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THE FAILURE OF A DECISION SUPPORT SYSTEM IN USE: AN IRISH CASE STUDY

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Abstract

This paper illustrates the collective impact of organisational setting, a decision makers individual cognitive system/style, and the use of informal sources of information, on the performance of a Decision Support System (DSS). A case study of a DSS is presented, highlighting three critical areas that impacted on the use of the DSS, causing it to fail in its primary function - to calculate accurate re-order quantities for Irelands largest grocery and food distributor.

Introduction

A critical assessment of literature relating to the area of decision support reveals that the design of certain support systems focused on the available technology rather than maintaining a focus on the provision of support to the decision maker (Mann *et al.*, 1986; Keen, 1997; McCosh, 1998; Murphy and Adam, 1998). There are numerous benefits that can be delivered by a DSS (Keen, 1980; Wagner, 1982; Liebowitz, 1990; Adam and Pomerol, 2000) however, if the design fails to incorporate context, the DSS may be rejected (Berkeley, 1998; McCosh, 1998). Many of today's designs in decision support are based on early decision theories, which identified decision making as a sequential linear process (Simon, 1960; Mintzberg *et al.*, 1976; Hickson *et al.*, 1985). However, more recent research claims that decision processes are difficult to link to a normative model, and re-asserts the need to take into account the emotions and past experience of the actual decision maker (Langley *et al.*, 1995; Laudon and Laudon, 1998; Adam and Pomerol, 2000), the decision makers own individual cognitive system (Simon, 1960; 1977; 1987; Langley *et al.*, 1995; Butcher, 1997; McPherson, 1995) and the use of informal systems (McLeod, 1984; Draft and Weick, 1987; Carlsson and Leidner, 1998; Davenport, 1993; Jones *et al.*, 1993; Butcher, 1997).

This paper presents the findings of an interpretive case study of a DSS in use. The choice of case was purposeful in that the DSS module of the Information System being studied was not included as criteria for selection. However, the DSS was implemented to support the re-ordering function within the organisation, which is critical to the success of the business entity studied. In order to understand fully the complex issues involved, a detailed explanation of the case analysis is now undertaken.

The Case of Musgrave SVC

The organisation chosen for study is ***Musgrave SuperValu and Centra (SVC) Distribution***, a trading entity of *Musgrave Group* - Ireland's largest grocery and food distributor. *Musgrave SVC*, the retail franchises division of the *Musgrave group*, account for 72% of group sales. In 1999, group sales were in excess of 1.3 billion Irish punts. Up until 1998, *Musgrave SVC* distributed dry products (ambient goods) to the various franchise retail outlets. However, after extensive market research, *MSVC* decided that it would be profitable for them to distribute perishable as well as ambient goods. This expansion into a new business area was also necessary with the entry of a new competitor into the Irish retail grocery market. This competitor was identified as a threat to *MSVC* growing market share.

The business of operating a chilled food distribution network represented a totally different environment to ambient product distribution, in which *MSVC* had vast experience. In 2000 (two years since opening the first chilled distribution warehouse)

MSVC position themselves two to three years ahead of their competitors. Prior to their commitment to a chilled distribution network, *MSVC* extensively examined similar types of distributions in America, Europe and particularly in the United Kingdom. According to the IT Director within *MSVC* “to make the distribution operate depends on the operational technology behind the infrastructure. The Information System introduced plays a huge part in making it all happen”.... “the warehouses are driven by both prior experience in ambient product distribution and are underpinned by the extensive investment in Information Technology”. At present they remain the first and only organisation engaged in centralised distribution in Ireland.

The Selection of a Suitable Information System

There are several critical aspects to maintaining a chilled distribution network. Due to the short shelf life of many of the products, lead times in and out of the warehouse as well as optimum inventory levels are extremely important. Due to the fact that *MSVC* had no prior knowledge of the chilled distribution business, coupled with their awareness of the need for a system to manage the chilled distribution network, they decided to purchase a readily available Off-The-Shelf (OTS) package.... “if there is an information system readily available on the market which suits the *MSVC* operation, then *MSVC* shall make that purchase”. *MSVC* wanted to be sure that the system selected did what it purported. In order to achieve this, various packages were examined in operation in different countries, but few tried and tested applications existed. In 1998, *MSVC* purchased a package known as World Wide Chain Stores (WWCS) from an IBM affiliated company. WWCS is a warehouse management system focusing on purchases, store orders and optimal inventory levels. The IT director stated that “from a practical point of view WWCS works, it is used in over 100 organisations worldwide, it is the dominant choice in the market”. However, the fact remained that *MSVC* did not have a working model for the chilled distribution business. Therefore, the main selection criteria focused on buying an OTS package that would provide a business model for the chilled distribution network. “There is a way of working in the WWCS environment that dictates how the business works. This was an added benefit, which lead to its ultimate selection”.

The software package was purchased to aid management of the new chilled distribution warehouses. On its first introduction, the systems advantages were readily identifiable. A major advantage of the system is that it operates on real time, which is critical for the chilled distribution environment, where stock reports need to be extremely accurate.

The Use of SUGO Within *MSVC*

Within the WWCS system there is a module known as SUGO (Suggestive Order Quantity). SUGO, best described as a Decision Support System (DSS), would use its various models and variables in estimating demand for a particular product, from which it suggests an appropriate re-order amount (examining previous sales of a product as well as their lead time and shelf life). *MSVC* recognised that having the correct levels of chilled product inventory would be a key to running a successful business. However, as the findings presented in this paper illustrate, SUGO failed in its primary function - to calculate an accurate re-order quantity. The re-order buyers within *MSVC* ignored the quantities suggested by the DSS. Basically, SUGO continually suggested incorrect re-order amounts, despite its apparent ‘dynamic’ method of calculation. Although *MSVC* had seen the WWCS system in operation in similar networks to the one they had planned, the SUGO module was not considered as part of the overall system selection criteria.

The primary role of Information Systems within *MSVC* is to ‘empower employees’ in their decision making and WWCS aims to facilitate this role. The IT director stated that the Information Systems need to “provide relevant and timely information for the re-ordering department, so that they can make informed decisions about what products need to be ordered and in what quantities”. On average, 90% of a re-order managers time is spent re-ordering products for chilled distribution within *MSVC*. All products, plus a history of their previous sales, lead times, service levels, etc. are available on WWCS. The re-order manager emphasised the importance of WWCS to the re-order function, “it is vital. If the system went down, the business would not be able to function, we are completely dependent on WWCS. There is no room for vagueness, one has to go through all the relevant information, and the decisions taken are based on the various sources available from WWCS”. The SUGO module of the WWCS is available to re-order buyers when calculating optimal re-order quantities. According to the re-order manager “SUGO is excellent in that it gives you all of the information you need to do your job, but for short lead time products, of which 95% of *MSVC* chilled products are, it could not suggest a correct or accurate re-order amount”.

Shortfalls in the Use of SUGO Within MSVC

In order to calculate a re-order quantity SUGO would analyse previous movements of inventory. The re-order buyer would also enter information relevant to the re-order quantity, for example, the lead time associated with a product and the expected shelf life of the product. Information like lead time and shelf life are important when placing orders, re-order buyers have to be confident that they have enough stock to cover anticipated demand while waiting for deliveries. Furthermore, the suggested re-order quantity calculation is based on other factors such as those listed in Table 1.

Table 1. Factors for the Dynamic Calculation of Re-order Quantities by SUGO

Stock Calculation Factor
Lead Time
Lead Time Variability
Review Time
Item Service Level
Mean Standard Deviation

Also, *MSVC* were under the impression from the vendor of the system that it could calculate re-order quantities for products that were on promotion. Promotions can have a dramatic effect on the demand for products, which ultimately will have knock on effects on the re-order quantities. The SUGO system was, in theory, capable of coping with the effect of promotions on demand, it would ignore previous sales history of the product and hence identify the promotional product as a totally new product, which incorporates the new selling conditions. Therefore, the re-order quantity it would suggest would be able to account for the promotional environment.

SUGO appeared to have accounted for all of the critical factors in calculating a re-order quantity for the re-order managers. However, the re-order manager admitted that they were “*not using the figure suggested by SUGO. In fact, they never used it. For the first month or so of its introduction, the re-order buyers were using the figure but that was only because they were being told to by their superiors. We learned very quickly that it did not work; we did not use SUGO at all to place orders, ever!*”. The members of *MSVC* involved in the selection of the *WWCS* system, commented “*that from an IT perspective SUGO would work in the chilled distribution re-ordering department and they could not see why it would not work, but its only when you go into practice you realise*”. SUGO’s failure in its primary function was basically due to an inability to cope with various contextual issues present in the *MSVC* chilled distribution environment.

A Combined Analysis of the Critical Factors

Organisational Setting

The case of SUGO in the *MSVC* chilled distribution environment illustrates the importance of contextual issues on the successful use of a DSS. According to the re-order manager, “*SUGO was not compatible with MSVC chilled distribution...the bottom line was that SUGO was ineffective and was making life more difficult to calculate re-order quantities*”. The dynamic factors, which the system used in the calculation of a re-order quantity, all but practically failed. The system was totally inflexible and unable to adapt to the *MSVC* chilled environment. Table 2 illustrates the problems SUGO incurred in its calculation of a suitable re-order quantity. Another contextual issue, which lead to inappropriate re-order quantities being forwarded by SUGO was the rapid growth of *MSVC*. When the chilled distribution business first commenced there may have been only a roll over of 40 retail franchises between SuperValu and Centra. However, this grew exponential in a short time period to over 480 retail franchises in Ireland. This growth in outlets also affected SUGO’s ability to forward accurate re-order quantities.

The case research findings presented, highlight the impact contextual issues can have on the successful use of a DSS. As an example, the contextual issues outlined in Table 2 can be interpreted as failure factors affecting the use of the SUGO DSS within the *MSVC* chilled distribution environment. However, the IT director defended the system stating that it “*was only a small module in the WWCS system, and the department were still only learning*”. This does not still hide the fact that SUGO was a failure and was practically never used by the re-order managers for its primary function. However, one re-order manager pointed out that “*the system does work as a support system, but it does not work as the end product, it did not do what it purported to do*”. The SUGO system provides the tools and information for the calculation of accurate re-order quantities to be done manually. A year and a half into its introduction, the re-order managers were still being asked, by IS, why they were not using SUGO. This was recognised, by the re-order managers, as an attempt to justify the investment in the system. The re-order manager concluded that

“all the information is present in SUGO, add to this a little intuition-past experience, and the re-order buyers can calculate an appropriate re-order amount, you are never going to get the intuition factor incorporated”.

Table 2. Failure Factors in Use of SUGO within MSVC Chilled Distribution

Stock Calculation Factor	Compatible with MSVC Setting	Reasons Outlined for Incompatibility
Lead Time	NO	System would only accept one lead time per product per supplier, whereas in reality MSVC had scenarios of one supplier of many products, and many suppliers of one product
Lead Time Variability	NO	The system could not account for lead times which over ran their expected length, this is common with some of MSVC’s product range
Review Time	NO	In order for accurate re-order quantities to be calculated, the system needed short review times, however, many of MSVC’s products have relatively long review times
Promotional Periods	NO	When a product came out of a promotional period the system would be missing a sales record for the product over the period, hence it could not forward an accurate re-order amount
Seasonal Factors	NO	The system calculated re-order amounts based on previous sales and not actual orders placed by retailers, therefore, it was unable to account for changes in demand brought on by seasonal factors

The Use of Individuals Cognitive Systems in the Re-ordering Function

It also appears that the design of SUGO totally ignored human factors in its role as a DSS. The re-order manager emphasised that “a manager’s intuition and past experience has a huge importance in the successful execution of their function in re-ordering... Other informal sources of information played an influential role in a re-order managers decision making. SUGO’s design failed to incorporate these important aspects, which added to its inability to forward accurate re-order levels”. The re-order manager highlighted many incidents within his role as a re-order buyer where his past experience and intuition had an immense impact on his decision making. The importance of intuition was more acute given the previously outlined failure of SUGO. The re-order buyers would use what information was available to them on the system together with their own cognitive process/style to estimate demand and subsequently estimate a more accurate re-order level. Table 3 summarises incidents where the re-order buyers relied on their past experience and own intuition to aid in calculating a re-order amount.

Table 3. Failure Factors in Use of SUGO Within MSVC Chilled Distribution

Scenario	Re-Order Managers Reaction
Seasonal Effects	Use past experience and own intuition to estimate the impact that seasonal effect will have on demand
Pipe-Filling	Based on their own intuition and past experience of similar situations, the re-order buyer will be able to estimate when there is enough stock

On examination of the scenarios presented in Table 3, it is obvious, as mentioned by the re-order manager that “the amounts you place will depend a lot on your own past experience and intuition”. When analysing re-order amounts supplied by SUGO, the role of intuition in the decision process was hugely important. The re-order manager highlighted an analysis undertaken within the re-order department during the summer holiday period of 1999. When a re-order buyer is on holiday, his/her role will be filled temporarily by one of his/her peers. The aim of the analysis was to measure the impact on the department’s performance following the introduction of a new employee in the re-ordering role. The unit of analysis was service level out to the retailers. These service levels dropped below the departments threshold during the time period of the analysis. A 1% or more drop in performance was noted, which is quite significant when one considers that MSVC sell approximately £5 million Irish punts of chilled product weekly. The re-order manager believed that “the drop in performance could be directly linked to the role that intuition and past experience has in the re-ordering function”. One has to remember that all the re-order managers were working from the same system and methods. The difference is in what the users actually know or basically their differing cognitive styles. This analysis highlights the importance of incorporating decision styles and the individuality of the user into DSS design. In the case of this research, the SUGO system design totally ignored the role of the decision maker in deriving re-order levels. SUGO

does not incorporate the re-order buyer's relevant position in the process of re-ordering, it simply forwards a quantity with the least amount of interaction with the user.

The Use of Informal Systems in the Re-ordering Function

Another important aspect of SUGO's design was that it failed to incorporate any informal sources of information that impacted the re-order decision. The re-order manager identified several sources of information, which could be best described as being informal, that would be used by a re-order buyer. These sources provide the re-order buyer with relevant information, which would not be available on the formal system. For example, the re-order buyer may be aware of a promotion or advertising campaign on one of the products they distribute, or there may be shortages of raw materials in the market. SUGO is unable to account for such relevant information which will affect demand and re-order quantities. SUGO calculates a demand level based on previous sales history alone, whereas the re-order buyer would factor in various elements in calculating a demand level and a subsequent re-order quantity. SUGO's design ignores the relevance of informal systems which are available to the re-order buyer and which impact the amount that is re-ordered.

Summary and Conclusions

From an analysis of this case it was discovered that Information Systems play a significant part in the successful running of the *MSVC* chilled distribution network. An OTS system was purchased after a thorough investigation of the available packages was undertaken. However, it was noted that SUGO, the DSS module of the *WWCS* did not figure in the selection process, although the investment team did expect SUGO to be operational in the *MSVC* chilled distribution setting. It was discovered that this was not the case, and the system was incapable of adapting to the *MSVC* environment. The calculation methods used by the system for formulating an accurate re-order level failed. It was also noted that the design of the system did not incorporate either cognitive or informal systems. The use of intuition, past experience, and informal sources of information form an integral part of the re-ordering function, however, SUGO's design failed to recognise or incorporate these facets. The findings of this research identify critical factors that contributed to the failure of the SUGO system in its primary function. Therefore, the system was incapable of adapting to the new organisational setting and it also failed to incorporate the individual's own cognitive system and informal sources of information, which were readily available to the re-order manager.

The primary objective of DSS design should be information mastery. The key to information mastery lies in the interface between Information Systems and cognitive systems. Therefore, the key to a more effective SUGO type application, in supporting the re-ordering function of *MSVC*, lies in the interaction between information management, human networking and cognition and the integrated technological domain of Information Technology.

It is important to note that SUGO is not obsolete in the re-ordering department. In fact it is interesting to note how the system is currently being used, as it strengthens the conclusions of this research. The re-order managers have always ignored the re-order quantities suggested by SUGO, however, SUGO does hold relevant information to manually calculate an accurate re-order quantity.

Finally, *MSVC* have recently changed their stocking policy within the chilled distribution warehouses. They have moved to a semi JIT system, where goods are ordered from suppliers directly based on the orders received from franchise retailers. The warehouses hold the stock for as little time as possible, passing it immediately on to their retailers. Therefore, stocking levels are no longer as important as in the past, and the role of SUGO has been diminished as a result.

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