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Original Article

Identification of Prerequisites for the Deployment of Business Process Management Practices in Iran's Hospitals

Farzaneh Doosty[1], Vahid Rasi[2*], Mohammad H Yarmohammadian[3], Mohsen sadeghpour[4]

1. Ph.D of Health Services Management, Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, Iran
2*. Ph.D Student of Health Services Management, School of health management and information sciences, Iran university of medical sciences, Tehran, Iran,
3. Professor, Health Management and Economic Research Center, Health Services Administration, Isfahan University of Medical Sciences, Isfahan, Iran
4. Ph.D Student of Educational Management. Manager of organizational development & administrational evolution, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Introduction: Business Process Management (BPM) is a disciplined approach that allows a business to identify, model, deploy, execute, manage, monitor, and improve its processes in a standardized manner. This research aimed to identify the prerequisites for the deployment of this approach in Iran's Hospitals.
Methods: The present research was a qualitative cross-sectional study which was conducted using the content analysis method in 2017. Sampling was performed using the purposive sampling method and continued until data saturation. The participants were 18 men and 5 women. The data were collected through semi-structured interviews. Data analysis was performed using the content analysis method.
Results: After analyzing the contents of the interviews, we classified the prerequisites for the deployment of BPM practices into six themes and 14 subthemes: Process Engineering, Flexible Treatment Guidelines and Procedures, Flexible Organizational Rules, Learning Organization, Smart Electronic Filing, and Access Control Systems.
Conclusion: According to the experts interviewed, decision-makers have to carefully address the prerequisites such as legal and cultural requirements and the limitations such as budgetary constraints before initiating the deployment of BPM systems. Overall, it appears that the localization and deployment of this approach, as much as it is currently possible, can benefit the Iranian healthcare systems as well as Iranian patients.
Keywords: Process, Quality Improvement, Healthcare, Business Process Management

Introduction

In today's world, where change and dynamism is a natural part of business, maintaining competitive advantages and adapting to environmental changes are the major concern of business managers and planners. Businesses have learned from experience that investment in process management is a good strategy for achieving persistent success under environmental change (1). The history of process management is rooted in traditional concepts such as work simplification and quality control, which over time have evolved into more advanced methods such as Six Sigma and Lean Manufacturing (2). In recent years, significant developments in process management techniques have occurred.

For example, many companies promoted their process from first-generation solutions such as Total Quality Management (TQM) to second-generation techniques such as Business Process Reengineering (BPR), and ultimately to third-generation methods of process management that focus on information technology and business process automation and are collectively known as Business Process Management (BPM) (3).

The core concept of BPM is the integration of information technology with process management theories in order to assist organizations to strategize and act towards continuous improvement. Given the merits of BPM, many businesses and organizations across the world have heavily invested in preparing

the essential foundations for implementing this approach in order to benefit from its advantages (4). For example, this approach has been widely used in the United States and Eastern Europe since the late 1990s and early 2000s (5), and many businesses continue to utilize its principles to achieve strategic success. Unlike industrial businesses, healthcare institutions and businesses have not shown much interest in using BPM principles (6). However, it should not be overlooked that processes of healthcare businesses are more difficult to manage and reform because they are rarely limited to the business itself and often involve interaction with a wide range of groups and other businesses (7). Despite these difficulties, the rising costs of the healthcare industry and the need to maintain competitive advantages such as superior service quality necessitate process reforms in these businesses, particularly hospitals (8). While different hospitals have different goals and challenges, they all share a common feature that is the multitude and complexity of business processes (9). Many studies have asserted that successful deployment of BPM practices in hospitals can lead to obtaining better results from these institutions (10). Using this approach, many hospitals, insurance companies, and other healthcare businesses throughout the world have managed to administer key business processes in such a way that they benefit from reduced management burdens and assume better control over processes (11). For example, deployment of BPM in Chestercounty Hospital has resulted in improvements such as reduced workload and increased speed and accuracy in doing business (12). It is, therefore, reasonable to assume that this approach can also be beneficial for Iranian healthcare businesses. As in other countries, Iranian hospital businesses involve profoundly complex processes and may immensely benefit from the deployment of BPM practices. However, before initiating this process, it would be wise to examine the requirements of BPM deployment in order to avoid unforeseen problems in the implementation phase. In view of this necessity, the present study was conducted to identify the prerequisites for the deployment of BPM practices in Iranian hospitals.

Methods

The present research was a qualitative study carried out in 2017 using qualitative content analysis with thematic analysis technique to collect expert input on the requirements for the deployment of BPM practices in Iranian hospitals. The inclusion criteria for experts were having a master's or doctorate degree in management or having five years of work experience in hospital management. Initially, the participants were selected by purposive sampling using snowball method and the others were found by theoretical sampling based on research findings, which continued until data saturation (until no additional data was retrieved in data collection). Data saturation was achieved after interviewing 23 experts including the faculty members at Isfahan School of Management & Information Sciences and Mashhad School of Health (Department of Health Services Management) and also the managers of several hospitals in Isfahan and Mashhad. The data collection method was in-depth semi-structured interview. Before interviews, the interviewees were informed about the purpose and nature of the study and the confidentiality of the data they shared and were asked to fill out a form of informed consent to record their conversations. The interviews were 65 minutes long on average. The shortest interview was 45 minutes long. In six cases, because of the tight schedule of the interviewee, the interview was paused and continued in a later session. In the last three interviews, the content analysis of conversations offered no additional information, leading to the conclusion that data saturation is reached. Each interview started with pre-prepared questions such as "In your opinion, what are the prerequisites for the deployment of business process management?" and was continued with exploratory questions aiming at clarifying the remarks in line with research objectives, such as "What do you think are the prerequisites for deploying BPM practices in Iranian healthcare businesses or organizations?". To increase the accuracy of data collection, conversations were recorded by one researcher and the recordings were transcribed verbatim by another researcher. Data analysis was performed using the content analysis method. For this purpose, the obtained transcripts were carefully reviewed to identify the major and minor patterns; 210 initial codes were extracted accordingly. After multiple careful examinations, these codes were classified into several main themes based on their similarity and relationships. The resulting themes were named abstractly according to their nature and concept, and finally the subthemes of each major theme were obtained.

Disagreements between the researchers regarding the classification of codes were settled by the third researcher. At the end, each participant was provided with a full copy of the encoded interview and a summary of the themes and subthemes extracted and asked to make necessary corrections wherever he or she did not confirm the extracted materials. To

improve the research confirmability, the researchers actively tried to prevent the reflection of their own opinions in data collection and analysis and to adhere to the principles of open and semi-structured interview. To ensure the credibility of the findings, we had them reviewed by peers, members of the research team, and three faculty members.

Results

The experts interviewed in this research had a mean age of 43 years and an age range of 35 to 55 years. Of the 23 interviewees, 18 were male and 5 were female, 7 had a doctoral degree in health services management, 6 had a master's degree in management, and 10 had unrelated degrees, but they were experts on the issue. The findings regarding the prerequisites for the deployment of BPM practices in Iranian hospitals were categorized into 6 themes and 14 subthemes (Table 1). Given the wide scope and complexity of the topics discussed during the interviews, a brief description of each subtheme and the examples of the exact remarks are provided in the following Table.

Process Engineering
Integrating the Health Information System (HIS), Electronic Health Records (EHR), and workflow and guidelines

Naturally, medical treatments are the primary processes of healthcare businesses and institutions. Success in accomplishing these processes strongly depends on the medical knowledge and case-specific decisions of the personnel. Decisions made in the course of a clinical process depend on the proficiency of the treatment team and how they interpret the patient data and conditions. In order to support clinical decisions, we should integrate the patient information, along with relevant guidelines, into a well-designed Health Information System (HIS). The integration of medical knowledge, patient-specific data, and complex Decision Support Systems (DSS) results in high flexibility in decision-making for the treatment process (13).

"Such integration will certainly reduce medical errors because then physicians will have access to relevant information, patient history, and the other data in a more detailed and accurate way. However, currently we have neither electronic records nor a complete hospital information system. Our current hospital information system cannot be relied on to serve as a reference for information. Solving this problem will make it far easier to become more process-oriented".

Eliminating the Non-Value Added Activities

In businesses like healthcare, where professionals have to adhere to many legal constraints and guidelines during the service delivery processes, it is vital to provide freedom to reorganize the business, eliminate activities that bring no added value, and reconsider mandatory (imperative) procedures. One way to approach this issue is to implement flexible BPM principles. By encouraging regular and targeted change and reform, this approach can reduce the frequency of human error in healthcare processes and

Table 1: Prerequisites for the deployment of BPM practices in hospitals

No.	Theme	Subtheme
1	Process engineering	Integration of health information system, electronic health records, and workflow and guidelines
		Elimination of non-value added activities
2	Flexible treatment guidelines and procedures	Use of declarative modeling language instead of imperative language and delegation of authority to the treatment team to make swift decisions in unforeseen situations.
		Combination of declarative and imperative languages
3	Flexible rules	Defining social rules for intra-organizational interactions, when a person is unable to perform a certain task
		Defining social rules for intra-organizational interactions, when a person is not allowed to perform a certain task
4	Learning organization	Process mining
		Learning from the problems and events that occur during a process, predicting future events, and engaging in continuous process improvement accordingly
5	Smart electronic filing	Creation of web-based electronic files
		Process-oriented electronic documentation of patient information (as opposed to data-centered approach)
6	Access control systems	Setting up discretionary access control for electronic health records
		Setting up mandatory access control for electronic health records
		Setting up role-based access control for electronic health records
		Combination of discretionary, mandatory, and role-based access control modes into an access control system

facilitate the planning, controlling, and monitoring of internal and external processes of the business, according to the existing operational sequence and structures, in line with the goal of continuous process improvement (14).

"If we had a comprehensive electronic health record, we could actually do a sort of effective re-engineering in our healthcare organizations; this would eliminate all activities that have no added value, which would save a lot of time for the treatment team and for patients as well."

Flexible Guidelines and Procedures
Use of declarative modeling language instead of imperative language and delegation of authority to the treatment team to make swift decisions in unforeseen situations

The current clinical guidelines are not flexible enough for treating certain patients or dealing with unexpected conditions. In the imperative process modeling languages, the executors of instructions have no authority to modify the process even if they find it ill-suited for certain conditions. In BPM settings, it is recommended that Declarative Computer-Interpretable Guidelines (DCIG) should be used. In this modeling style, the essential activities of the treatment process and the dependency relationships between these activities are defined without specifying the sequence of the tasks or putting unnecessary restrictions. This gives the person some freedom in choosing the way the healthcare process is accomplished. Naturally, some laws are impossible to ignore, so declarative modeling language should include some "mandatory restrictions" to make sure that the laws will not be violated (15).

"Look, in our country, it is the doctor who makes the final decision, and even red lines cannot force a doctor into a certain path; they can only act as an alert. Some undesirable outcomes may end up being investigated in specialized committees, but they are often lenient or gloss over the problem. Ultimately, we are still not process-oriented, whether the processes are imperative or declarative. It would be great if this happens and certainly there would be fewer mistakes."

Combination of Declarative and Imperative Languages

When writing guidelines or defining procedures, it is much more effective to use both declarative and imperative languages, than either of them alone (16).

"I personally believe that we Iranians always prefer the middle road. In this case, I can say that if we go process-oriented, but use either declarative or imperative language alone, we won't get the result we want. But if we can use a combination of these languages to communicate processes, I'm sure people will be more willing to follow them. I think people work well neither when there is too much ordering going on nor when there is not enough ordering. I my opinion, the best solution is to consider the level of organizational posts; for example, lower levels should have more imperative guidelines, but for higher levels, guidelines should be more declarative."

Flexible Rules
Defining social rules for intra-organizational interactions when a person is unable to perform a certain task

The BPM approach takes into account the norms that are involved in doing a job and can define the social rules and roles that facilitate interactions in abnormal situations resulting from the violation of the boundaries and red lines. These social norms reflect the people's interaction capabilities within an organization and can be helpful in extraordinary and unpredictable situations where compliance with rules and guidelines not only does not improve the patient condition, but can also makes it worse (17).

"In our country, many things are about who you know, not what the law says. I think this is one of those things. For example, since the result of an investigation into the damage done to a patient involves the levers of power, a doctor may be more confident to take action in these cases and another may act more cautiously."

Defining social rules for intra-organizational interactions when a person is not allowed to perform a certain task

In cases where the rules prohibit a person from doing a task but medical diagnosis requires the task to be performed by that person, social and informal norms can remove the obstacles (18).

"So many times, I have seen the nurses who are much more experienced, more perceptive, and more capable than a doctor, especially in emergency wards where doctors are general practitioners, but since they won't get any support if there is a problem, they prefer to take care of their own tasks and ignore social obligations because they are afraid that taking some measures may get them into trouble. In my opinion, in every process, procedural instruction or guideline, patients' health and safety should be the top priority at all moments, and all actions should be aligned with this goal."

Learning Organization
Process Mining

Process mining consists of three steps: examining

the results obtained from the processes, comparing them with the predicted results, and identifying the deviations. The information obtained from process mining is extremely useful for reforming the processes. Simply put, doing tasks in the usual way is not always the best way to achieve the best results and sometimes deviations from designated processes may lead to an improvement. Process mining is a procedure for examining this possibility (19).

"Realistically, can we talk about becoming process-oriented and not about continuous process improvement? Process mining can be seen as a link of the process chain; if we actually care about quality, we should get back to process mining on a regular basis."

Learning from the problems and events that occur during a process, predicting future events, and engaging in continuous process improvement accordingly

One way to achieve continuous process improvement is to turn the business into a learning organization. The organizational learning process is a recurring cycle consisting of defining major and minor objectives, identifying deficiencies during the implementation and specifying exceptions, and automatic adaptation of the process to the set objective by eliminating the identified deficiencies. The goal of the learning process is not only to learn from the problems encountered during the implementation, but also to adapt to technological changes, environmental requirements, new laws and guidelines, and innovations (20).

"We have to inject the economy into the health sector by institutionalizing the culture of learning and by keeping pace with global changes. We can prevent many errors and improve the system efficiency by learning from the problems encountered when adapting to changes and from self-evaluations of treatment teams."

Smart Electronic Filing
Creation of Web-Based Electronic Files

The current challenge of the health information system is how to create a web-based health filing system that would ensure efficient information flow between health providers in such a way that it reduces human error and improves the service quality (21).

"Nowadays, there is a lot of arguments about how much people need web-based electronic health records. It is obvious that one of the main steps for reforming hospital processes is to make electronic health records web-based, so that all patient data can be accessed anytime and anywhere and there would

be more control over the treatment process."

Process-Oriented Electronic Documentation of Patient Information

The current system of health data documentation in Iran is data-centered (each healthcare organization collects data related to its own work, regardless of the information previously collected by other organizations or patient's extended medical history. Also, the collected information will not be available for use by other organizations). Therefore, healthcare organizations are unable to offer effective treatment based on the patient's history and background. Deployment of BPM provides an opportunity for more flexible electronic record keeping and sharing, which allows both service providers and patients to access the current and past information and keep track of future developments in other processes (22).

"A process-oriented view in the field of information and also in practice can improve the services delivered. Although some hospitals keep electronic records, this is just for their own organization. I mean if a physician working elsewhere asks for a patient file, they will not share it. Of course, if we implement process-oriented electronic documentation, many of the medical errors will automatically go away because each doctor can supervise the decisions of the previous doctors."

Access Control Systems

Today, there is a lot of interest in forming nation-wide health electronic records in order to benefit from its obvious advantages such as lower cost, improved treatment procedures, and higher efficiency. Some countries have successfully migrated to a nation-wide electronic health record system to integrate the services provided in separate healthcare business and organizations, but this centralization has created new problems regarding the protection of security and confidentiality of patient information. In order to overcome these problems, several access control approaches have been defined to address privacy and security concerns regarding the handling of patient information (23).

Discretionary Access Control

In this method, the patient has control over his or her own file, and only the users who are authorized by the patient can access this information. The problem of this method is the patients' lack of sufficient knowledge about which users should be granted access to their information and the amount of information which should be shared with each user (24).

"When we talk about electronic health records, it's

important to seriously consider the confidentiality issue. This method seems to be paying the most attention to the patient rights, but there may be some risks for patients as they may not be educated enough about the issue."

Mandatory Access Control

In this method, access rules are determined by the system and the patients do not interfere with the level of access to their information. In this method, patient rights are not fully respected (25).

"*In my opinion, this method works well as long as access levels are fully respected. The arbiter of access levels should be the family doctor. The family doctor should be granted the right to collect the patient's information and share them with other doctors.*"

Role-Based Access Control

In this method, users will be granted access to patient information according to the role they play in the patient's treatment process.

"*I think patients should not be the decision-makers; this method seems more logical, of course, provided that there is a clear policy regarding the doctors' access to data*".

Combination of discretionary, mandatory, and role-based access control modes into an access control system

Incorporating discretionary, mandatory, and role-based access control approaches into one access control system appears to be a reasonable option as none of these methods alone can satisfy the patient information security and confidentiality requirements (26, 27)

"In this way, the methods will cover each other's defects and turn into a more complete method. But, for any combination where patients play a huge role in deciding access levels, people should be first educated and trained".

Discussion

As the review of the literature on the deployment of BPM practices in hospitals indicates, BPM can benefit hospitals by transforming them into process-oriented businesses (28). In many developing countries, however, such transformation is likely to face substantial obstacles and challenges. To further examine the issue, the researchers reviewed the past literature related to the research subject. A brief report of this review is provided in the following section.

In a research by AlShathry on the status of deployment of BPM practices in Saudi Arabian

health organizations, it was concluded that although senior executives greatly welcome the use of BPM, the absence of prerequisites for its deployment, the significant gap between the existing and required information technology levels, and the lack of necessary guidelines will cause significant challenges in the implementation phase (29). According to Rohani et al., the critical factors for successful implementation of BPM systems include the accurate identification of key organizational processes, continuous improvement of the processes, proper performance measurement during the implementation phase, proper integration of the programs with processes during the implementation phase, accurate modeling of organizational processes, and proper standardization of the organizational processes (30). In a study conducted by Kalhori and Hajiheidari, the effective factors in preparing for the deployment of BPM were classified into six broad categories and several subcategories. The main factors cited in this article were senior management commitment and support, project management, change management, information technology, culture, and choice of methodology. In the category of technical factors, which is more consistent with the subject of the present work, the success factor for the implementation of BPM was reported to be the access to appropriate methods for analyzing, designing, and deploying a BPM system, such as standardized and well-organized executive guidelines, detailed information about instrument capabilities, and the consistency of the codes used in the design with the system's language (31). In a study by Rezaee et al., it was stated that one of the factors of success in the implementation of BPM is the accurate measurement of organizational performance during the implementation phase, which can be achieved by defining critical performance measures, periodic review of measures, and persistent performance measurement based on the defined measures (32).

The study of Santos et al. also reported that the presence of suitable infrastructure is an important factor for successful implementation of BPM. According to this research, the technical factor for the deployment of BPM is the prediction of the required infrastructure, especially technological infrastructure, to support the BPM initiative (33). In another study, 15 components needed for the optimal deployment of BPM were reported to be performance standards, best practices, delegation of responsibilities, clarification of the role of each employee, clarification of the duties of employees, organizational structure, operational objectives, services, macro-objectives, control mechanisms, evaluation mechanisms, support

services, administrative transparency, structural flexibility, information dissemination, and project (34). In another study performed to examine the theoretical framework for measuring the readiness of organizations for BPM deployment, the results showed that the effective factors in the deployment of BPM were the alignment of strategies with organizational goals, the formulation of suitable policies for the implementation of BPM, the management and staff's perfect knowledge of the organization's core processes, prioritization of the processes for designing improvement programs, development of a process improvement methodology, process evaluation, process reform's focus on customers, process management, required information technology and systems, change management, process applications, and project management (35). The results of the present work are largely consistent with the findings of the above-reviewed studies. There are, however, some slight differences between our findings and the reviewed reports. For example, the term "learning organization" is only discussed in the present study and is not explicitly mentioned in other works although they have also underscored the importance of continuous learning from past experiences and benchmarking the experiences of top-performing organizations as a factor of success in effective implementation of BPM systems.

Conclusion

As stated above, the findings of this study regarding the requirements of BPM deployment in Iranian hospitals were categorized into six themes and 14 subthemes. The experts interviewed in this work believed that in most Iranian hospitals, poor process management leads to spending a lot of time by the employees on non-value added activities and complaining about long waiting times by the patients. An interesting issue repeatedly raised in all interviews was the dire need of hospitals to reform the processes, eliminate non-value added activities, prevent duplication of work, and accelerate the implementation of the processes by offering services in the IT field. Some participants supported the deployment of the BPM principles in Iranian hospitals to reform the existing processes, but others disagreed, citing the absence of prerequisites for a full deployment of BPM, and argued that reform should start with far less ambitious objectives. Among the interviewed experts, there was a broad consensus about the necessity of deploying BPM practices in Iranian hospitals to make the necessary reforms in the processes of this sector. However, before initiating the deployment of

this approach, many legal, cultural, and budgetary constraints that will undermine the progress of work and many prerequisites without which true success is impossible should be judiciously addressed. Nevertheless, the localization and deployment of this approach, as much as it is currently possible, can benefit the Iranian healthcare system as well as patients by ensuring continuous improvement in the system efficiency and the quality of services provided.

Limitations

Because of the novelty and breadth of content, usually interview lasted more than prematurely. Unfortunately, some participants refused to continue the interview and inevitably excluded

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