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SUPPLY CHAIN FORECASTING IN A GOVERNMENT OWNED CORPORATION

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ABSTRACT

This paper looks at identifying factors affecting forecasting decision making in the supply chain of a government owned corporation (GOC), and how a recent Enterprise Resource Planning System (ERP) implementation was perceived with respect to the usability of the forecasting modules available. It is argued that GOCs represent a distinct form of organisation and that ERP implementation strategies may need to modify some of their basic assumptions in order to be successful. The research approach used was a case study as this was seen as the most appropriate to uncovering the deeper issues which may be unique to GOCs. The study consisted of two major steps. The first step identified 31 key personal in the supply chain and these people were interviewed to determine the level of need for decision support tools prior to the implementation of a new ERP. The second step of the research involved conducting interviews with 16 of the original 31 staff and this was done after the ERP had been implemented for over a year. The feasibility of improving forecasting through the use of decision support system (DSS) and the degree to which the technology can assist forecasting in the supply chain was then explored. It was discovered that data accuracy was a problem. This was not associated with the ERP implementation, but rather with social factors such as different preferences among groups of staff on how to configure procurement and payment of invoices resulting in a lack of a consistent approach across the entire GOC. A lack of trust in the ERP and ineffective training methods were also identified. This research suggests that ERP implementations within GOC's, in particular those with an extensive distributed network such as transport and electricity, are special cases and should be treated differently to implementations in other industries. Further research studies are needed to determine if ERP implementation in GOCs represent a distinct population with special requirements.

Key words: Enterprise Planning Systems, Government Owner Corporations, Forecasting modules

INTRODUCTION

The implementation of enterprise resource planning systems (ERP) provides many advantages for the companies involved. These include the integration of information technology and all the competitive advantage possibilities associated with improved data access. These possibilities are many fold and include improvements in the forecasting capabilities for the supply chain.

FORECASTING

Improved forecasting capabilities can help improve competitive advantage through better estimates of supply and demand within the supply chain. For example [1] describe the forecasting problem for supermarkets as being able to decide what, how much and when to buy stock based on data from previous sales. The authors describe this task as non-trivial as it is further complicated by factors such as "past sales, prices, advertising campaigns, seasonality, holidays, weather, sales of similar products, competitor's promotions" [1] (page 2). Although these authors were describing the supply chain of a supermarket company, the problem discussed could equally apply to other distributed networks such as transport and electricity which have been traditionally owned by governments.

All the major players in ERP sales provide modules to assist in forecasting, for example the SAP Forecasting and Replenishment module claims to minimise inventory and maximise customer satisfaction [5]. The forecasting task has

been described by many as a subset of decision support systems [18], [20] and [22]. For example, [9] discuss the design features of a subset of decision support systems they refer to as forecasting support systems (FSS). These authors indicate that forecasts play an important role in supply chains and assist in decisions related to a multitude of key operational factors. These include “purchasing, marketing, manufacturing, staffing, financial planning and logistics” [9]. Many authors discuss forecasting decisions in terms of integrating judgement with quantitative methods such as using forecasting models [9], [20]. [10] discuss the concept of FSS design being able to help in DSS design.

This paper looks at the tools that are available (mainly as modules within the ERP) for forecasting within the supply of a government owner corporation (GOC) in Australia. According to [21] many forecasters in industry use their own judgment rather than quantitative data analysis. In a survey of 240 firms in the USA, the authors profiled differences in forecasting performance based on whether firms used judgemental or quantitative methods. The authors [21] concluded that there were significant improvements in accuracy when quantitative forecasting methods were used and they recommended that “firms should begin by implementing specific practices found to be associated with quantitative method use” [21], page 521. These practices included database maintenance, use of information technology, focusing on objective rather than subjective information and the use of software capable of forecast generation.

FORECASTING AND GOVERNMENT OWNER CORPORATIONS

This paper concentrates on end-user perceptions of forecasting modules from an existing ERP within a Government Owned Corporation (GOC). The GOC in question has a vast distributed network and is typical of many GOC's around the world. Typically this class of GOC is in the transport, electricity or telecommunications business and is very asset rich through its large network infrastructure. A basic premise of the paper is that ERP implementations and hence forecasting capabilities are different in a GOC with a distributed network to that of an organisation in the private sector. This premise is based on work done by [2] in which they contend that GOC's are a special case in ERP implementation and this is due to the nature of their history and evolution over time. In previous eras, industries such as energy and transport provision were associated with the public sector and were clearly different to private sector organisations. However, in Australia, the Hilmer report in 1993 [7] provided the catalyst for publicly owned services to be privatised. For example [7] describes this partial privation process in the rail industry as a process where the below rail (the infrastructure) component is owned by the government and the above rail components (rolling stock and freight) are subject to competition. In the rail example, this has resulted in a GOC that has obligations to maintain infrastructure but also has to operate as if it were a private company for the above rail competitive component. This effectively means that a GOC has to follow public management principles and guidelines for one part of the business but still compete on the open market for the other part. In Australia, GOC's associated with electricity supply, water and telecommunications have undergone similar reforms to the rail example.

A GOC is defined as “a corporatised commercial entity that is freed from the budget sector but that is managed by Governmental ministers” [12]. “This type of corporation acts as a publicly-owned trading enterprise which conducts activities and provides services in a commercially-orientated environment” [13].

When one considers the influence voters have over politicians and how the office controlling GOC's has so much input into the way they are run, it can be seen that a typical GOC has many masters. For example the GOC is answerable to the Minister, its customers and the board who have a commercial eye for the business and a strong motive to remain competitive and produce a profit for its shareholders (the voters of the state). While increasing reporting requirements and privatisation put pressure on GOC's to be increasingly aligned to the commercial realities of life, GOC's have different requirements in terms of profit to that of a private enterprise. For example, a recent state government report indicated that many GOC's are running at a loss. For instance a transport GOC (either rail or bus way), losses to a certain level may be a more palatable alternative to constructing a new highway to handle the extra traffic. There are many examples of the commercial versus public good dilemma facing GOC's around the world, for example Amin and Gellings (2006) describe the problems facing the North American electricity industry with respect to markets, environmental economics and infrastructure security. However, it is imperative that GOC's responsible for essential services such as transport, electricity, water and telecommunications run as efficiency as possible because the direct and indirect costs of these services affects the efficiency and effectiveness of the economy of the entire nation.

[2] capture the complexity of a GOC through the following statement “These different financial operations are due to the fact that GOC are also crucial service providers for the public interest. A GOC must therefore consider employee

rights, public interest and voter backlash and profitability: like private companies, they engage in profit-seeking commercial activity, often in competition with private sector businesses. Like public sector agencies, they are required to execute government policies, often in the form of delivering non-commercial services or community service obligations” [14].

The tension between public and private drives makes changes such as an ERP implementation, more complicated than would be the case in a purely private corporation [6]. I contend that complex implementations such as ERP’s are especially difficult in a GOC because of the following factors;

1. GOC’s must take a stakeholder rather than shareholder perspective and therefore need to gather more data to manage more issues?
2. The distributed network model is poorly understood and much of the logic of the ERP software is based in manufacturing from the original manufacturing resource planning (MRP) systems. This is also true with the embedded financial models within the ERP’s themselves.
3. Policy reforms around public utilities and just what balance to strike between regulation and free market forces are still yet to be developed to a sophisticated level. For example the New Zealand government bought back the previously privatised railway in 2005 and the problems with the electricity industries see [4]. There is also a general trend for large corporations to want to walk away from utilities such as water.
4. Investment logic is different in GOC’s to the private market, for example investment in infrastructure needs to be done years ahead of time even before a market exists. This results in unique forms of risk which, may be better handled by government rather than the private sector.

Tasks such as forecasting would be more difficult in a GOC environment than a private sector environment due to the factors outlined above and this is confirmed in this research. In addition, the nature of a highly networked GOC means that various actors have to make decisions in isolation from central management and this may mean that forecasts are made around individual needs and local priorities and may not be optimal for the corporation as a whole.

THE CASE STUDY

The organisation used for this study is a large GOC operating at a State level in Australia. It is an essential utility service within Australia and has been operating for well over a century. Due to confidentially reasons, I will refer to the GOC as UTILCOM. UTILCOM has a global reputation for providing innovative and performance driven services and has an annual turnover of over 2 Billion (AUD) with over 13,000 employees.

UTILCOM has recently implemented the ERP, SAP R/3. The implementation was designed to improve reporting and other functions. The process involved conversion from SAP R2 to SAP R3 for 6,000 users.

The modules involved in the implementation were: financial; material management; logistics; forecasting and planning; materials resources planning (MRP); human resources; information systems including executive information systems; project management; and office integration. This paper is focusing on the forecasting and planning module and assessing the usefulness of that module for UTILCOM.

The research project was divided into two stages. The first was conducted by a team of researchers from a University and within UTILCOM. This stage was designed to find ways to optimize the supply chain of UTILCOM. It was a multi-disciplinary research project with the main aim of trying understand how the supply chain operated and then to create an effective model for managing the supply chain operations. The project was complex in that it aimed to understand the basic social, technical and political workings of the supply chain and how it could be managed. This stage involved 31 semi-structured interviews with key stakeholders along a supply chain associated with UTILCOM. The interviews were conducted to determine important elements in each individual’s job and how they related to the supply chain. The supply chain in question was an integral part of infrastructure building and maintenance for UTILCOM and involved three other organisations, one was the manufacturer of the product and the other transported the product to the supply chain distribution point. Interviews ranged from human resource personnel to operational staff and included the supply chain partners mentioned above. Over 500 pages of transcripts were recorded.

Stage two of the research was initiated after the results of stage one indicated problems with forecasting and concerns about the future usefulness of the yet to be implemented SAP R/3. In stage two, 16 semi-structured interviews were conducted on previously identified experts in UTILCOM’s supply chain. These experts were identified by the General

Manager of the supply division of UTILCOM from the original 31 individuals involved in the first stage of the research. They were assessed as being key personnel involved in the supply chain.

As mentioned above, the UTILCOM implementation of SAP R/3 included a forecasting and planning module and there was an expectation that forecast modules would be able to be used effectively.

Therefore, the objectives of this research were to:

1. Identify the salient factors associated with forecasting decision-making in the supply chain of UTILCOM
2. Identify the acceptance of decision support tools by key personnel within the supply chain of UTILCOM
3. Determine a method that would allow for the adoption of DSS tools within the ERP environment that will assist in forecasting within UTILCOM

The expectations of the new implementation were many-fold and from the supply division of UTILCOM, the SAP R/3 was considered to be a useful system for determining inventory levels and transactions across the whole supply chain. However, during the interviews conducted during stage one of the research project, some concern was expressed about understanding the day-to-day operations of the supply chain and of the possibility of predicting future trends.

THE RESEARCH APPROACH

A case study research method [25] was adopted for this research. The approach used a combination of evidence sources. These were documentation, direct observation, participant observation and interviews. These four sources were sufficient to provide triangulation of data sources as described by [25]. The author spent six months at the headquarters of UTILCOM and was able to directly observe the implementation process of SAP R/3. This research is based on a single case study and the four design tests described by [25] of construct validity, internal validity, external validity and reliability were used to ensure rigour within the research.

Construct validity was achieved through the multiple sources as described above, internal validity was tested through matching patterns in the interview transcripts and a large number of discussions with employees within the supply division of UTILCOM which lead to explanations of how and why things were done the way they were. This aspect of the approach was consistent with Yin's concept of explanation building. External validity was tested using rival theories within the case and this included comparing the approach to implementation outlined as appropriate by the information technology consultants and management at UTILCOM with end-user perceptions of how well the implementation process went. Reliability, another design test outlined by Yin, was achieved through the transcription of all interviews which resulted in a substantial database of each of the 47 interviews conducted during both stages of the research project.

DOCUMENTATION

Documentation consisted of Intranet postings by the CEO and reports by the information technology section of UTILCOM. All of this information portrayed a positive slant to the ERP implementation and none of the publicly available documentation mentioned the use of the forecasting module of SAP R/3. Intranet postings were available to all employees as soon as they logged on to their computer.

DIRECT AND PARTICIPANT OBSERVATION

During the author's direct observation period at UTILCOM and he went through the training program for the SAP implementation. During this time he made direct observations and recorded informal conversations with UTILCOM employees at the supply division of the organisation. Training is considered a vital part of effective ERP implementations and a great deal of research has identified poor training as a key barrier to success [24], [17]. At UTILCOM the training packages were computerised manuals with 'successful' training being determined by the user working through each module. The final outcome of the training was a certificate indicating that the employee was "SAP ready".

INTERVIEWS

Interviews were semi structured with the initial 31 being conducted before the implementation of the SAP R/3 and the remaining 16 being conducted a year after implementation. The first stage of interviews was conducted in order to understand how the supply chain at UTILCOM operated and coding of the relevant theme were completed by the open coding method [21]. Open coding is done by hand and transcript passages are organised into concepts. [21] argues that open coding allows the coder to highlight themes deep inside data by looking for a consistent pattern. It provides a

platform for examining the interviews for both observable themes and allows a comparison with abstract concepts (obtained from informal discussions and observations) that help to understand the observable patterns.

Revelations from this first series of 31 interviews led to the following research questions and the second stage of the research consisting of 16 interviews.

1. How effective is the current ERP implementation and training in providing a base for decision support development and usage for the forecasting problem?
2. How useful is the data already gathered within the ERP for use in forecasting?

These first interviews indicated that staffs at UTILCOM were not fully convinced of the usefulness of the ERP implementation. This was emphasised in many occasions during both the first and second stage interviews and lead to many “work a rounds” by staff, these are outlined later in this paper.

The second stage of interviews were conducted a year after the ERP implementation and the same open coding method of analysis was used. These interviews were semi-structured and expanded on the themes identified in the first stage of interviews. However, the emphasis was on decision support and forecasting as it was deemed necessary to focus on one aspect of the multitude of factors identified in the first stage of interviews.

RESULTS

The results for this study are divided into three sections, namely observations from the documentation provided to employees, direct and participant observation of the GOC during the author’s research leave and analysis of the interview transcripts.

SOME OBSERVATIONS FROM THE DOCUMENTATION PROVIDED TO EMPLOYEES

The positive slant on the ERP implementation provided by the Intranet postings and other material appeared to reinforce some of the negative prejudgments about the ERP implementation amongst end-user employees of UTILCOM. It was stated many times that the information provided by management was simply “spin” and that management had to say implementation was a success because “they have spend millions on this and they have to justify the expense” (personal communication for a UTILCOM employee at the lower management level).

DIRECT AND PARTICIPANT OBSERVATION

One of the first things noted during the direct observation stage of this study was the SAP training. The author went through the training process himself and considered it inappropriate due to the “mechanised” approach that many participants adopted. The author observed that many end users in UTILCOM began to repeatedly press the *enter* key as this sped up the process of going through the training program. There was no real need to learn or understand how the system was working and it is suggested that many of the trainees did this because the training was not done in context to their every day work. For example many of the modules related to sections of the business that individuals were not involved with and did not relate to their own work environment. Participant observation and informal discussions indicated that many adopted the repeated pressing of the ‘enter’ key technique and this allowed many end users to end up being “SAP ready” and qualified to use the ERP. This approach is not consistent with the stated aims of UTILCOM’s training as being practical and “on the job” training for staff. The training process used by UTILCOM is at the end of the day is a set package that can be considered a “mechanized hoop-jumping [exercise]” [2].

ANALYSIS OF THE INTERVIEW TRANSCRIPTS

Analysis of the transcripts from stage one of this research revealed a strong suggestion that key decision maker in the supply chain wanted decision support systems to be developed to aid them in making non-routine decisions. The statements from the transcripts were divided into categories based on user-defined aspects of decision support in the supply chain. These categories are shown in table 1.

Table 1: Categories of factors stakeholders consider important based on the transcripts

Category	Attributes describing the category
People	How people relate to the supply chain and the interdependence of people
Innovation	How people perceive decision support will help with innovation in the supply chain
Integration	How people perceive decision support will help integration of data sources

	with respect to the supply chain
Heuristics	How tacit knowledge is used in the supply chain and how decision support systems may be able to help make this knowledge more explicit
Forecasting scheduling	How decision support can help with forecasting and/or scheduling activities
Governance	How corporate governance affects the development and use of decision support systems
Learning	Using decision support systems to learn more about the supply chain using methods like what-if scenarios of change
Collaborative planning	How decision support can help with collaborative planning along the supply chain.
Power	How power relationships affect the development of decision support
Content	How decision support systems can help reduce information overload.

A phenomenon that became clear during this first stage of interviews was that of “feral systems” [15]. A feral system is defined as an information system that is developed by individuals or groups of employees to help them with their work, but is not condoned by management nor is part of the corporation’s accepted information technology infrastructure. Its development is designed to circumvent existing organisational information systems. This concept became a major consideration in the direction of the research as it indicated a certain level of dissatisfaction of the existing ERP system by staff that developed their own systems as an adjunct to or instead of the SAP solution available to them.

As forecasting and decision support were considered important by respondents in the first series of interviews and there were clear indications that some people were developing their own systems instead of using the ERP, stage two interviews concentrated on this aspect of the problem. Stage two consisted of a total of 16 semi-structured interviews, conducted on key members in UTILCOM supply division. The interviews consisted of asking five questions and allowing respondents to expand on each theme. The factors identified from the interview transcripts during stage two of the research are shown in tables Two and Three.

Table Two - Factors identified in the interviews and evidence obtained

Factor Identified	Evidence
Feral Systems	There appeared to be extensive use of feral systems and these computer systems were developed by individuals outside the accepted SAP environment. For example statements by workers such as “... we’ve got a diary that tracks all material usage on a daily basis so it will have on there how [much product] we unloaded today so Bruce will come in write in the diary in that section, how many items of [product] he does. That diary then goes into a database internally within here and onto a spreadsheet...” indicates a high level of internal information systems are used to either supplement the SAP system or replace it.
Problems with communication	There were problems with communication both from within levels of management and between management levels. For example statements such as “Overly reported in supply division (too much information presented slightly differently too often)” and “[it is] Difficult to get easy reports quickly” demonstrate communication problems both in terms of reporting and report complexity.
Strategic communications misunderstood by employees	Strategic communications from decision makers at the upper level were misunderstood by employees. For example “more consistencies and correlation between inputs and outputs” [is needed] indicates miscommunication between parties.
Data that comes from SAP is not contextual in some cases	Data that came from SAP system was not provided in context in some cases and hence misunderstood by employees. For example “Patterns are not easy to find (no smart tool to find patterns in the data like missing inventory etc.)” and “Missing inventory because of ‘under the counter’ just in case and a lot of grass stocks” indicate a misunderstanding of the system and the reports it produces.
Figures coming out of SAP did not align with	Figures coming out of SAP did not align with other, legacy reporting systems, although many of these systems were still in use. Some members of the supply chain did not trust the SAP solution. For example statements such as “Some business processes in the field have trouble matching the

other reporting systems	one in the SAP system” and “Processes in the field are not very efficient in that they don’t appear to match processes outlined at the strategic management level” highlight these problems.
A need for more strategic direction and alignment of SAP to the social system	There was a definite feeling amongst many employees that there was a need for a more strategic direction and alignment of SAP to the social system within the organisation for example statements such as “Local knowledge not being put into the system (not considered)” and “Business processes in the field have trouble matching the one in the system (SAP)” indicate a level of misalignment between the SAP system and the “real world”.

Table Three - Factors identified in the interviews and evidence obtained

Factor Identified	Evidence
A lack of active forecasting capabilities	There was a perception amongst employees that there was a lack of active forecasting capabilities within the SAP system. Further investigations into this revealed that procurement and invoicing practices differed in the various areas of the state and that country based employees had different approaches to procurement because as quoted by one respondent “they have to live in the district and rapid payment to suppliers was a big priority for them”
Risk aversion in UTILCOM	Employees at UTILCOM were very conservative and risk adverse and this effected some decisions made with respect to purchases and reporting. For example statements such as “people are in a fiscal year mindset” – despite the need to order in a different time frame indicates a desire to use the same procurement approaches despite the need for change.
Master Data poorly managed	Respondents felt that the master data was poorly managed and that this was due to definition problems. For example the statement “No corporate data model” was typical of the concern many had about how inventory was handled and the cost of this mishandling to the company in terms of expired warranties and obsolete materials.
A need for macro level organisational analysis (process management/soft change)	Many interviewed expressed an urgent need for macro level organisational analysis of the processes and changes required. This could be an indicator of a lack of awareness of the process mapping and other activities that necessarily preceded the SAP implementation. For example statements such as “Nobody knows what the macro level practices are” highlight this problem.
A need for better asset management strategies	A need for better asset management strategies was also conveyed through the interview transcripts and this is typical of a large GOC with large amounts of money tied up in infrastructure assets. Examples of this are demonstrated in the following quote “[We have] Missing inventory because of ‘under the counter’ just in case [approach]”
A need to improve business practices	It was interesting to see that many respondents felt that there was a need to improve business practices, although these improvements were not clearly defined. For example “Cultural factors are stopping major process changes” was one quote that highlighted this problem.
Requests for an analysis of SAP and its role in the organisation	A common theme was a perceived need for a complete analysis of SAP and its role especially in answering the question: How is it helpful to those who work at UTILCOM? For example the quote “Better metrics needed – that is better ways to apply models of analysis etc.” indicate a degree of discontent with the organisation and the ERP implementation.

DISCUSSION

This paper looked at the supply chain of a large network based GOC (UTILCOM) and examined the processes used in day-to-day operations of the supply chain. The paper also looked at the processes used in association with SAP and how relevant these processes were with respect to the forecasting problem at UTILCOM. The author also looks at the integrity of the data used in SAP and the links to meta-data. Other issues associated with UTILCOM and, the author suspects to other GOC’s, are end user information literacy and the ways organisations can make people want to engage with the information system in this case SAP R/3. The study also analyses what cultural factors and reward systems drive the need to develop “feral systems” where end users develop their own systems presumably because the SAP system does not provide the information they want. It is yet to be determined if feral systems in general benefit an organisation or not and further research in this area would be useful.

According to [20] “effective decision support requires a dynamic strategy”. [20] describes the present business environment as “information-critical” and considers that too many organisations face significant reporting obstacles and tend to operate with inefficient processes. [20] contends that despite recent technological advances in database and reporting tools that few businesses have developed a formal strategy to maximise their return on information. [20] considers that “a Decision Support (DS) strategy that evolves with changes in technology, business requirements and service options is the key to staying competitive”. The author further suggests that “Decision Support System (DSS) strategy should be tightly integrated and support the overall business plan, have individuals responsible for the plan development and monitoring, have the support of senior management, be broad in scope, and be reviewed frequently”. The use of Decision Support Systems (DSS) that are “interactive, computer-based and intended to help decision makers utilize data and models to identify and solve problems and make decisions” are an integral part of the concepts espoused by [20]. In addition this computerised DSS usage is considered by many businesses to be a necessary function for effective operations in any competitive industry.

The research conducted here indicates that employees at UTILCOM are aware of the advantages that ERP’s provide under ideal conditions with respect to integrated IT resources and better decision making through better access to data. However, in practice these ideal situations do not appear to eventuate especially under the network GOC environment. This is due in the main to social and other factors such as reported in the results section of this paper. These factors include problems with both strategic and operational communication and a lack of alignment with other reporting systems.

Employees at UTILCOM indicated that procurement and invoicing systems were different for different regions in the state and that it was extremely difficult to change this to a consistent pattern as would be needed for accurate forecasts. It appears that this is the case because of different work practices and cultures in regional and rural areas of the UTILCOM network. The interviews also revealed the risk adverse nature of employees at UTILCOM and this conservative perspective could affect the way they view the ERP implementation. This conservatism could also have implication for corporation wide forecasting because there is evidence that individuals only maintain accurate inventory for their immediate work area because they do not trust the centralised inventory system. Examples of this are shown in this paper with interviewees disclosing their development of private reporting systems that allow for “grass stocks” or inventory that is hidden away for times when there is an emergency and/or parts are required quickly.

The results of this study also indicate a concern about the need for macro level organisational analysis and this revolves around a need to improve business practices such as the management of master data and infrastructure assets. This asset management has been reported as a major problem in many other public sector organisations and GOC’s [18] and may well be specific problem associated with ERP implementations in GOC’s with a natural monopoly and vast networks of asset infrastructure. Further research is needed in order to establish whether there is a pattern of master data and asset problems associated with ERP implementations in networked GOC’s.

CONCLUSIONS

This study has uncovered many problems with the concept of using decision support modules within SAP. Some of these problems were related directly to UTILCOM, while others were more generic in nature. The author suggests that UTILCOM attempt to use the existing DSS framework within the SAP system; however it is acknowledged that there are major difficulties with this and they involve factors, many of which may be unique to UTILCOM. The author also contends that these factors may have applicability in many other GOC’s as evidenced by the plethora of literature about commercial aspects of government corporations versus the public good factors and the problems with asset management.

In the example case study, it is suggested that UTILCOM change their culture with respect to purchasing and invoicing. It is further suggested that they adopt a consistent purchasing policies regardless of location and this will ensure that consistent data recording is undertaken to ensure the same pattern of expenditure is applied across all items of inventory and across all regions in the state. In this way accurate forecasting measures can be implemented within the SAP system because when the data is consistent, the accuracy of forecasts improves. However, it is accepted that cultural change such as outlined above is very difficult to implement due to individual needs to have control over inventory in case of emergencies and of a general lack of trust in head office and the centralised approach to inventory and asset management.

Further to these suggestions, UTILCOM can possibly include the development of individual DSS for specific problems. These problems were identified by respondents and included a decision support system that is based on better business warehouse data tools and new, innovative decision aids that can be added to annual reports. Many of the features requested by respondents are readily available within SAP, however they are not being used and this will continue unless the structural and social problems of inconsistent procurement policies are solved. As it stands now, data used to make forecasts are inaccurate and this results in inaccurate forecasts.

Other requests by respondents indicated a desire for decision support aids and development. These requests included the development of a DSS to help determine the best processes for procurement in an effort to fit into the SAP solution. Other requests included decision support tools to help in improving relationships between supply partners. This could incorporate aspects of the customer relationship modules of SAP, however this capability was not known to the respondent. Additional requests revolved around developing and implementing a DSS to help improve the efficiency of processes in the field

This research has identified major social and cultural factors that limit the effectiveness of existing DSS modules in SAP. The author contends that these factors are similar and as problematic in many GOC's and that ERP implementations in a GOC environment may need to be treated differently by ERP vendors.

It is accepted that this study has limitations and these are outlined below. The study involved only one GOC, however the author believes that this is representative of a wider range of GOC's in Australia at least. This is due to the similarities they all have with respect to being a distributed network, having the same industrial relations constraints imposed on them by governments and a similar culture being associated with an established utility that has a long standing culture with well established practices and procedures to contend with. If this is the case then it is clear that a lot of money will be wasted in ERP implementations if the factors found here in particular, are in fact systematic to GOC's in general. There is, therefore a need to conduct research on the implementation of ERP systems and all modules (not just forecasting) to determine what adjustments need to be made in order to enhance success in the GOC environment.

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