

Managing Enterprise Resource Planning System Customisation Post-Implementation

The Case of an African Petroleum Organisation

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Abstract: Implementing an Enterprise Resource Planning (ERP) system is a challenging endeavour. One dominant challenge is to determine when to customise the ERP system to match organisational requirements and when to rather change business processes to fit standard ERP delivered functionality. However, there is agreement that ERP customisation needs to be managed. While research has been done in understanding drivers of ERP customisation during an implementation, little research has focused on the post-implementation journey. This paper describes factors impacting ERP customisation post-implementation. The study is an interpretive single organisational case study in a multinational African petroleum organisation. The study identifies multiple reasons for the need for customisation post-implementation and describes practices that organisations can employ to manage customisation, including staff training interventions, systematically removing modifications and approval processes. This paper contributes to our understanding of ERP customisation and should be a value to practitioners trying to manage customisation post-implementation.

1 INTRODUCTION

Enterprise Resource Planning (ERP) systems have transformed the way organisations operate and are supported by software. ERP systems provide process templates that claim to embody current best business practices (Esteves and Pastor, 2016). Yet there is an inherent misfit between the processes of the business and the functionality offered by the packaged solution. Therefore, in order to achieve functional alignment between the system and organisational processes, some ERP customisation is necessary (Buonanno et al., 2005). It is wiser to minimise customisation to reduce post implementation maintenance costs (Kholeif, Abdel-Kader and Sherer, 2007). Yet many organisations struggle to control the proliferation of customisation (Panorama Consulting, 2017) and the drivers for customisation post-implementation are not well understood. Hence this paper describes factors impacting ERP customisation post implementation. To achieve this, a brief summary of ERP systems as well as the customisation drivers are presented. This is then followed by the research method, the study's findings and conclusion.

2 LITERATURE REVIEW

Unlike bespoke software, ERP software packages are not custom built to match the needs and business processes of one specific organisation (Fryling, 2015). Instead, ERP systems, such as SAP ERP, are designed by ERP vendors to support a wide-range of organisational needs across a diverse global landscape (Haines, 2009; Luo and Strong, 2004). These systems enable an organisation to automate, standardize and integrate their business processes across functional divisions (Aslam, Coombs and Doherty, 2012). The major value from ERP systems accrues post-implementation, although there is little research on this (Cao, Nicolaou and Bhattacharya, 2013). There are many ERP lifecycle phases after go-live (Brehm and Markus, 2000).

ERP vendors inscribe industry "best practices" into their pre-packages software. In reality these "best practices" are common business processes (Antero, 2015). The success of an ERP implementation hinges largely on being able to identify a fitting match between these ERP standard processes and the organisation's business processes (Cao et al., 2013). Yet, there are many different industries and

organisations within those industries that operate differently from one another (Pan et al., 2015). As every organisation is unique and operates differently, the implementation of the general standard solution offered by vendors can be inadequate (Davis, 2005). To achieve a fit between the business processes required and the system, customisation of the system or changing the business process is necessary (Luo and Strong, 2004). In this paper, focus will be given to the customisation of the ERP system.

There are many ways of categorising ERP customisation or tailoring (Brehm, Heinzl and Markus, 2001; Hustad, Haddara and Kalvenes, 2016). They can be categorised into three categories: module customisation, table configuration and ERP programming. Module customisation refers to selection of various modules. Table configuration refers to the setup of table parameters that alters the functionality of the modules according to the requirements set out by the organisation. ERP programming includes the programming of screen masks, extended reporting, user exits, enhancements, extensions, interface developments and code modification. Code modification refers to the actual modification of the standard delivered system source code (Luo and Strong, 2004). Unfortunately, the most commonly used term, ERP customising, is often misused. The SAP ERP menu refers to table configuration as customizing and in contrast many articles and users when referring to customising imply code modification. Therefore in reviewing the literature we loosely use the term customisation which in most cases implies ERP programming.

An ERP's ability to compete within the hypercompetitive ERP environment market is determined by how well it keeps up with technological innovation (Antero, 2015). Therefore, ERP vendors release a continuous flow of upgrades and fixes which ERP adopters need to implement post-implementation (Brehm and Markus, 2000). The more modifications, the more development and testing time is required to deliver the solution. This effort is duplicated at each ERP upgrade when code modifications are overwritten and need to be reapplied (Zach, 2012). As a result of this, post implementation costs continually rise (Esteves and Pastor, 2016). Functionality offered by ERP vendors also takes preference over all forms of ERP programming as the vendor is responsible for its support (Light, 2005) and hence costs are reduced. While practitioners have stated that the ideal level of ERP customisation should be between 10 and 20% of code modified (Panorama Consulting, 2017), customisation is known to increase post

implementation (Esteves and Pastor, 2016). The literature identifying factors driving customisation was reviewed in this paper and was found to focus predominantly on the implementation stage and the definition of what constituted customisation was found to be vague. For parsimony sake, these factors are presented with the findings. As ERP programming is the form of ERP customisation with the highest long term cost an understanding of its drivers is needed.

3 RESEARCH METHOD

Despite the recommendations from literature that discourage excessive ERP programming, the amount increases after the ERP system has gone live. Hence the main question posed is "What impacts ERP programming at post implementation stage." An embedded interpretive single case study was conducted as it is suitable for answering descriptive questions (Yin, 2012) enabling a rich understanding of the underlying factors impacting customisation.

Company Z studied is a multinational petroleum organisation that has a presence in many sub-Saharan African countries and had been running SAP for longer than 20 years. They had their own internal ERP team within their Information Systems (IS) department. The initial implementation project brought about substantial code modifications and created a culture that accepted and invited this practice. Their ERP had undergone numerous upgrades that were very challenging due to the large amount of ERP programming. In 2016 they were upgrading to the latest EHP8 version and in line with SAP's future road map they were planning to migrate to S/4HANA, and needed to reduce their custom objects. This provided the ideal setting to understand factors that impact ERP programming. The university's ethics committee approved the study.

Data triangulation included semi-structured interviews and secondary data in the form of change notes extracted from the call logging system. To restrict the study, we chose to sample customisation on the core modules of Finance (FI), Sales and Distribution (SD) and Materials Management (MM). We were given access to 990 change notes submitted between 2012 and 2016 but focused our review on requests completed through ERP programming in the three modules. The convenient and purposive sampling strategy for interviews included users who requested customisation (U1-U3), internal functional consultants responsible for the various modules (C1-C3), senior management of functional departments

(M1-M3) as well as technical consultants and a technical manager (T1-T2). Hybrid inductive and deductive thematic analysis which was then followed allowed specific themes to be identified and compared with theoretical ones and validated or invalidated (Braun and Clarke, 2006).

In terms of limitations, while we performed 11 interviews, which is more than similar studies, we did not test for theoretical saturation and it is possible that more themes could emerge with further interviews. A second limitation is that other than the two technical staff interviewed, other respondents were not able to differentiate between ERP modifications and other forms of ERP customisation. We were also not easily able to do this differentiation in the call logs reviewed and hence the call logs were not that useful. We are also not able to clearly argue generalisation outside of the context studied. This study does focus on a large organisation and a mature ERP product.

4 FINDINGS AND DISCUSSION

Table 1: Contrasting this study’s findings with literature.

Literature factors impacting customisation across all phases	Factors impacting programming during post-implementation
Inexperienced and revenue maximising external consultants	(-) Experienced and knowledgeable internal consultants
Lack of ERP knowledge in the organisation	(+) Insufficient ongoing user training focusing on business processes (+) Lack of handover between users
Organisational resistance to change processes	(+) Organisational resistance to change processes
Lack of involvement of operational departments	(+) Business preference of bespoke over standard functionality (+) Involvement of operational departments
ERP systems with high complexity	(+) ERP Systems with high complexity and extensive functionality
ERP systems with low maturity	Not applicable in this case
top management support	(-) top management support
	(-) Customisation approval processes (-) Systematically removing modifications
ERP and organisational misfit	(+) ERP and organisational misfit
Strategically important or differentiated business	(+) Strategically important or required functionality
Legislative requirements	(+) Legislative requirements
	(+) Country differences (+) An evolving industry

Table 1 summarises the factors found and contrasts these with factors identified in the literature which impact customisations at any phase. The table includes a plus (+) sign to indicate factors increasing and a minus (-) for those reducing ERP programming.

4.1 Experienced and Knowledgeable Internal Consultants

ERP consultants can promote customisation reduction by rejecting requested customisation based on the standard provisions (Davis, 2005) and are better able to convince an organisation to modify a business process instead (Ko, Kirsch and King, 2005). Yet, well experienced experts are also able to thoroughly assess whether any strategic advantage is gained by retaining a specific business process (Haines, 2009) and are able to promote customisation (Rothenberger and Srite, 2009). In contrast, consultants with less experience are less able to discourage and avoid customisation (Haines, 2009; Rothenberger and Srite, 2009). In worse situations, consultants may encourage customisation as it is seen to be a source of revenue and can maximize billable hours (Haines, 2009; Rothenberger and Srite, 2009).

In Company Z, the consultants were internal not external and there was no exploitation of revenue generation. The consultants were very experienced having implemented the specific ERP system for more than a decade. Individual learning was a common practice amongst the consultants that enabled their awareness of standard ERP functionality. This was carried out by visiting ERP vendor support websites and User Group or Special Interest Group events (Table 2).

Table 2: Data supporting knowledgeable consultants and avoiding modifications.

“SAP SD consultant since 1998.” (C2)
“We do the research; we go through the SAP user groups and we learn what’s the new functionality. What’s new, what SAP has done away with” (M3)
“we will advise them of possible solutions and how we would be able to configure the system or even introduce custom objects to satisfy their need.” (M1)
“as SAP consultants we need to apply our minds more, look at the business requests and see how best the request can be met in the system with, with the information, with the functionality that is there, with the fields that is there.” (M2)
“I have made use of the online ordering defaults table to avoid hardcoding in the program; this will assist the consultant to do only the CONFIG if future rollouts are required.” (Call logs)

Users were dependent on the consultants bringing standard ERP functionality to their attention. However there was a long history of modifications performed to meet user’s requirements (Table 2). Consultants were recently reducing modification by providing alternate forms of customisation that would prevent code modifications in the future. For example performing table configuration or introducing custom objects or using existing fields. Hence, experienced and knowledgeable internal consultants were able to avoid modifications.

4.2 Insufficient Ongoing User Training Focusing on Business Processes

The relationship between the business and implementation specialists needs to be closely monitored and managed in an effort to gain as much insight into ERP systems as possible from the information rich consultants (Chen, Law and Yang, 2009). Customisation requests can then be put forward from a better, more informed position (Parthasarathy and Sharma, 2014).

In contrast, lack of knowledge and awareness of the standard functionality results in custom development requests, over-customisation and duplication of standard functionality (Haines, 2009; Hustad et al., 2016). Organisations that lack ERP knowledge tend to hand the responsibility of the project over to consultants. User’s lack of knowledge of the ERP system also causes too much reliance on ERP consultants who may be in favour of customisation (Rothenberger and Srite, 2009).

Table 3: Data supporting training.

“MM training course and SAP actually offered it here at Company Z a couple of years ago. I just can’t remember ...but we received a certificate for that.” (U3)
“I think that users that we have here not all of them are, are sort of familiar and understand in depth the process aspect and integration so there’s a lot of room for improvement in that area.” (M1)
“They don’t have the big picture; they are only concerned with what they do. They only know what the transactions that they execute, they don’t have the bigger picture.” (M3)

Some users interviewed created the impression that they were trained well, even getting SAP certifications (Table 3). However, there is evidence that users still lack understanding on how the system integrates the various modules across processes. Managers highlighted the importance of training that covers end to end processes that users are involved in

(Table 3). Having a better understanding of the entire process will enable users to understand their contribution or impact on the other sub processes. Hence insufficient ongoing and user training for users focusing on business processes was identified as an enabler of programming.

4.3 Lack of Handover between Users

A new theme that emerged was the duplication of functionality caused by lack of suitable handover between users. Users would request custom developments to assist them in their job functions. When they no longer filled that job role, the necessary handover to the subsequent user is not done sufficiently. The new user then requests similar functionality and the existing custom programmed objects lie dormant in the system (Table 4). Hence a lack of handover between users increased programming.

Table 4: Data supporting insufficient handover.

“there’s always a loss of knowledge when there’s a hand over from one person to the other” (M2)
“people will request something that gets built and then they use it and then that user maybe leave and then it is not known out there, it’s not used.” (C2)
“if you move onto another department, you’re not going to use that report anymore, you don’t handover to the new resource” (C3)

4.4 Organisational Resistance to Change Processes

Fear of personal disadvantages and threats that the system may replace human resources results in low ERP acceptance (Rothenberger and Srite, 2009). Low project or system acceptance results in resistance to change processes to standard practices offered by standard ERP systems (Rothenberger and Srite, 2009). In contrast, the more comfortable and experienced an organisation is with the ERP system, the higher the chances are that they will embrace and promote its use (Aslam et al., 2012). In this study there was organisational resistance to change but in contrast to during implementation, resistance was not from a position of fear or lack of communication. The users had sufficient experience with the ERP system and were in favour of its use.

4.5 Business Preference of Bespoke over Standard Functionality

Resistance to change business processes was found to be high in Company Z and confirmed the literature theme. It appeared that users prefer to apply changes to the system based on their sense of ownership and therefore the potential advantages offered by adopting standard practices are often overlooked. Therefore resistance to standard functionality appeared to be driven from a business perspective, especially when they were used to getting modifications, as shown in quotes in Table 5. Hence a preference of bespoke functionality drives modifications.

Table 5: Data supporting preference of bespoke over standard functionality.

“They may have a solution to doing whatever they are doing but it may not be giving them exactly what they want from their own business point of view” (C1)
“when it comes to customisation because people are used to it, they love it, they ask for it but when you take them to standard there is always a resistance” (M3)
“if you advise them on whichever standard way out there they only already have their mind fixed on what they wanted” (C3)

4.6 Operational Department Involvement

Including functional business units in discussions with ERP implementers influences user acceptance of process changes because they are part of the exercise and hence minimises unnecessary ERP customisation (Pan et al., 2015). In addition, involvement of operational departments enables consultant insight into the business and affects their solutions proposed (Haines, 2009) which can influence customisation. Having the support of the organisation to adhere to the standard functionality offered by the ERP will further discourage needless customisation (Rothenberger and Srite, 2009). Yet this factor was proven irrelevant at post-implementation stage as requests are initiated by operational department users. ERP consultants sit together with the users to thoroughly understand their requirements and various meetings are held before their requests are approved and formally logged for action. Hence, unlike during implementation, in post-implementation, operational departmental involvement does not lead to reduced modifications.

4.7 ERP Systems with Extensive Functionality and Complexity

The less mature an ERP system is, the higher the chances that there will be additional customisation required to cater for functionality not delivered with the standard solution (Haines, 2009; Rothenberger and Srite, 2009). In addition, the more complex the system, the greater the chances of misunderstanding functionality, resulting in customisation (Haines, 2009; Rothenberger and Srite, 2009).

Immature ERP systems are seen to be the cause of many modifications (Haines, 2009; Rothenberger and Srite, 2009). However, in this case the system that the organisation implemented has matured over the last two decades and this has resulted in a significant reduction in the amount of modification that would have been necessary if it hadn't. Hence this factor was not relevant. However, the system does offer a large amount of standard functionality that Company Z had not completely utilized. Hence in this case large amounts of existing functionality appeared to be a driver of modifications as consultants were not fully aware of all functionality. (Table 6).

Table 6: Data Supporting Underutilization Functionality.

“I think at Company Z we bought a Rolls Royce and we used a Mini Cooper, we are not using ERP to its fullest and it is also because people don't know what is out there” (M3)

4.8 Top Management Support

During an implementation, consultant management is seen to be critical and the support of top management to avoid customisation is necessary (Haines, 2009; Rothenberger and Srite, 2009). Top management can encourage the adoption of the standard practices and support business users deflecting customisation requests (Haines, 2009; Rothenberger and Srite, 2009). All participants were aware of the recent strategy of the IS department that standard solutions to requests take preference over modifications. The mindset to avoid modification had been well adopted throughout the organisation indicating effective communication. Top management had set key performance targets to achieve this objective. When adoption of standard functionality is driven from top management, the culture of the organisation is altered and users are less resistant to adopting standard functionality (Table 7). Hence top management support is needed to reduce modifications.

Table 7: Data supporting top management support.

“The perception is motivated by the reality that we have as part of our Strategy that goes up to the CIO level. He is aware that preparation for future upgrades like I mentioned earlier on to S/4HANA, that there is a very strong drive to clean-out our system” (M1)

4.9 Customisation Approval Processes

In Company Z strict approval processes for all user requests had been put in place which included approval from business process owners and ERP functional division management before commencing any work (Table 8). This reduced the amount of requests and limited modifications. Hence an approval process can reduce modifications.

Table 8: Data supporting customisation request process.

“It has to go through a lot of approvals. From their side, from business side, when they submit a request it goes through a number of approvals.” (C1)

“When the requirement comes in, it is a work request that the user is able to submit via the intranet and then it goes to the work management team, they direct it to the IT managers... and then we endorse it and it gets sent to the back to the work management team and from there it will go to level 3 manager which is the business process owner, who then further endorses it and looks at how long it will take and whether it will actually add value to the business operation.” (M1)

4.10 Systematically Removing Modifications

The development team was monitoring all custom objects that hadn't been used over long periods of time to identify which objects can be removed from the system (Table 9).

Table 9: Data supporting removing modifications.

Most of the stuff become obsolete because SAP has improved and that is when we have to investigate and bring new solutions (C3)

4.11 ERP and Organisational Misfit

While ERP adoption has a high failure rate, it is seen to be highly challenging in developing countries where implementations face specific difficulties over and above those found in industrialised countries (Hawari and Heeks, 2010). Some of these difficulties have been ascribed to ERP designed assumptions of devolved decision making not fitting with cultures of high power distance (Hawari and Heeks, 2010) found

in many developing countries. Other difficulties stem from large differences between Western “best practice” inscribed in the ERP system and ways of doing business in developing countries (Hawari and Heeks, 2010). The greater the misfit, the more customisation is performed (Hustad et al., 2016). Practitioners recommend redesigning processes prior to choosing an ERP to ensure a better fit (Kimberling, 2012). In this study many cases of misfit were found which are now described.

4.12 Strategically Important or Required Functionality

Practitioners recommend customising ERP systems for business processes that give you competitive advantage (Kimberling, 2012). Customisation enables the differentiation of a business unit and therefore business units that are of high strategic importance are known to request more customisation (Haines, 2009; Rothenberger and Srite, 2009). Despite the evolution of the ERP standard system that brings along new functionality with every upgrade, there are still a few areas where functionality was lacking. Users that believe value adding business requirements are not covered by standard functionality motivate for the system change. This could be a requirement to satisfy internal needs, customers or auditors as shown in Table 10.

Table 10: Data Supporting Required Functionality.

“Our competitors had something similar and if we didn't have a like offering, our customers would have gone to competitors instead of us” (U1)

“It wasn't exactly a legal requirement of the affiliate but it was more like a standard agreement with their customers, that's what the customer's expected” (U1)

“we had to go customisation because SAP could not give that to us but it was also an Audit requirement” (U3)

4.13 Legislative Requirements

Certain industries can have laws and regulations that are not covered by standard functionality (Hustad et al., 2016). In the case of multi-national African Company Z there were many modification requests for legislative requirements as shown in Table 11. Hence legislative requirements not covered in standard functionality can drive modifications.

Table 11: Data supporting legislative requirements.

“the customisations or the requests that we get are as a result of, um, legislative requirements per country that are different” (M2)
“Mozambique law now requires local currency and exchange rate to be printed on all invoices where document currency is not equal to local currency. I have created a new column on SAP Form Z_INVOICE_INT_MZ which is used to calculate the local currency” (call log)

4.14 Country Differences

The affiliate country business partners brought about various reasons for ERP programming. When new affiliates are incorporated, they need to align with the standard of the Head Office. Therefore, additional configuration as well as the necessary development is required. The language barriers between the different countries presented a need for modification that fulfilled the requirement for solutions to be delivered in various languages (Table 12).

Table 12: Data supporting country differences.

“Our customisation, is let’s say in essence is more if there is a new affiliate going in” (C2)
“the other challenges would be depends on the, the level of the, the education levels and stuff in the, in the affiliate and the experience of the people” (M2)
“changes to the ERP system is not always easy and especially if you have a language barrier” (U2)

4.15 An Evolving Industry

Another new theme that was identified through interviews was industry evolution which resulted in modifications (Table 13). The organisation’s business processes also changed with time leading to modification to support the business change.

Table 13: Data supporting evolving industry.

I am happy with the keeping things standard, but SAP needs to keep updating the standard so that it keeps working to the way things are evolving (M3)
So there’s a lot of things because the industry is always in a state of flux (U2)

5 CONCLUSION

There are various drivers of ERP customisation reviewed in the literature but these studies mostly focus on the implementation stage of the ERP system. This study conducted at a single multi-national

African petroleum organisation described 15 factors that impact ERP programming, in particular code modification, post implementation.

In contrast to during implementation, users did not resist changing processes from a position of fear or lack of communication during post implementation. While low ERP knowledge at implementation is attributed to insufficient user training, at post-implementation it is attributed to problems with user handover and insufficient holistic business process training. While literature notes that insufficient involvement of operational departments during the project results in increased customisation, in post-implementation, involvement of operational departments increases programming and business tends to prefer bespoke solutions over standard functionality.

Literature notes that external consultants who are inexperienced or striving to maximise revenue can increase customisation, while in post-implementation organisations tend to have internal consultants who if experienced can reduce ERP programming.

This study also described multiple requirements for programming. ERP systems with standard processes can never completely fit the processes of all organisations irrespective of country, industry or business model. Misfits were identified due to legislation gaps, customer needs, country differences, strategically differentiated processes and evolving business needs. Also noted are problems with ERP vendors not keeping up with the pace of evolving industry changes.

From a practical perspective, following from these 15 factors, the following recommendations for organisations to reduce modifications are made. Firstly all new requests need to go through an appropriate approval process and secondly a systematic process to remove modifications needs to be employed. Yet these processes need to be supported by organisational interventions. Firstly ensuring that newly employed users receive appropriate training and handover. Secondly, internal consultants need to continuously keep up to date with new functionality so they are able to identify where standard functionality can be used and thirdly, top management needs to support these interventions

This study was restricted to certain core financial and logistics modules. In many cases post-implementation was found to be different to during the implementation phase. A limitation in this and prior studies has been the ability to differentiate between different forms of customisation and ERP programming solutions. These solutions have different impacts on long-term costs. While ERP

modifications need to be reapplied and tested with each upgrade, other solutions can be completely upgrade proof and then there are many variants in between. More research is needed that can differentiate between these. While this paper focused on ERP programming, more research is needed on when standard processes should be adopted and when organisations need to differentiate themselves. Practitioners have referred to keeping a stable core and a flexible edge. These areas are unclear and organisations require guidance. Especially as Gartner urges organisations to manage Bimodal IT, balancing stability and exploitative behaviour with exploratory, agile innovation (Horlach, Drews and Schirmer, 2016). Furthermore, the role of business process management, process mapping and business architecture in driving ERP projects is understudied.

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