

Evaluating ERP Implementations: The Case for a Lifecycle-based Interpretive Approach

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Abstract: Enterprise Resource Planning (ERP) systems are considered the lifeline of modern organisations. At the same time, high failure rates ranging from 50 to 70 percent are reported in the literature. In this study, we critically examine the assumptions underpinning high failure rate narrative in ERP literature and evaluate these assumptions against recent works. A major finding of this study is that the failure rates quoted in the extant literature are not only historical; they employ limiting project management definitions of on-time and within-budget completion whilst disregarding long-term system usage. To substantiate this point, we present the findings from a longitudinal qualitative case study of an ERP implementation in a health service organisation. We find the system evaluation to be contextual, temporal and interpretive in nature. Based on our findings, we argue for a lifecycle-based interpretive approach for evaluation that attends to various stakeholders' viewpoints. Rather than traditional evaluation exercise serving as a project-closure ritual, lifecycle-based interpretive evaluation allows managers learn from different viewpoints and foster ERP utilisation in the longer run.

Keywords: ERP, Enterprise Resource Planning, Evaluation, Context, Lifecycle, Interpretive.

1. Introduction

Enterprise Resource Planning (ERP) systems are considered the lifeline of modern organisations. They may be defined as *configurable information systems (IS) packages that provide seamless integration of information and information-based business processes within and across functional areas in an organisation* (Kumar and Van Hillsgrsberg, 2000, p.23). Even from a cursory overview of ERP literature, it may be noted that it is customary for ERP articles to begin by citing the high failure rate of ERP implementations. Different failure rates ranging from 50 to 70 percent are often reported (Hughes, et al., 2017) in the literature. At the same time, however, the global market for ERP consistently register growth with an estimated market size of USD 24.5 billion in 2012 (Columbus, 2013) and expected growth of 7.2% for the period 2014-2020 (AMR, 2015). These two numbers present a particular contrast for IS researchers. If the failure rates are accurate, how does the ERP market witness consistent growth? If the ERP market is continuously growing, how does it sustain such high failure rates? To paraphrase Glass (2005, p. 113), the ERP industry *would not be possible if we didn't have astoundingly successful systems to do all the wonderful things they do*.

This clearly points to a conceptual and practical gap in the notion of success and failure in the IS evaluation literature. While ERP consultants and scholars often allude to a high failure rate narrative, ERP industry keeps registering healthy market growth despite alleged failures. There is a consistent search in the IS literature (DeLone and McLean, 1992; Bernroider, 2008; Ravasan, Zare and Bamakan, 2018) for the dependent variables of implementation success, resulting in inclusion of more variables and increasing complexity of measurement. However, as Brown (2005) observes, IS evaluation in practice is often either not undertaken in organisations or remains unsophisticated, usually due to a relative lack of resources and expertise. Another issue with the existing evaluation methods is that the social dimension and stakeholder perspective remain largely ignored (Jones, 2008; Lagstan and Goldkuhl, 2008; Lagsten, 2011; Stockdale, et al., 2008). This is unfortunate since user perception (Chevers, 2018) and user satisfaction (Mekadmi and Louati, 2018) are deemed crucial for implementation success not only in the academic literature, but also by the implementing organisations (Sumner, 2018). Finally, existing evaluation approaches usually conceive it as an exercise at a single point in time, whereas IS implementation outcomes are often not fixed and given. Rather, they are a product of the IT artefact, assessment agencies, intermediate outcomes, and emerging relationship between them (Cecez-Kecmanovic, Kautz and Abrahall, 2014). The eventual evaluation of the ERP projects may be determined not by the initial reaction after the 'go-live' but by the way organisations arrive at a 'working' ERP (Malaurent and Avison, 2015; Wagner, Newell and Piccoli, 2010).

While a similar narrative of 70 percent failure rate of organisational change initiatives is challenged by scholars (Hughes, 2011) and practitioners (Leeman, 2014), there is a rather passive acceptance of this high failure rate narrative in ERP literature. To address this gap, Section 2 critically examines the frequently cited high failure rates to understand the unstated assumptions on system evaluations. It locates the first instance of the failure rates which are often cited as the research motivations to the present day. Section 3 outlines the research methodology adopted for this study. Section 4 presents the evidence from a longitudinal study of an ERP implementation to explore the nature of the system evaluation. Section 5 discusses the case evidence in light of extant literature and puts forward a rationale for lifecycle-based interpretive evaluation. Finally, Section 6 concludes the paper by noting the limitations and implications.

2. Examining Failure Rates in ERP Literature

In ERP related publications, though failure rates citations may be from recent papers, almost all citations trace back to some high-profile citations originally made at the turn of the century. For instance, Dwivedi, et al. (2015) quote Nelson (2007) who in turn quotes a Standish report published earlier. Therefore, taking a historical perspective, this section locates the *first* instance of each such citation of ERP failure rates and examines the exact nature of the citation. In so doing, it provides a context to evaluate the failure rate in question and examines if the reported failure rate corresponds to a holistic system evaluation.

Most high-profile failure rate citations come from the studies by the Standish Group. Though many ERP studies refer to the famous 1994 Chaos Report by Standish Group, it is important to note that the report itself refers to IS projects in general. If we go back to the original report, it says that 31 percent of software projects were *cancelled*, 53 percent were *challenged*, and 16 percent were (outright) *successful*. Adding the first two numbers gives a failure rate of 84 percent, but it may not be correct to classify challenged projects as failures. Over the years, scholars and practitioners have raised concerns about definitions and measurements in the Chaos report (Glass, 2005; Eveleens and Verhoef, 2010) and have stressed that the classification of successful, challenged and cancelled does not cover all the possibilities, and that it ignores the fact that many times organisations are not bothered even if original estimates exceed by a certain amount.

The earliest original citation which categorically refers to ERP failure is from Martin (1998) that portrays a dismal picture of failure rates of around 90 percent. Upon closer inspection of the original article from *Fortune* magazine, one finds that though the article refers to an earlier Standish Group study, it relies on a personal estimate by the chairperson of the Standish Group (Martin, 1998, p.2):

A 1996 study by the Standish Group in Dennis, Mass., found that as costs of technology projects go up, the likelihood of failure increases rapidly. "Once you hit \$10 million, the chances of a project coming in on time and on budget are statistically zero," says Jim Johnson, Standish's chairman. He estimates that at least 90% of ERP implementations end up late or over budget.

There are two observations here. First, it implicitly refers to failure as non-conformance to time and budget estimates. Second, the figure of 90 percent comes from a personal estimate. Citing this estimate without contextualising it undermines the rigour required for academic inquiry.

A related and often quoted citation is Calogero (2000). In the article published in Sun Server magazine, the author cites data from Standish Group, though there is no reference to a specific report or year. It classifies ERP implementations in three categories – implementations that finished on scheduled time and within planned budget (10 percent), implementation that finished with time and/or cost overrun (55 percent), and implementations which were eventually cancelled (35 percent). Similar to the previous citations, it will give a failure rate of 90 percent if we define failure as non-conformance to time and cost estimates. However, if failure is defined as project abandonment, the failure rate reduces to 35 percent.

A report titled '*Getting Value from Enterprise Initiatives*', from Boston Consulting Group (BCG, 2000) provides another reference point which is often quoted to mention failure rates of 67 percent. The report is based on interviews with more than 100 executives across North America who had responsibilities for ERP initiatives during the period 1996-1999. The report notes (BCG, 2000, p.7):

Only 33 percent of interviewees judged their initiative as “positive” or “strong positive”. These interviewees affirmed that their initiatives had created sufficient value to justify the effort; had met business objectives, schedules, and budgets; and had achieved tangible financial impact. Many of the initiatives that earned neutral or negative assessments were problematic. Some had been cancelled after wasting substantial investments, other failed to deliver functionality, and some required replacement of the vendor.

Looking at the text, one notes that it defines success as value creation for the organisation within time and budget constraints. It pegs ERP success rates at 33 percent, higher than the estimates (10 percent) mentioned earlier in this text. However, classifying all the remaining 67 percent ‘problematic’ projects as failure presents too dismal a picture of ERP projects.

Another widely cited source is a 2001 Robbins-Gioia survey (IT-Cortex, 2002) which mentions that 51 percent of the respondents viewed ERP implementation projects as unsuccessful. It may be noted that among all the companies surveyed across different sectors, only a total of 36 percent had or were in the process of implementing ERP. It clearly demonstrates that the sample size was not exclusively focused on ERP implementations and yet its results are cited for ERP failure rates. Apart from these, two other widely quoted citations of failure rates are 50-75 percent (Umble and Umble, 2002) and 40-60 percent (Langenwarter, 2000 p. 327). A closer reading of both texts indicates that the failure rates are based on authors’ guesstimates. Among recent citations, Hughes, et al (2017) note the success rate of 39 percent from the 2013 Standish report. While an improvement in the IS/ERP project management over the years cannot be denied, different numbers reported in this study clearly underscore the significance of defining failure when determining failure rates.

Based on the analysis, it is identified that most of the citations discussed in this section are not only historical, they employ the concept of the project management iron triangle (Ika, 2009) that defines failure as an inability to implement a system within planned budget and scheduled time-frame. This definition is also termed as a process failure (Aloini, Dulmin and Mininno, 2007; Ravasan and Mansouri, 2016). However, even the scholars from the project management area (Toor and Ogunlana, 2010; Turner, 2016) acknowledge that it is a minimalist notion of evaluation that focusses on the project completion and does not consider further system use. In other words, it works more as a disengagement device for closing-off the project (Kumar, 1990) and remains ritualistic (Walsham, 1999; Jones, 2008). In this way, this view of failure decontextualises the IT artefact and ignores the long-term system usage in the organisation.

It is interesting to note that the high failure rate narrative is still alluded to despite subsequent research unpacking the concept of success and failure. Scholars note that the notion of success (Petter, DeLone and McLean, 2013; Zerbino, et al., 2017) or failure (Aloini, Dulmin and Mininno, 2007; Ravasan and Mansouri, 2016) is multidimensional in nature. For instance, Ravasan, Zare and Bamakan (2018) suggest evaluating the impact of ERP implementation through system quality, information quality, service quality, individual impact, workgroup impact, organisational impact, and inter-organisational impact. Similarly, there is an acknowledgment for adopting a context-aware perspective (Howcroft, Newell and Wagner, 2004; Dwivedi, et al., 2015) that takes into account the viewpoints of diverse stakeholders. Notwithstanding these developments, the complexity and accuracy of measurement (Parhizkar and Comuzzi, 2017; Zerbino, et al., 2017) remains a problem if one wishes to conduct a holistic evaluation. The emergence of cloud-based ERP (AMR, 2015) further complicates the matter since it not only introduces new variables such as compliance, network capacity, and security (Gupta and Misra, 2016), but also results in a longer ERP lifecycle (Demi and Haddara, 2018) due to the continuous evolution of the cloud system. Perhaps due to such complexity, organisations often do not engage in formal ERP evaluation in practice (Brown, 2005) or at best, stick to the project management based conception of in-time and within-budget completion. To this end, based on our study of an ERP system in a health service organisation, we argue for the application of lifecycle-based interpretive evaluation for holistic system evaluation. The next section outlines the methodology adopted for this study.

3. Research Methodology

This study is based on evidence from a longitudinal case research that is part of a larger research program. Case research was the preferred methodology for this study because it helps studying the events ‘in context’ when there is low or no researcher control over contemporary events (Yin, 2017). A key parameter for the case selection was that the organisation must have undergone a full ERP lifecycle (Ravasan and Mansouri,

2016; Saxena and McDonagh, 2017). This was necessary to observe the change in intermediate evaluations. We got access to a health service organisation that witnessed a full ERP lifecycle from the adoption decision to the eventual retirement of the system during 1998-2015. This allowed the participants to look beyond the immediate outcomes and to perform a summative evaluation of the ERP system.

The fieldwork for the case study was conducted during March-December 2015. The time coincided with the retirement phase of the old system and the go-live of the new system in September 2015. The data collection methods included interviews, documentation, and observation. The primary data for the case study was collected via interviews (twenty-seven in number). The interviews were conducted following the responsive interviewing method (Rubin and Rubin, 2012) that allows for the flexibility in the interview schedule in response to the participants' answers and researcher's emerging understanding. The documentation for the study included project documents, minutes of board meetings, and government/newspaper reports. The interviews were recorded and transcribed, except for three participants for whom recording was not permitted. For the aforementioned participants, detailed notes were taken during the interview and the transcript was prepared within twenty-four hours based on the notes and memory. Narrative analysis embedded within a processual approach (Pentland, 1999; Rhodes and Brown, 2005) was used to analyse the findings. Temporal bracketing strategy suggested by Langley (2009) was used to structure the narrative. The next section reports the findings in the form of a narrative of evolving ERP evaluation in the case organisation.

4. A Case Study of ERP Evaluation in a Health Service Organisation

Health Service Organisation (HSO, a pseudonym) is a self-financed public service body from a western European nation. In 1998, the HSO started an ERP project called Blood Banking System (BBS, a pseudonym) to put a new system in place to control blood banking activities. It was envisaged that the new system would replicate best industry practice in the management of blood banking activities and related data processing. Initial budget of the project was €4.26 million and it was due to complete by late 1999. However, due to a series of problems, the implementation project consistently got delayed and finally completed in early 2003 with an estimated cost of €9.3 million.

4.1 Immediate Evaluation after the Implementation

Immediate evaluation of the ERP project aligned with the project management based conception discussed earlier. From the point of view of project management practices, the project was initially described as a failure since it went over-time and over-budget. Indeed, there was a subsequent audit by the national auditor and the matter was debated in the parliamentary Committee of Public Account:

"Looking back at the project, it seems the service was, dare I say, naïve about what was involved in getting such a complex system up and running. This is reflected in the cost and time overruns when compared to the original estimates." (National Auditor in the debate)

HSO participants recall:

"When BBS came-in, we ended up before Public Accounts Committee trying to explain the overrun in cost." (R5)

"(HSO) ended up in front of the Public Accounts Committee explaining itself why this money was spent and came out of it quite badly." (R1)

However, as one respondent notes, the evaluation needs to be mindful of the implementation context:

"Last time around, I don't know what the overrun was, but certainly talking to other services, 50 percent overrun will not be unknown (for such projects)." (R1)

4.2 Ongoing Evaluation Based on user Experience

Furthermore, despite being considered a project management failure, the BBS system remained in use in the organisation. Over the years, use of BBS became institutionalised within the organisation as various other testing equipment and applications were interfaced with it. It took time for the end users to get used to BBS, they evaluated it positively once the system use was institutionalised:

“Obviously it took a while for clinic staff to get used to it because initially it caused delays on clinics and things like that because it was a new, completely new to them; but after that, they got used to it.” (R19)

Due to hardware obsolescence, the hardware platform of the system was upgraded during 2007-08. During 2008-09, HSO implemented a Blood Operations Support Software (BOSS) to generate management reports from BBS data. During 2011-12, HSO introduced an electronic ordering system interfaced with BBS. The electronic ordering system was used by the Hospitals to place their order for blood products. These systems formed the backbone of HSO blood operations until a new ERP suite was rolled out in September 2015. As respondents note:

“We have dependency on 3 systems - we have BOSS... we have BBS... we have the electronic ordering system.” (R4)

“Having worked in the (Department of) social welfare, having worked in the (national) guards, having worked in (the Department of) revenue, (I would say) BBS is the most critical system in the whole country.” (R5)

These responses clearly demonstrate that once the system use is institutionalised in the organisation, users start to form a position opinion of the system. Therefore, although the implementation was initially construed as a failure from a project management perspective, the system in itself was not deemed a failure over time.

4.3 Summative Evaluation at the end of ERP lifecycle

BBS supported HSO’s business operations for more than a decade. As respondents recall:

“It actually, it was tough, it was hard, and it took longer but that was okay, you know, because when it was done, when eventually we went live, we had stayed live. It was, you know, it was a successful project. It made us spend a little bit longer in amount of (money) taken, a little bit more money, I can't remember but it didn't cost that much more than budget. But it certainly took a lot longer in time. But at the end, it was done. The whole place was integrated across one system. We might have done a better job of it, it might have been, you know, you might have got rid of a lot of other processes along the way, but when it was done, it was done. So, it was a very big project done at a very difficult time, and yeah, it's, it was good.” (R19)

The BBS was retired in September 2015 when a new system was rolled out to replace it. Interestingly, when evaluating the new system, the respondents focussed on the day-to-day working of the system rather than traditional project management considerations of time and budget:

“...the bottom line is - all the systems are in; all the systems are working; we haven't had any significant (issues), well, what I would consider a significant instance that would have jeopardised patient safety or product quality.” (R3)

“We have been getting no reaction but... (the users) are not complaining... I mean, we were expecting a barrage of complaints and didn't really get them.” (R23)

5. A Case for Lifecycle-Based Interpretive Evaluation

Based on the findings, this section ties empirical observations back to the literature and offers the rationale for lifecycle-based interpretive evaluation.

5.1 Including the Contextual Element in the Evaluation

Case evidence suggests that the project management based evaluations using time and cost do not truly reflect the evaluation of the system and that the users make an assessment based on the organisational context. The case findings suggest that the implementation context may determine what additional measures are used for the system evaluation. These measures need not be quantitative and are usually based on the on the dominant institutional logic (Berente and Yoo, 2012). For instance, Toor and Ogunlana (2010) note that

safety, effectiveness, efficient use of resources, satisfaction of stakeholders, and reduction in disputes may determine the outcome of the projects in the public sector context. In the case organisation, more acceptable measures were operational continuity and patient safety, reflecting the institutional logic within the health service context (Currie and Guah, 2007; Poba-Nzaou, et al., 2014). The interview participants also evaluated the project outcomes within the public sector context where budget and time overrun are not very uncommon (McDonagh, 2016). Therefore, there is a need for a context-aware perspective (Howcroft, Newell and Wagner, 2004; Dwivedi, et al., 2015) on ES that is sensitive to context-specific priorities in performing ERP evaluations. In this regard, a socio-technical approach to evaluation (e.g. Sittig and Singh, 2015) might be useful since it attends to the technological, organisational, institutional, and situational aspects during an evaluation exercise.

5.2 Introducing Temporal Dimension via Lifecycle-based Evaluation

The case findings demonstrate the temporal nature of the evaluation exercise by noting how a system implementation which was deemed a failure became the backbone of the organisation with the course of time. Moreover, the case evidence clearly suggests that the users engage in a performative evaluation (Cecez-Kecmanovic, Kautz and Abrahall, 2014) which evolves based on the day-to-day working and the institutionalisation of the system in the organisation. This is in line with the findings in the recent literature. For instance, Malaurent and Avison (2015) present a case of an ERP implementation in Chinese subsidiary of a French firm. The system introduced many misfits in the subsidiary which the workers resolved by using certain workarounds. These workarounds were later examined by the project team in consultation with the users to formalise or prohibit them. The solution at the end was deemed successful by both the management and the end users. Similarly, Shim and Shim (2018) report the gradual change in user perception as they gain more experience with the ERP system. Therefore, we argue that the temporal aspect of the ERP lifecycle should be given consideration during the evaluation exercise. This would require performing the evaluation exercise at regular intervals, and not just immediately after the project go-live. In a lifecycle-based evaluation approach (Bronte-Stewart, 2015; Greci and Hull, 2004), emerging issues are documented alongside the ERP lifecycle to evaluate the entire project in perspective. A lifecycle-based approach would be especially useful in the emerging context of cloud-based ERP (AMR, 2015; Gupta and Misra, 2016) which results in a longer lifecycle (Demi and Haddara, 2018) than traditional on-premise ERP. There is no denying that the process of lifecycle-based interpretive evaluation would be both time consuming and resource intensive when compared to the traditional project management based evaluation, the learnings gained from the former should outweigh the cost of such an exercise in the longer run (Brown 2005; Walsham, 1999) as they inform future action (Lagstan and Goldkuhl, 2008).

5.3 From Quantitative Measures to Interpretive Evaluation

The general trend in the IS evaluation research is on developing a measurement tool using quantitative variables of interest (Petter, DeLone and McLean, 2013; Song and Letch, 2012). However, barring an immediate evaluation based on project management considerations, there was no evidence of a formal quantitative evaluation in the case study. Even when the cost and budget overrun prompted further evaluation, rest of the exercise remained qualitative in nature focussing more on the lessons learnt (Sumner, 2018) from the implementation project. Scholars (Hedman and Borrel, 2004, 2005; Irani, 2002; Jones, 2008) argue that the major purpose of the system evaluation is to provide feedback to managers and to assist with the organisational learning processes and an interpretive approach is best suited to provide this feedback. An interpretive evaluation of the ERP system takes into account the qualitative and subjective data for evaluation purpose (Jones, 2008; Stockdale, et al., 2008), making the evaluation exercise contextually relevant (Hedman and Borrel, 2005). This involves engaging with a diverse set of stakeholders and obtaining their perspectives (Bartis and Mitev, 2008; Lagsten, 2011). Diverse groups might have a different evaluation of the system but the interpretive evaluation would provide the opportunity to discuss their viewpoints and may help in determining future actions (Hedman and Borrel, 2005; Lagstan and Goldkuhl, 2008). While some scholars (Bartis and Mitev, 2008; Hedman and Borrel, 2005) suggest an open-ended narrative based approach for the interpretive evaluation, others (Irani, 2002; Lagstan and Goldkuhl, 2008; Lagsten, 2011) suggest the use of specific models for evaluation. Nevertheless, the point remains that the evaluation exercise should focus on the interpretive dimension and should include stakeholder perspective for a more holistic evaluation of the ERP system.

6. Conclusion and Limitations

ERP literature is replete with high failure rate narratives of ERP implementations. Yet, the ERP industry has not only survived but has grown at a rapid rate as well. In this paper, we examine the highly cited failure rate from the ERP literature and find certain limitation of ERP failure narrative based on the empirical evidence from a case study. Key findings include:

- Most of the failure rates are based on a project management conception of the implementation that measure the project success in terms to completion time and costs incurred.
- Based on the evidence from a case study, it is reported that even though the implementation project may be construed as a failure upon immediate completion based on project management criteria, the project may be considered a success during the larger lifecycle of the ERP system.
- The implementation context has a bearing on the ERP evaluation, and it may privilege certain measures other than project management effort to define ERP success. For example, in this case the logic of patient safety was paramount due to the health service context.
- Appreciating the temporal nature of ERP implementation requires a lifecycle-based approach to ERP evaluation that goes beyond the immediate evaluation and incorporates outcomes from different phases of the lifecycle.
- An interpretive approach to evaluation is suggested that attends to different stakeholders' viewpoints during ERP lifecycle to represent a holistic picture of the system outcomes.

A key contribution of this study is highlighting the complex and messy nature of system evaluations. By acknowledging the temporal nature of the system outcomes, it sensitises the scholars and practitioners towards the limitation of immediate evaluation based on the project management consideration of time and budget. By highlighting the interpretive nature of the evaluation, this study draws a sharp focus on the stakeholder involvement and user acceptance of the system. For practitioners, a lifecycle -based interpretive approach not only reflects the ERP outcomes more accurately, it also allows for organisational learning by documenting the issues as they arise. Rather than traditional evaluation exercise serving a project-closing ritual, lifecycle-based interpretive evaluation allows practitioners to learn from different viewpoints and to foster greater ERP utilisation.

Limitations of this study stem primarily from the theoretical nature of the inquiry and limited external generalisability of the case study method. However, what we seek here in generalisation to theoretical propositions (Yin, 2017) as opposed to the statistical generalisation sought in quantitative studies. Since the findings are based on a traditional on-premise ERP system, the conclusions may have limited applicability to a cloud-based ERP system. However, it is argued here that the lifecycle-based evaluation approach suggested in this study closely aligns with the cloud-based ERP systems, which have considerably longer lifecycle than its traditional counterpart does. Future work may be conducted on the cloud-based ERP lifecycle to generalise the findings and to investigate the applicability of ideas discussed in this study.

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