

Business Process and Quality Management using Lean and Six Sigma Technique

Honey Jain¹, Rohan Benhal² and Tanmayee Parbat³

¹⁻³B.E IT, Maer's MIT, Pune

Email: tanmayee.parnat01@gmail.com

²BBA IT, Maer's MIT, Pune

Abstract—In an environment of intense globalization and digitalization, business organizations are increasingly faced with various challenges such as rising costs, strong competition, rapidly evolving technologies, increasingly demanding and whimsical consumers, and, in social terms, changing societal demands. It is within this context that the effectiveness and efficiency of the management of business organizations is actualized. There is a lack of interdisciplinary research on the link between Business Process Management and Quality Management, and this study aims to ground this link. Methods of the research are literature review and the critical analysis of the scientific sources on the issue. The findings show that there exists confusion, overlaps among different paradigms of QM and BPM. The BPM paradigm might be considered as an integral part of almost all essential quality management paradigms. BPM is like a horizontal area “crossing” different paradigms of quality management (e.g., TQM, SMS, Lean, Six Sigma). The conclusions drawn are useful for organizations that implement quality management systems. The integration of BPM into quality management systems and tools creates preconditions for the development of an effective and efficient organization.

Index Terms— process; business process management; quality management; total quality management; Lean; Six Sigma; ISO 9000.

I. INTRODUCTION

In an environment of intense globalization and digitalization, business organizations are increasingly faced with various challenges such as rising costs, strong competition, rapidly evolving technologies, increasingly demanding and whimsical consumers, and, in social terms, changing societal demands. Companies operating in this context seek to make the best decisions (Beilmann and Clever 2019). Becker et al. (2013a) describe competition as a “mobile war”, where success depends on anticipating pertinent market trends and responding quickly to changing consumer needs. The insights of these authors are extremely relevant because most organizations have already entered or are entering the digital transformation that enables critical business changes. This leads not only to the fundamental transformation of an organization but also that of the entire industry. Digitization of business processes in many cases becomes the key to increasing business efficiency (Osmundsen et al. 2019). In other words, in recent years, the digital transformation has been changing the economic environment of organizations (Fischer et al. 2019), which highlights the importance of business process management while developing digitization (Martinez 2019). Business process management (BPM) is one of the most popular business practices nowadays, which is being explored both in the business world and by the scientific society. The relevance of this methodology is

undeniable, as BPM is vital to every organization. The relevance of BPM has become even more pronounced in the last decade, during which the functioning of organizations has been significantly affected by digitization (Pereira et al. 2019; Chountalas and Lagodimos 2019; Van Looy 2020).

To manage business processes, it is first necessary to comprehend the concept of “process” (Seethamraju 2012; Iden 2012). Quality Management (QM) has been based on this definition since the beginning of the 20th century. For several decades already, business organizations have been identifying, describing, and, in some cases, standardizing (for instance, ISO 9001) their business processes by introducing quality management systems and applying/constructing quality management models. Thus, quality management conceptions such as Total Quality Management (TQM), Lean, Six Sigma, and others do not consider processes to be a peripheral area (Chang 2006). This can be illustrated by Bhat and Fernandez’s (2010) insight, which implies that process professionals may look at BPM with suspicion, considering that it might simply be “the old wine in new bottles”—that is, the same quality management. The truth of most management ideas is that they are often constructed “on top of each other,” sharing key themes that have not changed over the years. Be it TQM in 1980 or Business Process Reengineering (BPR) in 1990, the main theme uniting these management ideas is the concept of process management to increase value. The existing theories of process management have emerged from the quality movement and the BPR movement over the past two decades (Chang 2006). Several twentieth-century management initiatives, including TQM, Lean, Six Sigma, and BPR, cover the core area of processes and process management. The origins and essential philosophical basis of process management are related to TQM, which generalizes the use of business management, information technology, and quality management methods (Seethamraju 2012; Klimas 2013). So, the question arises as to whether BPM is an integral part of quality management.

This paper analyses two management methodologies—that is, Business Process Management (BPM) and Quality Management (QM). The scientific problem of this paper focuses on the following fundamental questions at the theoretical level: What role does business process management play in the context of quality management? Should BPM be considered as the axis of QM? Alternatively, is BPM a completely separate discipline which has nothing to do with QM? The subject of the research is the link between BPM and QM. This conceptual topic is particularly relevant for science, as the most recent research on the link between QM and BPM, which is fragmented, may lead to appropriate decisions in terms of evolving quality management concepts, such as the direction of ISO management standards or the need of certifying other QM systems (that are not being certified yet), etc. This would allow the scientific substantiation of the relevance and benefits of the link between BPM and QM (perhaps even the convergence of these concepts) to the specifics of the business sector—that is, application of new theories (in this case, QM and BPM theories) to the solution of the phenomenon. Thus, this paper aims to define the link between the essential aspects of business process management and quality management based on theoretical insights.

The methods of the research are literature review and the critical analysis of the scientific sources on the issue. Scientific articles and other scientific sources (dissertations, books) published over a period of 20 years (2000–2020) were analyzed, looking for the research conducted on the topic of the links between BPM and QM. International databases were investigated by entering the following keywords: Business Process Management and Quality Management, the link between BPM and QM, the link between BPM and TQM, Six Sigma, Lean.

II. CONCEPT OF BUSINESS PROCESS MANAGEMENT

The definition of the business process, which is relevant in the conception of BPM, is still not properly perceived in business. The process is inherently dynamic (agile). It is not just what needs to be designed or redesigned; it is an important complex organizational unit that needs to be managed. A business process is a set of all the activities of an organization, including the roles, resources, and rules required to produce and deliver a product or service to external or internal users (Iden 2012). It is a complex phenomenon and is more than just a sequence of actions (Becker et al. 2013a). Thus, a business process is an agile, complex organizational unit with a logical and time-bound sequence of actions. This process should be managed in an organization to create a user-defined value. Given the dynamic nature of the business process, continuous process improvement is a prerequisite for creating and maintaining a long-term competitive advantage for an organization.

BPM has been developed as an important management tool that helps organizations to grow and innovate. This methodology includes designing (or re-designing) the business logic of the organization; modeling its implementation; execution; management; monitoring and changes needed to meet customers’ needs to the greatest extent. “The axis of the BPM philosophy and the implementation of its principles is the satisfaction of customers’ needs; therefore, it can be stated that the BPM philosophy remains as a future management

philosophy” (Klimas 2013, p. 12). In other words, BPM is a management approach that treats the functioning of an organization as a network of interconnected business processes. With this approach, to increase dynamism in an ever-changing environment, most organizations partially or completely change traditional hierarchical organizational structures by focusing them on processes (Chountalas and Lagodimos 2019). Thus, while traditional organizations are established on the basis of departments and functional silos, BPM positions organizations as networks or process systems (Chang 2006). Business processes are a core unit of BPM that is focused on identification, discovery, analysis, redesign, execution, and monitoring as a body of methods, techniques, and tools. In this way, the aim is to improve performance (Dumas et al. 2018).

Iden (2012) distinguishes four dimensions of BPM: process awareness, process ownership, process measurement, and process improvement. Process awareness is defined as the most important criterion of process management; that is, business organization processes should be identified, named, and documented. This is reflected in a comprehensive process map that visualizes the processes of the organization and their interrelationships. It should be supplemented by a set of documents describing individual processes and distinguishing activities, roles, resources, rules, and results. However, to meet the criteria of understanding the processes, having documents alone is not enough. Managers and employees should comprehend these processes; employees should have a deep understanding of the processes they are involved in from the beginning to the end. This most important criterion is about how employees and managers perceive the organization—that is, how it is structured, how it works. Moreover, in case processes are immeasurable, it is impossible to define the value they create. Measurements provide a basis for the improvement of processes (Chang 2006).

To sum up, it should be emphasized that BPM is a management concept that defines the performance of an organization as a system of related, interacting processes. The management of such an organization is based on networked processes. The BPM concept should have the following components: (1) the process should be correctly understood (this is the most important part of BPM);

(2) the process should have a process owner assigned; (3) the process should be evaluated/measured;

(4) the process should be systematically improved in the context of other processes. The process architecture is the basis of the BPM methodology, which demonstrates how the organization provides value to users. The essential condition of the process architecture is a correct understanding of processes.

III. EVOLUTION OF BUSINESS PROCESS MANAGEMENT: THE CONTEXT OF DIGITIZATION

The origins of BPM can be traced to F. W. Taylor, who shaped the principles of scientific management, and H. Simon, who applied systemic thinking to organizations (Chountalas and Lagodimos 2019). Shewhart (1931) was one of the first to argue for process monitoring in product control. During 1970, the methodologies of dealing with processes were refined as Just-In-Time (JIT) and Lean Production (Palmberg 2010). In 1980 and 1990, the area of monitoring the process was greatly developed and covered all areas of the organization.

Process management emerged as early as in 1980, but, despite many other management concepts, interest in process management remains very high (Palmberg 2010). Despite a relatively early discussion on the subject of processes among academics, the focus on processes began in 1980 following the approaches published by Gaitanides (1983), Scheer (1990), Porter (1989), Davenport (1993), Hammer and Champy (1993), and Hammer (1996) (Becker et al. 2013a). However, the most powerful assumptions in shaping the BPM concept came from the works of Porter (1985) and Deming (1986), who described the horizontal interrelationships of individual activities that extend throughout the organization, perceiving these activities as a unified system (Porter’s “Value Chain”, Deming’s “Flow Diagram”). These activities were not known as business processes; they were formally defined as a set of clearly specified, structured, and logically related activities that function together and use resources to transform specific inputs into desired outcomes (Chountalas and Lagodimos 2019).

In 1990, when the business was dominated by the Total Quality Management philosophy, to increase stakeholders and value, reduce organizational costs, and improve performance, the process-centered view, the so-called conception of Business Process Reengineering (BPR), incorporated a radical process redesign. BPR is a systematic management methodology which, in the form of an independent project of change, involves a radical redesign of the process. BPR quickly spread from production sources to non-productive areas. The first success stories of organizations appeared (for instance, Ford’s Billing Division, IBM Credit Corporation). Radical managerial approaches to process improvement were used, which were publicized in management journals such as the Harvard Business Review. However, the growing interest of the management community in the concept of BPR received considerable criticism from the scientific community, which argued that BPR evokes more myths than practical methodologies (Klun and Trkman 2018). Its implementation was a major challenge for managers and not always successful. Studies show that the rate of failure of the implementation of BPR was between 50 and 80 percent. As BPR is a

large, high-risk change project, failure can have a huge negative impact on an organization (Chountalas and Lagodimos 2019). It is important to note that the BPR movement made a particularly significant contribution to highlighting the importance of inter-functional processes (not just processes) (Näslund 2008). Recently, and in parallel with this conceptual transformation, the process-centered view reached a new dimension—that is, process management—which emphasizes the continuous improvement of organizational processes (Iden 2012). “BPM is a revival of BPR, as indeed BPM adopts the process-centred view on organizations” (Dumas et al. 2018, p. 15).

One of the most recent terms used in the context of BPM is Business Process Change (BPC). Harmon (2019, cit. in Javidroozi et al. 2020) defines BPC as the analysis, redesign, and improvement of existing processes to achieve competitive advantage in operations. This is implemented through the BPM program, which helps understand business requirements, the need for change, and the impact of BPC on business. Business processes, especially in large organizations, are complex; the BPC approach implies managing this complexity.

The organizations that integrate and implement digital technologies are much more innovative than other organizations (Osmundsen et al. 2019). Information systems have paid special attention to BPM and have begun to incorporate this concept into the curriculum of the IS model, research, and practice (Seethamraju 2012). The new paradigm of conceptual process management created by Hammer has led to new organizational structures and solutions that are closely related to information technology. The rapid development of IT focused on business process automation has begun. However, most of these information and communication technology-based process approaches failed because the solution of the IT software selected in the organization was more dominant than focusing on the challenges of fair business and IT alignment (Becker et al. 2013a).

Business process modeling has received special attention in recent decades, both in practical and theoretical terms. Modeling has always been the essence of BPM activities; process models have always been used to improve the organization. Gantt charts and flow charts were the earliest tools for modeling business processes (Aguilar-Savén 2004; Adamides and Karacapilidis 2006, cit. in Klun and Trkman 2018). Business process modeling languages using IT tools abound, ranking from early languages such as EPC (event-driven process chain) to BPMN (Business Process Model and Notation) and UML Activity Diagrams (Becker et al. 2013b).

IV. LINKS BETWEEN BPM AND QM

A. Evolution of BPM and QM

Schönreiter (2018) uses the term quality management synonymously with the term process management, arguing that processes themselves are the subject of quality management. A process-oriented quality management system encompasses, manages, and directs all the activities in the organization. Process management is an integral part of a model quality system (Iden 2012). Different sectors apply quality management to manage processes and ensure the quality of products and services. TQM today seems to represent an “umbrella” enveloping a growing body of knowledge, science, and technology that has been popular in organizations for the past 3 decades. The TQM philosophy broadly encompasses different approaches (for instance, BPR, Six Sigma, Lean) at the conceptual level. In some parts of the world, especially in India, TQM is particularly popular as a process and quality management philosophy (Bhat and Fernandez 2010). Process management plays a huge role in it. TQM covered a particularly large body of business process management literature (Chountalas and Lagodimos 2019).

The potential of the implementation of BPM exists in each of the following four paradigms: TQM, Standardized Management Systems (SMS) (ISO 9001, ISO 14001, ISO 50001, ISO 27001, ISO 22000, etc.), BPR, and Six Sigma; that is, BPM can be seen as an integral part of these quality management paradigms. The principles of each of these paradigms directly affect the features inherent in BPM. Despite some differences, the structure of BPM in all these paradigms confirms the classic stages of the BPM life cycle. However, each of these paradigms assigns different weights to each stage and thus reflects the different levels of BPM implementation. As described in the previous section, there exists a general paradigm-independent BPM model (Chountalas and Lagodimos 2019). The four paradigms still attract a lot of researchers’ attention. They have evolved effectively over the last 3 decades. Chountalas and Lagodimos (2019), using the data from the Scopus database (20 April 2018), graphically represented the number of annually published scientific papers where these paradigms are mentioned in the title or abstract (articles, conferences, reviews, book chapters, etc.). Although Six Sigma appeared later than the other three paradigms (SMS, BPR, TQM), it evolved even into the first paradigm in the implementation of BPM.

As DeToro and McCabe (1997, cit. in Chountalas and Lagodimos 2019) aptly observed, alongside other management paradigms, BPM itself was initially unknown as a concept. Since 2000, however, it has begun to be treated as a separate concept but more closely related to IT than to management (Chountalas and Lagodimos 2019). In case

there is no strong quality management on the part of the organization, process management will focus on IT. In many Indian organizations, quality management is governed by a central independent organization representing the management level. This logically implies that BPM should explore strong and synergistic partnership with quality management programs within the organization. For instance, process modeling initiatives under the BPM umbrella need to be integrated with process documentation repositories/process architectures—that is, maintained as part of the quality management system. BPM methods and tools should be combined with the quality models and awards that the organization seeks. For instance, BPM can be a great tool to facilitate Six Sigma projects (Bhat and Fernandez 2010).

To sum up, BPM is not a completely separate autonomous concept. Neither is it just another management theory existing in parallel with the concept of quality management. Business process management can be treated as an integral part of the quality management paradigm. Process management is like a horizontal field, “crossing” different paradigms of quality management (for instance, TQM, SMS, Lean, Six Sigma). This generalization is substantiated in detail in the next section of this paper.

V. CONCLUSIONS AND DISCUSSION

The study of the scientific sources discussed in this paper has revealed relevant insights for future research. Looking at the definitions and evolution of QM and BPM, the role of BPM in the context of quality management is actualized (Chang 2006, Chountalas and Lagodimos 2019). Having investigated the evolution of BPM (Chountalas and Lagodimos 2019) and its components (Biazio and Bernardi 2003; Iden 2012; Becker et al. 2013a), it is obvious that these aspects are covered by quality management, and its paradigms are distinguished as well (TQM, Six Sigma, Lean). Based on the insights of Chang (2006), Schönreiter (2018), Chountalas and Lagodimos (2019), and other researchers reviewed in this paper, it can be argued that BPM is not just a completely separate autonomous concept. Moreover, it is not a management concept focused exclusively on IT (Osmundsen et al. 2019). Neither is it just another management theory running in parallel with the concept of quality management. BPM is like a horizontal area that “crosses” different quality management paradigms (for instance, TQM, SMS, Lean, Six Sigma). There is confusion, overlaps among different paradigms of quality management and business process management. Business process management is not the aim in itself. It is a tool to help achieve business goals. The business process management paradigm can be called an integral part of virtually all quality management paradigms. Thus, frequently, BPM is not treated as a completely separate, autonomous management discipline. It is neither a new management theory nor another form of automation that manages the life cycle of improvement and optimization.

This paper contributes to the scientific sources by presenting a theoretical link between Business Process Management and Quality Management. It is also relevant in the practical sense. The conclusions drawn are useful for organizations that implement quality management systems. The integration of BPM into quality management systems and tools creates preconditions for the development of an effective and efficient organization. Organizations should not view BPM and QM as separate management disciplines with different tools. BPM can be seen as a tool integrated into quality management paradigms. Thus, quality goals can be achieved by efficiently and effectively managing processes.

We admit that this paper of communicative type is not without limitations. Firstly, a quantitative review of scientific sources has not been performed. This paper is based on researchers’ insights identified in the scientific literature to scientifically substantiate and communicate the theoretical links between QM and BPM. In the future, it would be beneficial to conduct a systematic literature review, involving a quantitative analysis of scientific investigations. Thus, other methods of research should be used. Secondly, this paper does not seek to refine the terminology in the field of quality management (how quality management systems, models, methods, practices, tools are defined). Different scientific sources use different terms to define certain QM phenomena; for instance, in one source, Lean is referred to as a QM system, but in another source, it is a method, etc. The issue of the definition of the terms related to quality can be the subject of future research. The future research on the topic of the links between BPM and QM substantiating the effectiveness and efficiency of quality management systems while dealing effectively with quality management systems through BPM is very relevant. Highly emphasized is the need for business process digitization research to reveal the impact of digitization on the effectiveness of quality management systems.

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