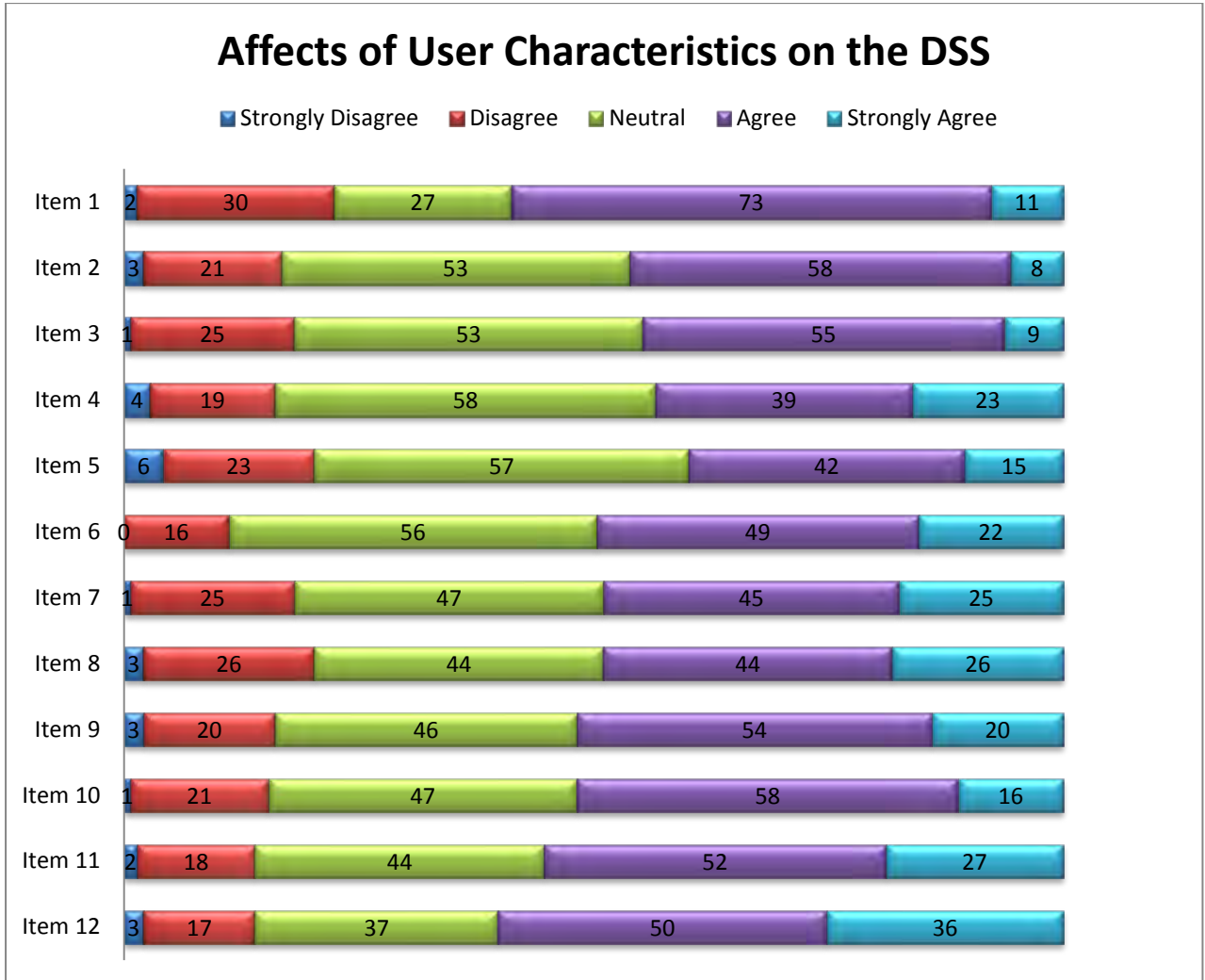


#### Key

- Item 1: Timely / accurate information
- Item 2: Make new information available to me that was not previously available.
- Item 3: Improving customer service
- Item 4: Organization image / reputation
- Item 5: Lowers cost
- Item 6: Improves efficiency / effectiveness of decision-making process
- Item 7: Makes it easier to do my job in general.

## Appendix 04

### Decision-Making Variables



#### Key

- Item 1: Years of experience
- Item 2: Cognitive style (analytical/heuristic)
- Item 3: Self-efficiency
- Item 4: Attitudes towards DSS
- Item 5: Involvement in the development of DSS
- Item 6: Level of training and education
- Item 7: Innovativeness of decision-maker

- Item 8: Fear from using DSS in making strategic decisions
- Item 9: Familiarity with DSS usage
- Item 10: Ability to interpret DSS output
- Item 11: Ability to change and use new methods to make strategic decisions
- Item 12: Confidence in DSS usage

## Appendix 05

### Gate Keeper's Letter

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#### Toyota South Africa Motors (Pty) Ltd

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Cel +27 (0)71 854 2222  
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I, Collin Naidoo, Senior Manager of Maintenance, hereby acknowledge and give permission to Suven M Ramsunder to carry forth the survey at Toyota in the field of decision support systems for the purpose of his dissertation.

A handwritten signature in blue ink, appearing to read "Collin Naidoo", is written over a horizontal line.

Collin Naidoo  
Senior Manager  
Assembly Plant Maint.  
Toyota S.A.Manufacturing  
vnaidoo9@toyota.co.za

Reg. No. 1961/001767/07

President & CEO: Dr JJ van Zyl\*, Executive Vice-President: HD Gazendam\*, Senior Vice Presidents: T Nomoto\*#, M Ogino\*#, HG Pretorius\*.

Secretary: Toyota South Africa (Pty) Ltd represented by CP Marais

\*Directors, #Japanese

## Appendix 06

### Questionnaire

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**A. Please indicate with an 'x', the frequency that pertains to you:**

No	Item	Never (1)	2	3	4	Always (5)
1	How often do you make decisions?					
2	How often do you rely on gut feel or intuition?					
3	How often do you consult with others?					
4	How often do you stick to your decision through the end regardless of the outcome?					
5	How often do you choose the first option that just about does it?					
6	How often do you remain calm when decisions need to be made quickly?					
7	How often do you feel in control of a situations when time and information are limited?					
8	How often are your decisions governed by your ideals regardless of practical difficulties?					
9	How often do you make decisions without considering all the implications?					
10	How often do you change your mind about things?					
11	How often do you take the safe option if one is available?					
12	How often do you avoid making decisions if you can?					
13	How often do you plan well ahead?					
14	How often do you carry on looking for something better even if you have found a course of action that is just about OK?					
15	How often do you find it difficult to think clearly when you have to decide something in a hurry?					
16	How often do you make up your own mind about things regardless about what others think?					
17	How often do you avoid taking advice over decisions?					
18	How often do you work out all the pros and cons before making a decision?					
19	In your decision making, how often are practicalities more important than principle?					
20	Is your decision making a deliberate logical process?					

**B. To what extent do you agree or disagree with regards to the following statements about the perceived ease of use of a DSS, and the affect that a DSS could make in the strategic decisions in your organization? Indicate with an 'x' in the relevant block.**

No	Item	Strongly Disagree (1)	2	3	4	Strongly Agree (5)
1	Ease of learning DSS software.					
2	The interaction with DSS software is clear and understandable					
3	The interaction with DSS software does not require a lot of mental effort					
4	The interaction with DSS software does not require a lot of time to get the information that I need					
5	The interaction with DSS is flexible					
6	It would be easy for me to become skilful at DSS usage.					



C. Please indicate with an 'x' if DSS usage could affect any of the following factors in your organization:

No	Factors of perceived usefulness	No Improvement (1)	2	3	4	Significant Improvement (5)
1	Timely / accurate information					
2	Make new information available to me that was not previously available.					
3	Improving customer service					
4	Organization image / reputation					
5	Lowers cost					
6	Improves efficiency / effectiveness of decision making process					
7	Makes it easier to do my job in general					

D. To what extent do you agree or disagree that the following decision-maker characteristics have an effect on DSS usage in making strategic decisions. Indicate with a 'x'

No	Item	Strongly disagree (1)	2	3	4	Strongly Agree (5)
1	Years of experience					
2	Cognitive style (analytical/heuristic)					
3	Self-efficiency					
4	Attitudes towards DSS					
5	Involvement in the development of DSS					
6	Level of training and education					
7	Innovativeness of decision-maker					
8	Fear from using DSS in making strategic decisions					
9	Familiarity with DSS usage					
10	Ability to interpret DSS output					
11	Ability to change and use new methods to make strategic decisions					
12	Confidence in DSS usage					

E. If you wish to add any further views, please do so below:

# Appendix 07

## Ethical Clearance



26 April 2013

Mr Suven Mohanlal Ramsunder 203503043  
Graduate School of Business and Leadership  
Westville Campus

Dear Mr Ramsunder

Protocol reference number: HSS/0241/013M  
Project title: The Enhancement of Traditional Decision Making with a Decision Support System

### EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steven Collings (Chair)

/pm

cc Supervisor: Dr Elias Munapo  
cc Academic Leader: Dr E Munapo  
cc School Admin.: Ms Wendy Clarke

Humanities & Social Sc Research Ethics Committee  
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