Business Process Change in Enterprise Systems Integration: *Challenges and Opportunities*

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Abstract: Currently, many organisations have undertaken systems integration with the aim of improving business performance, which potentially involves radical change in all organisational aspects, including business processes. The aim of this research is to explore and prioritise the challenges of Business Process Change (BPC) in Enterprise Systems Integrations (ESI) specifically focusing on two approaches that are Business Process Reengineering (BPR) and Business Process Modelling (BPMo), as well as identify the solutions for them. Literature review is carried out in order to explore and understand the BPC challenges of systems integration in BPR and BPMo perspectives. Secondly, a questionnaire is deployed to gather various industrial and academic views and compare these with findings from the literature. Then, BPC challenges are prioritised, and relevant solutions are recommended to address those challenges. The main finding of this research represents "minimising human Issues" as the most important BPC challenge in both areas of BPR and BPMo in ESI and the solutions such as top-down management and people involvement are proposed to address it.

1 INTRODUCTION

In today's unpredictable and competitive business environment, making timely decisions by using real-time information is needed by organisations. This is achieved by integration of all systems, applications, and information, normally referred as Enterprise Systems Integration (ESI), which includes a massive change within the enterprise (Motwani et al., 2002).

ESI is a common term in enterprises that prepares, updates, and treats all data related to the business processes in one application software which stores data once and the business processes will use them in real time (Gulledge, 2006).

Change and improvement in all business key drivers, including processes, people, and technology as well as flow of information amongst them, is required for a successful ESI. All systems, applications, and information within the company are used by employees (people), with a suitable technology for enabling the business processes. Thus, performing the business processes is the main goal in all organisations. In addition, technology allows people to manage Business Process Change (BPC) for ESI (Shaw et al., 2007). Furthermore, flow of information through all of these elements is necessary in order to improve and run business processes (Berente et al., 2009). Therefore, BPC that is to analyse, redesign, and improve business processes to achieve a competitive advantage in performance (Harmon, 2003), plays a central role in ESI, because "People" are BPC implementers and "Technology" is an enabler to perform it (Xu, 2011; Nam & Pardo, 2011).

Moreover, integration of business processes addresses some issues in other areas of ESI. Thus, enterprises should shift from functional-oriented to process-oriented integration (Ramamoorthy et al., 1992; Hvolby & Trienekens, 2010).

Nonetheless, BPC includes many challenges such as inter-dependencies between processes, departments, and stakeholders, complexity, and customisation (Xu, 2011; Lodhi et al., 2013). There are a number of tools, techniques, and approaches for them, such

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as Business Process Reengineering (BPR), Business Process Modelling (BPMo), Business Process Management (BPM), Workflow Management (WfM), Total Quality Management (TQM), Six Sigma. Enterprise systems architecture is also a pattern/tool to develop, manage, organise, and map a large number of business processes, organisational structure, and Information System (IS) in ESI (Rossak and Prasad, 1991; Lankhorst, 2004). However, these approaches are involved with some challenges such as standardisation, cost, flexibility that dispute usage and selection of them for BPC.

This research focuses on BPR and BPMo areas, and aims to explore and prioritise the BPC challenges for ESI in these two areas, and identify the solutions for them. Expected research objectives are as follows:

- In-depth understanding of BPC challenges for ESI in aspects of BPR and BPMo
- Exploring the current solutions for the challenges
- Prioritising the challenges and identify the most important one(s)

The last objective of the research is actually the research question. Prioritisation and identification of the BPC challenges help to accurately design a framework as well as a systematic guideline for BPC in ESI. In order to achieve these objectives, a combination of secondary data (literature review) and primary data (various industrial and academic views) are gathered through this study, which are discussed in section 3.

Next section reviews literatures regarding BPC challenges and solutions for ESI specifically in two areas of BPR and BPMo.

In "Result and Discussion" section, all findings from literature review about the challenges and solutions for each area will be summarised. Then, the prioritisation of them will be represented according to the questionnaire results, and the most important challenge(s) in both areas of BPR and BPMo as well as the solutions for them will be identified. These are the main contribution of this research.

Finally, the section of "Conclusion" summarises the main findings of the previous sections and provides closure for the research.

2 LITERATURE REVIEW

For a successful ESI, change management must be performed in many aspects and levels. For example, Prencipe et al. (2005) emphasised that ESI must be defined and executed at two levels, technical (business processes and people) and strategic. They have also pointed out that ESI in the past, described it as a technology installation and a list of operations to be performed in the company, and there was little consideration given to process, people, and strategy. Thus, ESI is more than technology, and an ongoing process to bring all data involving business processes, technology, and human capital together.

Business processes play a dominant role in order to achieve organisation's goal. The enhancement of business process performance in terms of quality, adaptability, value, sensitivity, and customer contentment through ESI is meaningful advantage of BPC (Motwani et al., 2002) that is carried out using a number of tools, techniques, and approaches such as BPR and BPMo.

2.1 BPR

BPR has been defined in different ways, which all attempt to define it as a dramatic change within the enterprise that causes some challenges. One of the best definitions of BPR is described by Hammer & Champy (1993) and is cited by many researchers such as Terziovski et al. (2003), Weerakkody et al. (2011), and Kassahun (2013). They stated, "BPR is a fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed".

2.1.1 Challenges in BPR and their solutions

There has been little attention to integration of BPR and Information Systems (IS) by researchers in the past. BPR cannot be performed accurately without integration with IS reengineering, and the gap between business processes and IS should be eliminated by redesigning the legacy systems at the beginning of BPR (Weerakkody and Currie, 2003).

One of the important challenges of BPR is the maintenance of the reengineered business processes. In some cases, the actual results of the BPR were not compatible with the aim of the business process change, because the users and employees had not involved and had not executed the change properly. Therefore, reengineered processes will not be utilised for more than one year after implementation (O'Neill & Sohal 1999). The role of management by "people" is clearly manifested in order to address this challenge. Similarly, the corporate culture change is a major challenge in BPR (Revenaugh, 1994; Puth & Walt, 2012). Moreover, Herath & Gupta (2013) highlighted the cost as an imperative factor in BPR implementation. Furthermore, Grover

et al. (1995) found three main challenges associated with BPR through a survey. They are "project management", "process outline", and "minimising human issues". They identified change management as one of the most significant solutions for these challenges to implement the change properly, sufficiently, and timely. They also believed that technology capability is a key factor to deal with those challenges.

In terms of human challenges related to BPR, coordination between users and BPR activities, involvement of the employees with the project, and availability of the information for business people have been suggested by O'Neill & Sohal (1999). Moreover, the role of leaders is an important factor to prepare organisation's environment for the change (Ostadi et al., 2011). In addition, Paris & Thijs (2003) believed that people participation plays an imperative role in addressing BPR challenges. Furthermore, most of the researchers (e.g. Ostadi et al., 2011; Mohapatra, 2013) have suggested a number of BPR steps in order to implement systems integration in a clear and capable framework. These steps, which are preparation, map and analyse As-Is processes, define To-Be processes, implementation, and continuous improvement, help organisations to reengineer business processes while minimising difficulty.

2.2 BPMo

An adequate business process model is required for ESI (Vernadat, 1996; Mili et al., 2010). Business process models indicate how a business undertakes its mission and activities and how business people achieve their goals (Dufresne & Martin, 2003). Therefore, BPMo is a technique in order to address some BPC challenges such as business process visualisation, continuous improvement, measuring and assessing the business processes, and training.

However, many challenges also arise in BPMo and selecting its standards and method(s) such as flow charts, Data Flow Diagram (DFD), Control Flow Diagram (CFD), Business Process Modelling Notation (BPMN) (Dufresne & Martin, 2003).

2.2.1 Challenges in BPMo

Indulska et al. (2009) considered top 10 challenges in BPMo, which have to be addressed by new models. These challenges are value of BPMo, support for process execution, standardisation, support web service, management, support alignment between business and IT stakeholders, buy-in and sponsorship, ease of use, people involvement, and training. As shown by the titles of these challenges, similar to BPR, most of them are related to people. Likewise, many of the challenges explained by Rosemann (2006) are related to people viewpoint. He has declared many BPMo issues, which have been summarised by table-1. Most of them are similar to the challenges explained by Indulska et al (2009).

2.2.2 Solutions for the challenges in BPMo

Developing new models and modelling tools is essential to address business process challenges in

Table-1: BPMo challenges (Rosemann, 2006)

Categories of issues	Issues
Strategy and governance issues	- Lack of Relation of process model with strategy - Lack of Management and governance in decision making and measuring success - Lack of using a model for many processes synergically
Challenges related to Stakeholders	- Lack of employing competent modellers - Employing unqualified business representatives and solution finders - User buy-in
Necessities and Tools	- Reality in modelling (e.g. estimating number of models) - Choosing adequate modelling methodology and framework - Constraints of modelling tools and languages in comparison with the business features - Lack of Well translated business processes to models and understandability
The modelling practice	- Lack of using an appropriate tool for drawing - Lack of using an adequate complementary techniques and tools - Lack of relevancy of the models with processes - Lack of feasibility and applicability of the models - More focus on models rather than process of modelling - Wrong level of details

The method of designing model	- Lack of well understanding the business process before modelling - Lack of using an appropriate modelling practice and reference models - Over-concentration on IT matters for implement To-Be models
Successful modelling & maintenance challenges	- A successful modelling cannot guaranty the success of processes - Maintaining the business modelling - Lack of an accurate modelling measurement

ESI such as structural issues, adaption, customisation, collaboration, etc. (Lodhi et al., 2013). Moreover, Vaziri & DeOliveira (2012) have paid more attention to three challenges of accessibility, applicability, and understandability, Which are significant challenges in existing modelling tools like EPC and ARIS. Dufresne & Martin (2003) specified some innovative standards & methods such as BPQL, BPMN, ebPML, BPML, XPDL, EDOC, UML 2.0, and BPEL4SW for BPMo. For instance, Business Process Query Language (BPQL) addresses management and governance challenges in BPMo. Moreover, BPMN is an easy to use and understandable de-facto standard, which is directly translated to BPMo Language (BPML) (Chinosi & Trombetta, 2012).

The World Wide Web Consortium (W3C) has defined web services to improve the success of models. BPEL4SW developed by cooperation of WSFL developers (IBM) and SLANG model creator (Microsoft), is one of the web service-based methodologies. It has addressed the lack of web service issues in BPMo (Dufresne & Martin, 2003).

EPML is also a solution for problems of EPC and ARIS methods in terms of compatibility with other tools, easy to read & use, extensibility, and syntactical rationality. In addition, EPML converts the modelling language codes to some understandable graphical objects by XML parser. Touch-screen modelling tools developed by Signavio, Apple, etc., can also address accessibility issues in modelling tools (Vaziri & DeOliveira 2012).

3 RESEARCH METHODOLOGY

A combination of secondary data (literature review) and primary data (questionnaire) are gathered in this research. Secondary data have collected and explained in section 2 to predominantly identify and understand the BPC challenges in two areas of BPR and BPMo during ESI, as well as available tools, techniques, and solutions for them. These data will be qualitatively analysed, summarised, and represented in the next section. Academic literatures were reviewed to gather secondary data. This helps to collect and summarise data from discrete investigations and combine them into a united form of study. In addition, this aids to design and clarify the type of questions for gathering primary data. Significant databases are British library, online libraries, E-books, libraries of Birmingham City University (BCU), as well as online conference & journal article providers like IEEE, Science Direct, and Emeralds.

Primary data have also gathered to prioritise and rank those challenges and identify the most important one(s) in both approaches of BPR and BPMo, as well as matching the best solution(s) for them. This will be carried out by a quantitative analysis and comparison of secondary and primary research results in the next section. The key challenges in each area of BPR and BPMo were selected to be prioritised by primary research. There was sufficient time, but no fund for gathering this amount of primary data. Thus, questionnaire were selected to gather primary data (Kothari 2008). Questionnaires were answered by people from industry and academia. In industry, project managers, system & business process analysts and architects from enterprises that have already implemented a systems integration solution for their organisations such as Aurum Holdings and HP, as well as ESI implementers and solution providers such as SAP, Capgemini, and Atos were selected. They have been accessed by Email, in forums, workshops, and SAP SIG Conferences. In academia, business analysts, consultants, and research experts, who are closely involved with ESI projects in industry, answered to the questionnaire.

The questionnaire was started with inquiry about critical success factors in ESI. Then, it concentrated on prioritising the BPC challenges in BPR and BPMo in various aspects such as benefit for BPC, size (consideration in BPC life cycle phases), and overall impact on ESI. In total, more than 100 questionnaires were sent to the selected people and around 35 valuable answers were returned. A simple scoring method has also been carried out according to the percentages of selected answers in order to analyse and rank the questionnaire results.

4 RESULT & DISCUSSION

This section represents an analysis of collected data from secondary and primary sources in order to explore and prioritise the key challenges in BPR and BPMo, and recommend some solutions for them.

4.1 BPR

Table-2 represents the key challenges in BPR that have been identified by previous researchers. Table-3 also represents some of the solutions for these BPR challenges, which are identified in the literature review section. Most of these solutions are around people, management, governance, appropriate technology, and some of the challenges such as cost, flexibility, and customisation remain unanswered or with a few answers.

Table-2: The challenges in BPR (Literature findings)

BPR Key Challenges
1.Minimising human issues
2.Strong management
3.Maintenance of the reengineered processes
4.Minimising the cost of BPR
5.Flexibility and Customisation
6.Process outline
7.BPR and IS integration
8.Technology capability

Table-3: Solutions for BPR challenges (Literature findings)

Solutions	to address
Coordination between users & BPR activities	1, 3
Involvement of the employees with the project	1, 3
Availability of information for business people	1
Strong change management	1,2, 6
Selection of an adequate technology	3, 6, 8
Follow BPR steps from start to end	1, 2, 5
Project management budgeting	4

By applying these results, a questionnaire was executed to rank these BPR issues (Table-4):

Table-4: The questionnaire result for BPR challenges

BPR Challenges	Rank
Minimising human issues	1
Strong management	2
Integration between BPR and IS	3
Maintenance of the reengineered processes	4
Process outline	5
Technology capability	6
Minimising the cost of BPR	7

As illustrated by this table, "Minimising human issues" is the most important challenge in BPR. Thus, consideration of all issues related to "people" especially users of the innovative system, should be carried out first.

4.2 BPMo

Overall challenges in BPMo that have been explored by literature review are illustrated by table-5. Similar to BPR, most of these challenges are related to "people". Some innovative BPMo standards & methods have been developed to address these BPMo issues (Table-6). However, they are mostly solutions for technical problems:

Table-5: BPMo challenges (Literature findings)

BPMo key Challenges
Value of process modelling
Relationship between model & business strategy
Support for process execution
Standardisation
Support web service
Strong management
Support business & IT stakeholders alignment
Buy-in and sponsorship
Easy to use
Selecting right method and tools for modelling
Minimising human issues
Training

Table-6: New BPMo standards & methods

Standards, methods & tools	Especial solution for
BPQL	Management and governance issues
BPMN	Easy to use & understandability
BPEL4SW	Support web services
EPML	Compatibility with other tools, easy to use, extensibility, syntactical rationality

The results of the questionnaire regarding the BPMo related challenges and their importance level are represented by table-7 that shows human issues such as "People involvement" and "Training" are the top important challenges in BPMo.

Table-7: The questionnaire result for BPMo challenges

BPMo Challenges	Rank
Minimising human issues	1
Training	2
Standardisation	3

Support for process execution	4
Strong management	4
Easy to use	5
Value of process modelling	6
Relationship between model & business strategy	7
Selecting right method and tools for modelling	8
Support business & IT stakeholders alignment	9
Buy-in and sponsorship	10
Support web services (SOA)	11

4.3 Major challenge

As discussed in a previous section, "minimising human issues" is the most important challenge for BPR and BPMo in changing business processes during ESI. Thus, BPC challenges from the people perspective cannot be considered separately. It means, the role of people is manifested from start to end of systems integration project. Table-8 represents the significant human issues in BPC along with some suggested solutions for them.

Table-8: Human issues & their solutions during BPC in ESI

Human issues	Solutions
Culture changing (Revenaugh, 1994; Vaughan, 2001; Puth & Walt, 2012)	Defining people characteristics, cultures, and elements; define and clarify systems integration, improve the relationship between users, managers, etc. (Vaughan, 2001)
Commitment (Vaughan, 2001; Nah et al., 2004)	Involving people with the change and allowing them to make decisions and measure the changing process (Vaughan, 2001; Nah et al., 2001)
Acceptance (Vaughan, 2001; Nah et al., 2004)	Involving people with the change and allowing them to make decisions and measure the changing process (Vaughan, 2001; Nah et al., 2001)
Knowledge & Skills (Committee on Human-System Design Support for Changing Technology et al., 2007)	Efficient & effective training (Vaughan, 2001), expert trainers (Nah et al., 2001)
Relationship between workers (Vaughan, 2001)	Top-Down management, Support from management and leadership, Human centricity and integration of all human system fields, managing the interdepartmental collaborations, using communication technologies like social networking (Zaitun and Yaacob, 2000; Booher, 2003)
Compatibility between people and Technology (Madni, 2011)	Effective selection of sources, technologies, Evaluation and measurement, proper training program (Zaitun and Yaacob, 2000; Nah et al., 2001)
Slow decision making under pressure (Madni, 2011)	Top-Down Management, managing the relationship and collaboration between decision makers, clarification of the change process to reduce the pressure of the change (Zaitun & Yaacob, 2000; Nah et al., 2001; Booher, 2003)

As illustrated in table-8, most of the success factors for human matters in ESI have been known by organisations and implementers since 1990s. However, very few of them have been followed and applied (Booher, 2003). Therefore, the crucial task for managers and implementers is to consider these issues and apply the solutions effectively.

5 CONCLUSIONS

Managing change in all business aspects, including process, people, and technology is crucial during ESI. This study concentrated on process aspect and attempted to present BPC challenges in ESI, specifically in two approaches of BPR and BPMo. Moreover, the solutions for those challenges were reviewed through this research. Then, the findings from literature were summarised, discussed, compared, and prioritised according to the questionnaire results. Furthermore, "minimising human issues" was identified as the most imperative challenge in both approaches of BPR and BPMo, and it was a significant contribution of this research. This also justifies that different aspects of BPC in ESI comprising people, process, and technology cannot be considered separately. It means, the challenges related to people should be considered and addressed from start to end of ESI project. Adequate technology should also be selected and applied.

In conclusion, ESI and recent innovations in this area are continuously improving. However, some unsolved or partially resolved challenges have remained. For instance, the cost of BPC during systems integration is very high and it is time

consuming. In addition, flexibility and speed of respond to continuous process change is a key challenge in modern systems.

This research focused on BPC in two areas of BPR and BPMo. Further research can be conducted in other BPC techniques such as BPM, WfM, as well as the issues related to people, technology, strategy, and enterprise systems architecture. For example, a potential area for further research from the people perspective is to determine some methods to involve the employees in all steps of the change. Prioritisation of the challenges in all areas of BPC will help to accurately design a framework and a systematic guideline for BPC in ESI and will reduce the failure rate in ESI projects. Future research can also be carried out to identify the ways to reduce BPC cost.

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