Industrial Engineering Letters
ISSN 2224-6096 (Paper) ISSN 2225-0581 (online)
Vol.4, No.6, 2014

A Project Life Cycle (PLC) Based Approach for Effective Business Process Reengineering (BPR)

Bassam Hussein*, Mehdi Chouman, Ayman Dayekh

School of Engineering, Lebanese International University, PO box 146404, Mazraa, Mousaytbeh–Beirut, Lebanon

* E-mail of the corresponding author: bassam.hussein@liu.edu.lb

Abstract

Over the past two decades, business process reengineering (BPR) has been one of the most popular approaches to improving the efficiency and the effectiveness of organizations. However, a review of existing BPR models that are widely in use reveals a wide variation in the number of phases or stages of such models. In an attempt to overcome this challenge, this paper presents an optimal model with comprehensive phases that are based on best project management practices within the framework of well-established and industry proven project life cycles. The paper will provide an overview of the proposed model, describe its phases and highlight their application to help organizations successfully carry out BPR initiatives and projects in an effective manner leading to better chances of success.

Keywords: Business process reengineering (BPR), BPR models, project management, change management, project life cycle.

1. Introduction and Overview

The current competitive business environment has forced organizations to consider BPR in the quest to achieve dramatic improvement in their organizational effectiveness (Hussein, 2008). Kontio (2007) provides an operational definition of BPR as an approach where processes are developed to maximize an organization's potential. BPR has become a widely used approach since the early 1990's, yielding potential benefits such as increasing productivity through reduced process time and cost, improved quality, and greater customer satisfaction (Cao, et al., 2001). Several strategies and models have been developed for the implementation of BPR (Chi-Kuang & Cheng-Ho, 2008). As BPR is considered a relatively new concept for business improvement, its methods and approaches are still in their early development stage. The most important concern among BPR practitioners is the methodology to follow or the model to use (Hussein, 2008). However, it has been reported that most of the business organizations which have carried out BPR initiatives followed a traditional approach by using conventional linear life cycle models. Most of the existing BPR models were inspired by traditional software development and engineering which have always been criticized for the inconsistency and the variation in their stages. In such approaches, the reengineering effort is broken down into phases where the output of one phase serves as the input to the next. Both the diagnosing and transforming phases must be carried out before any implementation is attempted providing little agility.

Accurate and complete representation and analysis of business processes are crucial to the success of BPR. The objectives of using a BPR model may be classified in the following three categories: communication, analysis, and control. Regarding communication, facilitating the understanding of business processes may be the primary objective of using a BPR model. Process designers need to describe existing and improved processes, agree upon a common representation, and share their knowledge of business processes with other stakeholders. Simplicity and clarity may be the most desired features of a BPR model for the communication purpose. According to Cao et al. (2001), BPR failure can frequently be traced to ineffective communication. On the analysis front, analyzing and improving existing processes may be another primary cause for the use of BPR models. In order to identify effectively the best process, process engineers and designers need to generate alternative representations, simulate process behavior, and measure process performance. In addition to communication and analysis, managing, tracking, controlling and monitoring business processes could also be the purpose of using a BPR model. Given many interrelated processes within an organization, process engineers need to pay special attention process operations, manage process relationships and monitor process performance in order to have a significant and measurable effect on a firm's performance (Ozcelik, 2010).

2. Proposed Model Phases Description

A total of six models were investigated and they all present BPR as a cycle of successive steps and as an incremental process. Despite the fact that BPR models advocate different BPR approaches and consist of a variety of phases, all of them share one common task; that is, to reengineer processes (Lin, et al., 2002). According to a UK BPR models survey, the number of stages involved in reengineering models varied greatly ranging from a minimum of three stages to a maximum of eleven stages. The most popular number of stages was four with an average of five (Hussein, 2008). According to Chatha, et al. 2007, a BPR model should be designed or selected creatively to satisfy the current needs of the organization and support the life phases of a BPR project. Based on a careful examination and review of the literature related to BPR models, it was concluded that a generic model comprising the most commonly used stages could be developed. This would be a comprehensive six-phase BPR model which includes envisioning, initiating, diagnosing, transforming, implementing and evaluating as depicted in figure 1.

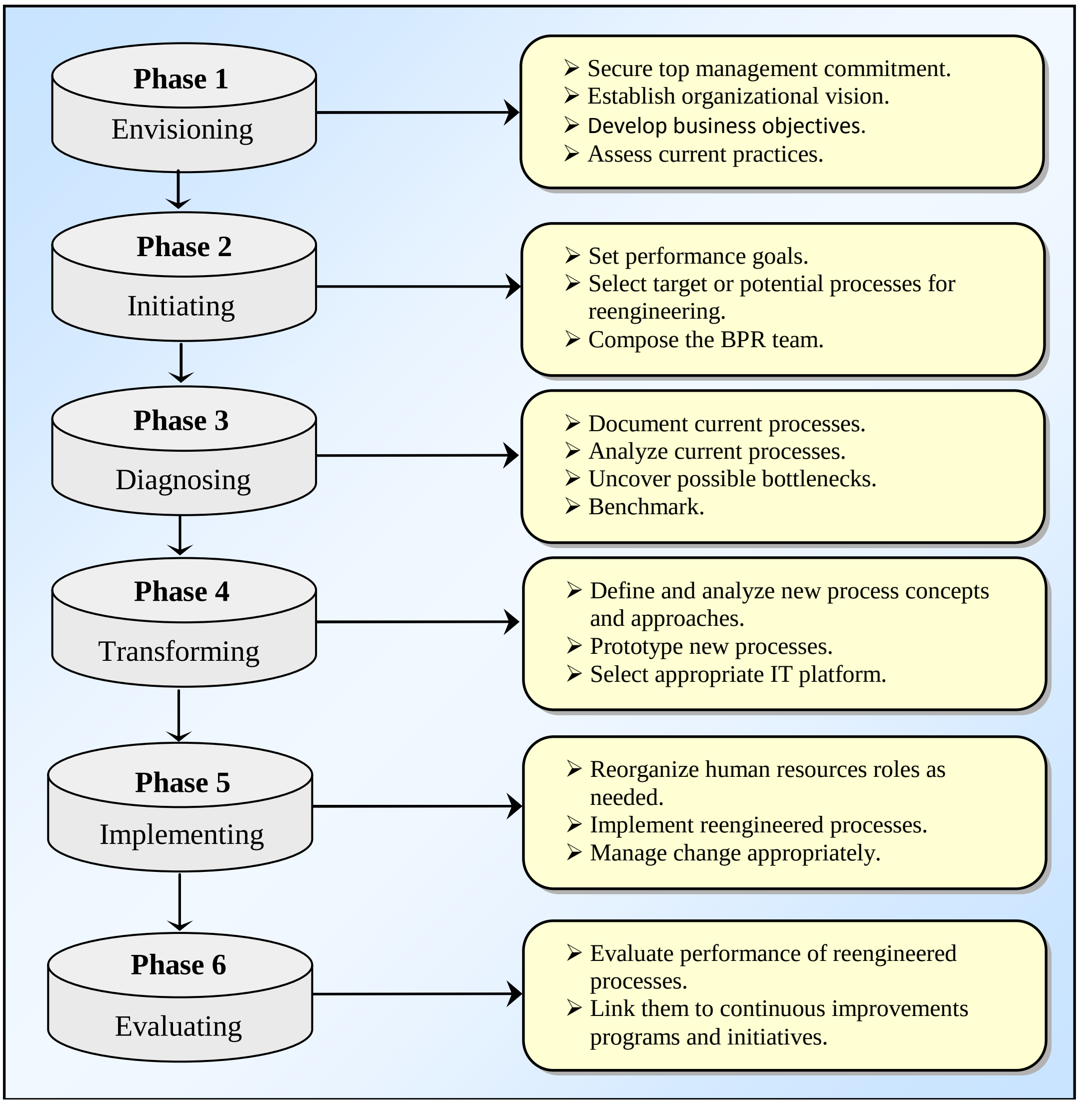

Figure 1: A comprehensive six-phase BPR model.

2.1 The Envisioning Phase

In this initial phase of the model, the top management of the organization must acknowledge the need for change, develop a complete understanding of BPR concepts and know the mechanism for achieving it. The envisioning stage typically involves a BPR project champion engendering the support of top management. A task force, including senior executives and individuals knowledgeable about the organization's processes, is authorized to target a business process for improvement based on a review of business strategy and IT opportunities in the hope of improving the organization's overall performance. The role role of IT in BPR must be considered as an enabler, as a supportive and as catalyst (Eftekhari and Akhavan, 2013).

At this stage, the organization's vision is set up, process objectives are developed, and current practices are evaluated. Developing a business vision and process objectives relies, on one hand, on a clear understanding of organizational strengths, weaknesses and market structure and, on the other, on the awareness and knowledge about innovative activities undertaken by competitors and other organizations. Therefore, the external forces which include customer needs, competitor actions, and technological and environmental factors, and the internal factors including the assessment of internal capabilities, influence the formulation of business strategy which in turn determines the process objectives. This stage is very important because organizations tend to embrace the need for radical change only when there are significant external threats or market pressures (Vakola & Rezgui, 2000).

2.2 The Initiating Phase

Once the understanding and commitment have been made, the reengineering project is prepared for initiating in the second phase of the model. At the same time, the reengineering route is defined and the performance goals are set. The initiation phase sets the tone and scope of the BPR project. Projects can be targeted at any level of the organization; thus the analyst's main task must be to determine the scope and extent of environment to be analyzed, and the number of levels of analysis which must be undertaken to achieve the desired results and outcomes. Based on a clear vision, the management should select the business processes that need to be redesigned, define clear and measurable objectives for redesigning the reinvented processes, and form the reengineering project teams for these reengineering efforts (Motwani, et al., 1998). The reengineering team is assembled from a multiplicity of units within the organization and external change agents are, if necessary, allocated to the project.

Due to the multifunctional nature of processes, the BPR team has to be assembled from various numbers of departments. An overall organization's project may involve people from all departments, while minor projects may consist of members from the affected departments only. Establishing "cross-lateral" teams that represent various functional areas increases the amount of information sharing (Al-Mashari, 2003). The literature suggests that executives and key staff members from the primary organizational units involved in the processes, as well as from the information systems department, should be included in the team (Motwani, et al., 1998). A responsible team leader is assigned by top management, and this team leader, in turn, assigns roles and tasks to the other members of the team.

The desired performance for the new reengineered processes is determined in the initiating step of the BPR activity. According to CSC Index Inc., there are three areas where potential benefits can be realized. These areas include the following: time, cost, and the number of defects. However, determining appropriate measures for performance improvement is a topic under discussion. That is why Nolan, Norton & Co., another famous consultancy group, proposes the following four dimensions of performance: financial success, customer satisfaction, internal processes, and organizational learning (Hussein, 2008). Jovanić (2010) claims that essential BPR performance indicators should include cost, quality, service and speed.

2.3 The Diagnosing Phase

In the third phase, the project team evaluates and documents current processes, uncovers bottlenecks, and establishes baselines and benchmarks for gauging future improvements. During this phase, the efforts of the project team are focused on identifying breakthrough opportunities and designing new work steps or processes that will create quantum gains and competitive advantage (Motwani, et al., 1998). Based on the performance goals to be accomplished, the team must perform an in-depth analysis of the processes to be reengineered. Existing processes are described and hidden pathologies are uncovered. The diagnosing stage is critical for further success of the reengineering effort due to its importance to process redesign.

Understanding business processes is crucial in today's business environment. It is even more important to understand existing processes before designing new ones. Recognizing problems in an existing process can help ensure that they are not repeated in the new process. Understanding existing processes also facilitates communication among participants in the BPR work. Models and documentation of current processes enable those involved in the BPR initiative to develop and share a common understanding of the existing state (Vakola & Rezgui, 2000). A presumption for business process redesign is to gain genuine understanding on how existing processes work, their scope, interdependence and bottlenecks. Important factors to take into consideration in process documentation include: description of the process, identification of process elements and resources, current process performance and analytic decomposition of processes (Hussein, 2008).

Finally, the pathologies of processes may have different nature and behavior, as there may be inefficient sequences and workflows of procedures, extensive high costs and trivial value adding for the process users, stakeholders and customers. These inadequacies have to be detected and documented at every step of the BPR trajectory. Therefore, a variety of quantitative as well as qualitative methods and techniques should be applied appropriately carefully taking into consideration the nature of pathologies of the business processes.

2.4 The Transforming Phase

The fourth phase, referred to as the transforming phase, involves the actual transformation to the reinvented process or organization. This transformation should take place in a small-scale pilot environment. Conducting a pilot study helps in fine-tuning of the new process design, enhancing management and employee understanding of the new processes, and providing realistic estimates of the scope of the organizational change and resource requirements needed (Motwani, et al., 1998). It also provides an instant feedback on the progress and acceptance of the BPR effort. Finally, a pilot study provides opportunities for simulating and evaluating BPR potentials within the organization, as well as the process development area. Continuous prototyping enables the reengineering team and management to make necessary adjustments before a final process design is selected.

Another important factor in the transforming phase is the selection of the appropriate IT platform to support process transformation. Many BPR practitioners and academics believe that IT has a major role in BPR, and many reengineering projects contain IT as one of its major components. IT tools can facilitate gathering and analyzing information of the process performance and structure, mapping or flow-charting the existing process and measuring the results with respect to cost, quality and time (Eftekhari & Akhavan, 2013). Davenport and Short (1990) go beyond viewing IT as an enabler for BPR and consider it to be a driver for the reengineering process as it is used essentially to model technically the organizational change. IT is commonly utilized within companies not only to provide effective support to business processes, but also in BPR initiatives in order to transform processes which limit the efficiency, effectiveness and competitiveness of the organization. The selection, design and implementation of a new IT system and infrastructure inevitably involve many technical issues. Most importantly, it must meet the stakeholders' requirements both on the user and organizational levels (Hussein, 2008). According to Vakola & Rezgui (2000), these important requirements may be classified under the following four areas:

1. **Functionality**: The technical specifications must cover the functions that the system will have to be able to perform in a way that it can support the required range of organizational tasks.
2. **Usability**: The system has to offer its functionality in such a way that the expected users will be able to master and exploit it without undue strain on their capacities and skills. The system must be user friendly and must offer an easy to use interface.
3. **User acceptability**: The system must offer its services in a way which its users across the organization will perceive as not threatening aspects of their work.
4. **Organizational acceptability**: The new system must not only serve immediate task needs but must also serve as a vehicle to promote wider organizational goals.

2.5 The Implementing Phase

The processes that were identified earlier as candidates for reengineering are implemented in this phase. Implementation is a critical phase because, often, the business process is being partially implemented or, even if fully implemented, is only partially used. In order to avoid these difficulties, the implementation stage has to be carefully planned and cannot be performed all at once (Vakola & Rezgui, 2000). In most cases, the implementation of the reengineered processes is done in phases, top down, and in a manner that causes the least disruption on the products and services offered by the organization and the least impact on its customers. In some cases, the changes can be made rapidly and with little preparation. In other cases, there are many activities and extensive preparations which must be accomplished before a specific change can be made. All the changes must be accounted for in the BPR plan and management must determine the order of the changes based on preparation time, priority, cost, and change dependencies and impacts. Another important issue, which must be addressed at the implementation phase, is the enabling technologies. Unless the necessary technologies exist, the reengineering project would not be implemented successfully. Technology could be applied in order to facilitate BPR projects implementation. To do so, the role of IT could be considered as a supportive tool in BPR implementation. A successful approach for BPR needs to apply IT tools and redesign the process at the same time. IT can improve the use of computers and software to convert, store, protect, process, transmit and retrieve information. The approach of IT as a supportive in BPR can be considered in the use of related software in BPR methodologies phases (Eftekhari & Akhavan, 2013).

When new processes are introduced for implementation, integration, and deployment, there are important factors that must be taken into consideration in order to achieve success. These factors include, but are not limited to, employee education, leadership, structural alignment and redeployment of technical and human resources, and modified reward system. Changes made during this phase may cause resistance or resentment that must be addressed through continuous communication among management, the project team and employees. This is to be expected as BPR projects, by their nature, entail major changes in business processes that may lead to organizational instability and failure (Ozcelik, 2010). Al-Mashari (2003) outlines some important organizational change management practices in the context of BPR implementation along with the organizations and firms that employ them. His findings may be summarized as follows:

- Following careful transition process for people. The aim is to reduce anxiety resulting from possible layoffs.
- Succeeding in changing mindset of users from focusing on functional domains to understanding wide range of information and operations belonging to other departments.
- Lacking trust between people, so managers become reluctant to share information with each other for fear of losing control over jobs.
- Getting employees updated through organizing focus groups, publishing newsletters and making use of technology to communicate.
- Increasing amount of information sharing through establishing “cross-lateral” teams representing various functional areas.
- Communicating project scope, objectives and activities to people involved.
- Establishing competency center responsible for knowledge management and transfer, and creating global configuration and standards.
- Putting huge investment into training and re-skilling employees on new environment and methodology.
- Playing role of integrator and leader of major strategic alliance initiatives bringing together suppliers, customers and consultants.
- Critical to include representative from each business line at level of personnel in the implementation efforts as early as possible.
- Major decisions must be made by strategy group consisting of representatives from top management, human resources, manufacturing, marketing, consumer imaging unit, and shared services. Group members’ commitment should be very obvious, well positioned and tangible.
- On-line training because it is cost-effective, allowing large groups to view same materials and to receive consistent and anonymous feedback messages on performance.
- Development of shared-services model where similar or redundant functions performed within individual business units are combined to increase efficiency.
- Definitions of roles, responsibilities and reporting procedures.
- Use of collection tools such as surveys, communications sessions and conferences to keep doors of communication open for everyone.
- Development of series of “job-impact-analysis” documents, reviewed by implementation teams, and then by middle managers to force them to get involved and thus minimize their resistance.
- Adopting operative management and “down-to-earth” approach.
- Change management through leadership enrollment, communication, training, performance management and practice.

Adapting the organizational structure to make it fit the new defined processes is an important and crucial task. The changes in the human resources have to be performed carefully in an evolved organizational structure with only marginal disturbances of the motivation of the individuals being affected. While employee empowerment, sub-unit reorganization and job rotation can often be achieved without major disruptions, the reduction of staff through layoffs and downsizing, often coming along with reengineering projects, can cause major disruptions (Hussein, 2008). BPR results in change, and successful BPR implementation requires fundamental organizational change in terms of organizational structure, culture, and management processes (Davenport, 1993). Change management is a tool used to manage such a change (Al-Mashari & Zairi, 2000).

2.6 The Evaluating Phase

The final phase of the model involves evaluating the success of the reengineering objectives against the performance objectives established at the start of the whole BPR initiative. The evaluation stage is very crucial for the whole BPR model (Vakola & Rezgui, 2000). At this stage, an evaluation of the potential achievements and failures must be performed. This stage of the BPR model requires monitoring of the new processes to determine if they met their goals and often involves linkage to the organization's quality programs. The identified and implemented processes have to be monitored in a continuous fashion in order to scan their performance and contribution to quality improvement (Valiris & Glykas, 1999). This is made possible by an iterational process, in which the new processes are used as input to the diagnosing stage of the model and then looped. This implies that reengineering projects are not handled in the conventional way of being initiated, performed and then finished, but that reengineering is an ongoing process of continuous improvement. The main advantage of such an approach is the recognition of the fact that BPR should be a continuous effort.

In order to determine the reengineering effort's success or failure, the new processes performance must be measured and compared to the processes being reengineered. This performance is measured in terms of process performance, IT performance and productivity. In addition, a process model validation tool must be used at this stage. This tool provides support for validating a process model which confirms that the proposed model is consistent with the modeler's understanding of the process. Validation is accomplished by allowing the user to simulate the execution of the process as if it was used in an actual situation. The main goal of validation is to improve business processes and to measure the impact on customer satisfaction and consequently on customer experience (Botha, et al., 2012). Along similar grounds, a process verification tool must be used to help in verifying that a specified process satisfies given properties. In summary, this may be viewed as validating and verifying if the actual performance meets the baseline.

At this point, an important question, on how much time and effort should be spent on each stage of the BPR project, arises. According to a survey carried out by Al- Mashari et al. (2001), it was shown that the greatest emphasis was placed on the "diagnosing" stage, followed by the "initiating", "envisioning", "transforming", "evaluating", and "implementing" stages, respectively. The results indicate that organizations put most of their efforts in the "diagnosing" stage. The reason for that is probably the lack of experience of a systematic approach. Organizations may have difficulty in analyzing existing processes and this, in turn, may require more attention and effort. Table 1 shows the average effort spent on each stage of a reengineering model. The rating that was used in this survey is on a scale of 1, being very low, to 5, being very high (Hussein, 2008).

Stage	***Overall***		***USA***		***Europe***	
	Mean	***Rank***	***Mean***	***Rank***	***Mean***	***Rank***
Diagnosing	3.61	1	3.59	1	3.64	1
Initiating	3.32	2	3.15	3	3.49	2
Envisioning	3.21	3	3.12	4	3.30	4
Transforming	3.17	4	3.01	5	3.34	3
Evaluating	3.14	5	3.16	2	3.13	6
Implementing	2.92	6	2.69	6	3.17	5

Table 1: Ranking of major stages of BPR models.

3. Conclusion

Over the past decade, several BPR models have surfaced to guide organizations through their process reengineering initiatives and efforts. Like the beginnings of many other disciplines, the initial BPR models were simplistic in nature since BPR was and relatively still is a new discipline which has not yet fully matured. That being said, most of those models exhibit similarities in key areas but have distinct features and characteristics. The biggest challenge lies typically in the number of phases used in such models which vary widely in range and type. The best approach for reengineering is the one that can help an organization carry out BPR successfully in an effective manner. As such, it should be based on well-defined phases that flow smoothly though out the project life cycle. In addition, these phases should represent a generic structure that comprises the overall reengineering activity. They also should be reasonable in number and efficient in type.

In this paper, an overview of the main issues related to existing BPR models was presented. Those issues were then expanded and further analyzed to cover a more in-depth look at the problems of existing conventional BPR models and the traditional approach they follow. It was found that most of these models were developed for other purposes in the first place and were later relabeled to fall under the BPR umbrella. Most of the existing BPR models appear to have serious limitations. These limitations were then summarized and discussed to introduce the need for a more systematic model that would help organizations to successfully perform process reengineering. This work sets the stage for the development of a comprehensive efficient BPR model that takes into consideration the presented limitations and proposes mechanisms to address them.

References

Al-Mashari, M. (2003). A process change-oriented model for ERP application. International Journal of Human-Computer Interaction, 16, 1, 39–55.

Al-Mashari, M., Irani, Z., & Zairi, M. (2001). Business process reengineering: A survey of international experience. Business Process Management Journal, 7, 5, 437–455.

Al-Mashari, M. & Zairi, M. (2000). Revisiting BPR: A holistic review of practice and development. Business Process Management Journal, 6, 1, 10–42.

Botha, J., Kruger, P., & de Vries (2012). Enhancing customer experience through business process improvement: an application of the enhanced customer experience framework (ECEF). South African Journal of Industrial Engineering, 23, 2, 39-56.

Cao, G., Clarke, S., & Lehaney, B. (2001). A critique of BPR from a holistic perspective. Business Process Management Journal, 7, 4, 332–339.

Chatha, K. , Ajaefobi, J. & Weston, R. (2007). Enriched multi-process modelling in support of the life cycle engineering of business processes. International Journal of Production Research, 45, 1, 103–141.

Chi-Kuang, C. & Cheng-Ho, T. (2008). Developing a process re-engineering-oriented organizational change exploratory simulation system (PROCESS). International Journal of Production Research, 46, 16, 4463–4482.

Davenport, T. (1993). Process innovation: Reengineering work through information technology. Boston: Harvard Business School Press.

Davenport, T. & Short, J. (1990). The new industrial engineering: Information technology and business process redesign. Sloan Management Review, 31, 4, 11–27.

Eftekhari, N. & Akhavan, P. (2013). Developing a comprehensive methodology for BPR projects by employing IT tools. Business Process Management Journal, 19, 2, 4-29.

Hussein, B. (2008). PRISM: Process Re-engineering Integrated Spiral Model. Berlin: VDM Verlag.

Jovanić, G. (2010). The impact of business process reengineering on small and medium size companies-research results. Proceedings of the fifth International Conference on Applied Statistics, Bucharest.

Kontio, J. (2007). Business process re-engineering: a case study at Turku University of Applied Sciences, Proceedings of European and Mediterranean Conference on Information Systems 2007 (EMCIS2007), 24-26.

Lin, F., Yang, M., & Pai, Y. (2002). A generic structure for business process modelling. Business Process Management Journal, 8, 1, 19–41.

Motwani, J., Kumar, A., Jiang, J., & Youssef, M. (1998). Business Process Reengineering: A theoretical framework and an integrated model. International Journal of Operation & Production Management, 18, 10, 964–

977.

Ozcelik, Y. (2010). Do business process reengineering projects payoff? Evidence from the United States. International Journal of Project Management, 28, 7–13.

Vakola, M. & Rezgui, Y. (2000). Critique of existing process re-engineering methodologies: The development and implementation of a new methodology. Business Process Management Journal, 6, 3, 238–250.

Valiris, G. & Glykas, M. (1999). Critical review of existing BPR methodologies: The need for a holistic approach. Business Process Management Journal, 5, 1, 65–86.

Bassam Hussein holds a B. Eng. in Computer Engineering, an MBA in Management and a PhD in Engineering Management. Dr. Hussein has worked for several international telecommunication corporations and educational institutions. He led multi-million dollar software development projects and rolled-out many products that are still widely in use by hundreds of millions of users across the globe. Dr. Hussein supervised many academic projects, participated in many conferences, symposiums and workshops and taught courses in the fields of software engineering, operating systems, engineering ethics, project management and organizational behavior. He is currently the Chair of the Department of Industrial Engineering at the Lebanese International University (LIU).

Mehdi Chouman holds a PhD in Mechanical Engineering. He achieved his PhD at the French Petroleum Institute (IFP) and has worked as post-doctorate researcher in the French Aerospace Lab (ONERA). His research activities concern mainly the mechanical behavior of the steel alloys and the fatigue of metals. He is currently a lecturer in the Department of Mechanical Engineering at the Lebanese International University (LIU).

Ayman Dayekh is the Chief Technology Officer (CTO) at the Lebanese International University. He holds a B.Sc. in Computer Science and an MBA in Business Management. He became a certified member in the Project Management Institute (PMI) in 2011. He led many IT projects in education and has been involved in designing and managing the execution of data centers and large networks. He is also involved in teaching computer and project management courses at university level. Current interests are in Instructional Design and Technologies as well as Online and E-Learning.