Implementation of a Cloud-Based Enterprise Resource Planning System at a South African Public Entity

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Abstract

Enterprise resource planning systems are comprehensive and complex software developed to consolidate business functions and processes. Public entities are encouraged to implement such systems to improve internal process flow and service delivery, despite obvious challenges of the new technology implementation. Elsewhere, many organisations have adopted ERP systems notwithstanding the difficulties and inherent risks. Using data from questionnaires and interviews, this study evaluated the factors that affect the implementation of Microsoft Dynamic 365 ERP systems in public entity in South Africa. The results indicate that the major challenges facing public entities, when it comes to the implementation of big projects, like ERP systems, is the rigid nature of supplier selection processes.

Keywords
Business processes; Cloud-Based ERP; Public entities; System implementation

1. Introduction

Enterprise resource planning (ERP) systems are applied to improve efficiency and quality by introducing process integration, simplifying, and standardising various business proceedings. Consequently, the adoption of enterprise resource planning systems has become an important feature of organisations in both the public and private sectors. Bachman (2010) suggests that it is more private sector organisations that implement ERP systems compared to public organisations, stating that that while private sector organisations have been implementing ERP systems since the early 1990's, ERP adoption in public organisations has straggled. This seems to be the case for public organisations in South Africa. There is little literature on South African organisations adopting or implementing ERP systems. Das Neves et al. (2004) laments the lack of literature, relevant to the South African context, about the selection of appropriate ERP systems for organisations. Other works (Townsend (2002); Scholtz and Kapeso (2014); Mukwasi and Seymour, (2014); Urban and Mashinini, (2008)) cover various topics on ERP implementation and adoption in South Africa but they are all based on private organisations and Small, Micro and Medium Enterprises (SMMEs). This study examined the implementation of an ERP system in a public organisation.

Successfully incorporating ERP systems into organisational structures result in a range of socio and technical challenges. These challenges differ from one setting to the next. Different organisations observe varying levels of success as well as different challenges after implementing ERP systems. Petter, DeLone, and McLean (2013) highlighted the adoption of information technology artefacts, by user communities, as an area of concern. The stated benefits of information technology investments depend on the level, nature, and appropriateness of system usage, as much as it is influenced by system quality. This study will abstract from similar studies that have been conducted, on the factors that affect implementation successes and failures of ERP systems and relate that to the experience of implementing an ERP system in a South African public entity. This study is set in a public entity in South Africa. Assessing the success factors and potential barriers from the ERP implementation process may provide an answer to why public entities, within the country, have been reluctant to adopt ERP systems. Moreover, the organisation opted for a cloud-based ERP system, Microsoft Dynamics 365. Peng and Gala, (2015) submit that ERP resources, such as Dynamics 365, can offer an assortment of options to users but also bring, with them, new obstacles. This study will also evaluate the benefits and challenges of Dynamics 365.

2. Literature Review

This study relates to the literature on the factors that influence the success or failure of implementing ERP systems and changing the norm in public institutions. Kelemen (2014) conducted a review of ERP implementation literature and concluded that in the area of non-economic public services, there is still some space for exploration, especially with respect to the implementation of ERP modules in the value chain of each area, taking into account the specifics with regard to the objectives of the organization and the level of development of the state. This provided the justification for the conduction of this study as it is set in a public entity.

2.1 Selection of an ERP System

The selection of ERP systems implementation consultants is a particularly important factor in public entities considering the regulations that govern the sector. The selection of a vendor or product involves multiple tasks and entail comparing and choosing potential software, hardware, network database, and general system implementation partners. Literature identifies several factors that influence the selection of ERP products/vendors such as mutual fit between system and business requirements; flexibility in configuration; technical strength and consulting experience of vendors; reputation; etc. Besides Das Neves et al. 2003, who amplified the importance of selecting the appropriate ERP system for South African organisations, there has been little research in this field, particularly for public entities. Burton (2011) submits that any company faces the challenge of deciding which ERP system is the correct one for the enterprise? This complication is often alluded to as the establishment of 'best fit'. Determining 'best fit' usually entails identifying current and future needs of the business enterprise and certifying that the standard capability of the selected software system should be able to achieve the functionality and efficiency of existing systems at least. The selection of the best ERP system relies on understanding existing processes as much as the capability of the ERP system.

Selecting the correct ERP system is even more complicated public entities as they are tasked with improving efficiency while managing costs. The purchase of packaged software is approached as a major acquisition program, which requires a competitive source selection for the software and the implementation consultants. Van Blerk (2012) raised a concern about using competitive sourcing to select critical suppliers, stating that a cheaper and/or substandard product can pass the eligibility processes and achieve the highest points due to a lower price, unless some aspects, in this case, the entity's requirements such as technology and functionality are specified as non-negotiable.

2.2 Reasons for Implementing an ERP System

Business enterprises are normally required to identify shortcomings in current processes that lead to constraints in growth or hinder future expansion of the business. Anwar and Mohsin (2011) posit that state enterprises around the globe choose ERP systems for assorted stated benefits such as better administration, consolidated real-time access to data, outcome-based management, and refined e-governance but due to stricter legislative and public accountability, social commitments, distinct culture and other factors, state entities face various challenges during the transition to ERP systems. Factors such as the selection of consultants, choice of an appropriate ERP system and internal factors are listed, in literature, as crucial for the success of ERP systems. Researchers also suggest that organisations in the public domain often introduce ERP systems reactively, in contrast to private domain. This is mainly attributed to the lack of pressure, bureaucracy and the culture that prevails in public entities. This study examined the reasons for implementing ERP and delved into the culture of the organisation and how that could hinder or propel the success of the implementation process. The strategic utilisation of Information Technology has been central to the process of transforming public services by increasing productivity in the workplace, supporting, and strengthening corporate goals, making data and information more accessible. Successfully implementing ERP systems will improve efficiency in public organisations.

2.3 Selection of Microsoft Dynamic 365

The system that was deemed appropriate, in this case, was Microsoft Dynamic 365. Elbahri et al. (2019), state that Microsoft Dynamics 365 is constructed on Microsoft infrastructure which facilitates flawless synchronising and development with extra Windows commercial requests. The organisation already utilises numerous Microsoft tools which will enable seamless synchronisation between Dynamics 365 and current processes. The ease of synchronisation also enables easier allocation of data across all methods organisations. The ability of Microsoft Dynamics to synchronize with different Windows applications, thus, making the transfer and sharing of data simple made it suitable as one of the objectives for the entity was to simplify data collection and collation methods.

As a cloud-based ERP system, Dynamics 365's architecture, according to Neevathakrishnan 2013, provides solutions to all the difficulties encountered by conventional ERP systems. It also avoids the infrastructure cost of the companies. As mentioned before, public entities are required to balance improving efficiency with managing costs. The report by Elbahri et al., (2010) expressed that Dynamics 365 takes the shortest application time when compared to Oracle's E-Business Collection and SAP because it is constructed on Windows substructure. For all the strengths of Dynamics 365 stated, no program method is without any errors. The main difficulty of cloud approach is security and confidentiality. The reliability of the network and integration issues is also one of the few other disadvantages of cloud ERP

3. Research Methodology

This study used a mixed methods approach. Ten In-depth interviews with Microsoft Dynamics 365 ERP system implementation consultants and members of the ERP Steering committee within the organisation were conducted. Based on the CSFs, open-ended interview questions were developed. The interviews aimed to ascertain if the organisation, in their planning, considered the CSFs and created conducive conditions to facilitate successful ERP Implementation. This was done by comparing the CSFs found in literature with what the implementation team deemed as the factors that influence successful ERP implementation. The questionnaire was distributed to employees at various operational levels within the organisation and with varying levels of education and experience to get a representative sample. The setting for the study is a metrology institute in South Africa. The institute is one of South Africa's Schedule 3A public entities and will be referred to, from hereon with a pseudonym, NMI. The NMI resolved to implement an ERP System to improve performance and service delivery. There are support processes that feed into and off the operational processes. There were different software systems for Supply Chain, Human Resources, SHEQ and operations which made data collection and reporting processes cumbersome. Since the NMI is a public entity, they are required to follow a strict supplier/vendor selection process. After satisfying the specified vendor selection criteria, a consulting firm and an appropriate ERP system were selected. To this effect, ERP implementation document analysis of the NMI's internal documents were also conducted to assess the effectiveness of the supplier selection process. Descriptive analysis for the questionnaire data was conducted using SPSS software. Interview data was transcribed and coded using Atla.TI software.

4. Results

4.1 Critical Success Factors

Interview findings are mostly congruent with critical success factors obtained from literature which suggest that these factors may be universal, but some are more pronounced than others, in different settings. This section presents and discusses the findings on Critical Success Factors of ERP implementation, in comparison with the on-premise implementation for the selected case, and with support from the literature**.**

4.1.1 Internal Factors

Organisational size: Literature states that an increase in organisational size affects bureaucratisation and leads to decreased flexibility and inhibits change. Consequently, ERP adoption in larger enterprises is different from that in medium-sized or smaller companies. Morabito et al. (2005) especially affirmed that the implementation of an ERP system requires less time in smaller enterprises than in larger ones. The respondents counted the size of NMI as one of the factors that improved the chances of success. The NMI is relatively small with about 200 employees**.**

4.1.2 External Factors

External factors speak mostly to the consultants appointed. The consultants provide a bridge between the vendors and the end users. In this case, the vendors and the consultants came as a package. The respondents commended the amount of knowledge-sharing by consultants and their support and flexibility. A respondent expanded on the support from the consultants and stated that:
*"running this project without consultants would have been difficult because we didn't understand all technical matters.***"**
Vendors are often accused of prioritizing their own interests ahead of the organisations', consultants are then often used to fill the technical knowledge gap between users and the vendors. Using the one company as both the vendor and consultant may expose the organisation to other risks. The organisation believed that the risk was mitigated by having enough in-house expertise on the ERP system**.**

4.2 Challenges

Mehrjerdi (2010) posit that despite thorough planning, leaders of successful projects still deal with as many obstacles as leaders of unsuccessful projects. These include time constraints, shortage of resources, technical challenges, and lack of sufficient training. Even with detailed up-front planning, enterprises are not always able to respond to the situations and complete the projects successfully. In this case, the challenges were split into two, broad categories.

4.2.1.1 Cumbersome supplier selection process: One of the most prominent issues that respondents pinpointed was the long, drawn-out supplier selection process. This was mainly due to the procurement procedures that need to be adhered to in public procurement. The high value of the procurement contract meant that the organisation must publicly advertise the tender for the supply of ERP software and consulting services. Public entities must justify and account to the public for their expenditure, as a result, the ERP implementation was budget driven. One of the section leaders stated:
"we were on a tight budget; so, had to limit ourselves in terms of scope. We chose vendors with special focus on their financial proposals".
This increases the risk of lower standard product being selected by virtue of being the cheapest and not because of functional superiority. In addition to price, bids are also adjudicated on preference points this leads to three different committees needing to be correctly constituted and meet at different stages of the procurement process. Committees for bid specification, bid evaluation, and bid adjudication

had to be formed and constituted properly, which contributed to the lengthy process. This put pressure on subsequent processes, leading to missed deadlines.

4.2.1.2 Functionality: Several researchers suggest that the fit between ERP and business processes is fundamental to the success of ERP projects (A Scheer, 2000). Several processes contribute to determining the extent of ERP software compatibility with business processes. In this case, Business Process Re-engineering (BPR) was used. Law and Ngai (2007) state that BPR is a critical component of ERP projects as automating an inefficacious process without reconfiguring it may result in reduced benefits. Conversely, weak, or inflexible IT infrastructure can adversely affect BPR. Respondents expressed that it took longer to conduct due diligence and review of processes. Targeted dates were missed which resulted in an incomplete BPR process. Failure to conclude BPR process resulted in a high number of features that needed to be customised to fit into the ERP system. A member of the steering committee stated that:
"Also, we mostly had to ask for programs to be customised as various departments could not reengineer current processes."

4.3 Analysis of Questionnaire Results

For the questionnaire distribution, the characteristics of the potential respondents were informed by Mann and Kehoe (1995) who counted employees' skill level, education level, age and experience, and their level of interaction with the product, as some of the factors that affect the implementation stages of new processes. The first section of the questionnaire measured the above characteristics. The educational levels of the employees at the NMI were high with the lowest qualification being an undergraduate diploma. The employees are also very highly skilled albeit in their areas of operation and not necessarily on ERP systems. The worrying factor was the average age of the employees in key ERP implementation positions such as the steering committee. Although they bring more experience to the process, they do not possess substantial ERP systems experience as they have been with the NMI for a long time with little ERP systems interaction.

The second section of the questionnaire dealt with supplier/vendor selection. The questionnaire was developed based on a selection criteria checklist proposed by Das Neves et al. 2003. The respondents were asked to rate the importance of different aspects to be considered when selecting the appropriate supplier and system, using a 7-point Likert scale. The items were divided into three categories, namely:

- Stakeholder Evaluation
- Functionality of the recommended ERP system
- Technical features of the recommended ERP System

Table 1. Results of Stakeholder Evaluation Criteria

Stakeholder evaluation criteria		Totally unimportant	Unimportant	Neutral	Important	Very Important	Total
B1.1 Number of installations	Count	0	6	22	51	9	88
	Row N %	0.0%	6.8%	25.0%	58.0%	10.2%	100.0%
B1.2 Market Rating	Count	9	15	20	33	11	88
	Row N %	10.2%	17.%	22.7%	37.5%	12.5%	100.0%
B1.3 Demonstration	Count	8	15	34	19	12	88
	Row N %	9.1%	17 %	38.6%	21.6%	13.6%	100.0%
B1.4 Local Representation	Count	0	2	6	51	29	88
	Row N %	0.0%	2.3%	6.8%	58.0%	32.9%	100.0%
B1.5 Speed and Ease of Use	Count	17	37	10	18	6	88
	Row N %	19.3%	42.0%	11.4%	20.5%	6.8%	100.0%

On stakeholder evaluation, the respondents rated the total cost of ownership, the service provider's track record, the speed and ease of ERP implementation from conception to completion of project and local representation and support as the most important aspects to consider, as indicated in table 1, above. It is important to note that, compared to the private sector, local representation is particularly important in the public sector. It is one of the criteria used in scoring public tenders. Vendors score more if parts of the project will be outsourced or subcontracted to a local supplier. The questionnaire responses reflect that.

Table 2. Results of system functionality

Functionality of the proposed system		Totally unimportant	Unimportant	Neutral	Important	Very Important	Total
B2.1 Functional Requirements	Count	0	4	24	51	9	88
	Row N %	0.0%	6.8%	25.0%	58.0%	10.2%	100.0%
B2.2 Fit to organisational Culture	Count	10	15	30	20	13	88
	Row N %	11.4%	17.0%	34.1%	22.7%	14.8%	100.0%
B2.3 Fit to business strategy	Count	0	0	14	62	12	88
	Row N %	0.0%	0.0%	15.9%	70.5%	13.6%	100.0%
B2.4 Range of modules to be added	Count	0	10	9	51	18	88
	Row N %	0.0%	11.8%	10.2%	56.8%	20.5%	100.0%
B2.5 Transparency and Information flow	Count	2	3	15	48	20	88
	Row N %	2.3%	3.4%	17.0%	54.5%	22.7%	100.0%

Table 2 above illustrates the responses on what important system functionality features. On the functionality of the proposed system, respondents rated fitting in with the business strategy, the possibility of incorporating a wider range of modules as well as transparency and flow of information as very important requirements. Fitting in with the organisational culture was not deemed as important. This may be explained by Allen et al. 2002, who stated that the implementation of ERP systems and process reengineering can be perceived as attempts to change organisational culture at its deepest level. In that study the characters within that context acknowledged the discord of academic and managerial ideologies. Organisational culture was invariably recognised as a barrier to the implementation. It is therefore a widely held view that the implementation of the ERP systems should enforce or reinforce changes in organisational culture

Table 3. Results of important technical aspects to consider

Technical Aspects of the system		Totally unimportant	Unimportant	Neutral	Important	Very Important	Total
B3.1 Technical Requirements	Count	0	0	9	57	22	88
	Row N %	0.0%	0.0%	10.2%	64.8%	25.0%	100.0%
B3.2 Flexibility	Count	0	0	7	61	20	88
	Row N %	0.0%	0.0%	7.9%	69.3%	22.7%	100.0%
B3.3 Costs	Count	0	0	14	62	12	88
	Row N %	0.0%	0.0%	15.9%	70.5%	13.6%	100.0%
B3.4 Customisation Potential	Count	0	2	17	51	18	88
	Row N %	0.0%	2.3%	19.3%	58.0%	20.5%	100.0%
B3.5 Ease of integration to current or future systems	Count	0	3	10	58	17	88
	Row N %	0.0%	3.4%	11.4%	65.9%	19.3%	100.0%

Summarised in Table 3 above, are technical features of ERP systems. Respondents deemed all the items, that were listed on the questionnaire, to be very important. One of the most important features that must be considered, when selecting an appropriate ERP system, is adaptability and flexibility with respect to any remaining legacy system. This ensures seamless integration and data migration between systems. This was also given as one of the main reasons why Microsoft Dynamics 365 was selected. Most of the organisation's system are on Microsoft portals, integrating them to the ERP system would be easier. This would also ensure that data migration and maintenance costs kept minimal.

5. Discussion

The discussion of key observations and lessons learned, from the case study, is provided in this section. An ERP project implementation checklist, kin to the one compiled by Anwar, is used compare key activities, decisions, and strategies involved in ERP project management against the implementation process of the NMI. A recurring theme detected from case studies was that public entities are likely to have less autonomy, in comparison to private entities, when deciding on large projects. This contributes to decision making, at different stages, being very rigid, resulting in delays to the progress of the project. A similar thread was observed in this study as well, respondents highlighted public organisations' distinction in business processes, service delivery priorities, accounting to ministers and societal responsibilities as contributors to why implementing large projects can be very challenging.

The projected go-live date for the ERP implementation kept changing as the implementation team faced numerous challenges. The makeup of the implementation team did not consist of enough executive members as a result, some decisions took longer to be made or finalised. Notwithstanding the differences in culture and lack of competitive pressure, state entities are still required to follow established project management frameworks and oversight procedures. These procedures and/or guidelines remain the same for both public and private institutions. In trying to assess how best did the NMI follow project management process, a comparison is discussed below.

5.1 Implementation

Project planning in public entities tends to be ad-hoc whereas successful implementation requires detailed planning in line with resource availability, operational requirements, and risks. The duties, responsibilities, and timelines were delegated clearly among parties, in this case. Section Heads and their teams were required to evaluate and map out business processes, identify business process re-engineering opportunities before seeking software customisation from the vendor. Delays in implementation emanated from the lack of decision-makers in the steering committee and lapses in monitoring and coordination of the planned activities. To avoid delays in implementation, it is very critical to monitor and coordinate planned activities and stick to the original timelines.

6. Conclusion

The findings from this study generally corroborate what is available in literature. This study confirmed that one of the main challenges facing public entities, when it comes to the implementation of big projects, like ERP systems, is the rigid nature of supplier selection processes, amongst other things. The NMI did not have complete control on ERP implementation collaboration team and partners and that influenced the effectiveness of the implementation strategy. Using the project management checklist, as a guideline, also identified parts of the implementation strategy that was not thoroughly considered. For future research, studies on successful ERP adoption and implementation in South Africa's public sector should be conducted. More studies should also be conducted on Cloud ERP and what it can offer South Africa's public organisations that other ERP systems were not able to offer.

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