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Evaluation Framework for Business Process Evaluation Approaches

Ayad Hameed Mousa[1*], Norshuhada Shiratuddin[2], Muhamad Shahbani Abu Bakar[3]

[1]University of Karbala
[1]University Utara Malaysia
[2]School of Multimedia and Communication, University Utara Malaysia
[3]School of Computing, University Utara Malaysia
[*]Corresponding author email: maryemayad@yahoo.com

***Abstract*:** Business Process Management (BPM) lifecycle consists of goals specification, through the other phases such as design, implementation, execution, enactment, monitoring and evaluation of BP During process enactment information collected about execution plans that are stored in the form of log files and database tables, with information systems (IS) and use .In the past decade it has emerged a new approach based on apply Business Intelligence (BI) in business process management. Since it is the Data Warehouse (DW), technique is the backbone of the BI. The comprehensive and detailed assessment of the use of DW in the process of business is scarce compared to heavily use the DW. Therefore, in this paper we extend the existing framework in order to propose a comprehensive framework (FBPEA) that can be used to evaluate the existing approaches used DW to store and manage post-execution data in BPM. Moreover, we have used this proposed framework in the evaluation of a number of studies for the period from 2001 to 2012 selected through of intensive and comprehensive study of these approaches.

***Keywords*:** Business Process Management, Business Process Management Lifecycle, Post-Execution Process, Data Warehouse Process Enactment, and Process Evaluation.

1. Introduction

Business Process Management (BPM) has been founded based on the monitoring of all outputs that enterprises provide it to the stakeholders and is the resulted by many of activities. However, BPM is a comprehensive management approach to stratify an organization's BP, it has been influenced by techniques and concepts coming from various domains such as computer science and business administration. Based on early BPM rooted in the process orientation in the year, according to head to work to manage the operations of the organizations, when it emerged a new way to organizing the organizations and companies depending on the BP [1-8].

Generally, BPM lifecycle start from goals specification, through the other phases such as design, implementation, execution, enactment, monitoring and evaluation of BP [5]. Figure 1 shows BPM lifecycle.

Under the Process Enactment phase, the designed processes are constantly monitored and improved. Once the implementation phase has been done, Business Process (BP) will be ready to enact or execute. This phase consists of the real run time of the BP. BP is created to achieve the business objectives of an organization.

The purpose to this process is to meet the correct process synchronization operation, to ensure that activities are performed in accordance with the process and implementation constraints specified in the process model [4-7, 9].

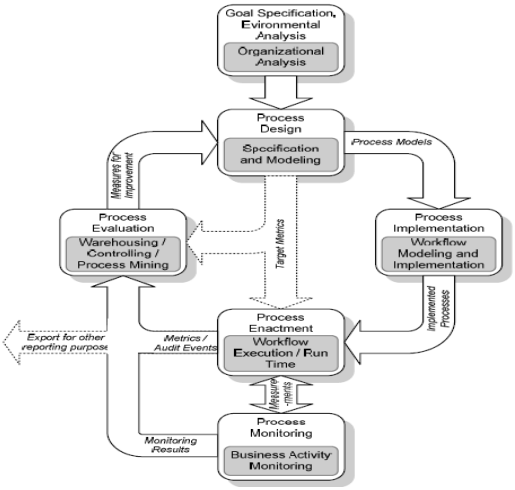

Figure 1. Business Process Management Lifecycle

During process enactment in BPM lifecycle, information collected about execution plans are stored in the form of log files and database tables, using information systems (IS) and using these information in process evaluation phase to evaluate process execution. The defects that appear after executing process bottlenecks are diagnosed by analyzing the data stored during process execution, these information are present in the data structures especially for this purpose. [3, 7, 9-13]. Therefore, in the past decade it has emerged a new approach based on applying Business Intelligence (BI) in BPM. Since it is the DW, technique is the backbone of the BI [14-17].

2. Data Warehouse Approaches used to Store and Manage Post- Execution data

Post-execution analysis completes the BPM lifecycle. It uses the information generated during process execution (Post – Execution data) to assess process performance that serve as a basis to improve processes and their execution performance.

In line with the above situation, there are some and through the deeply study of comprehensive and profound previous fifteen studies [3, 14, 18-28] it has been

summarized in the table1, have used DW for the storage and processing of post-execution data for the period from 2001 to 2012,and can be concluded as important of the post execution data, because it is considered input to other operations. Therefore, many studies concern on how to improve these data, final outcome of this definitely has a positive effect on the improvement of BP. Figure 2 shows the impotent of post execution data.

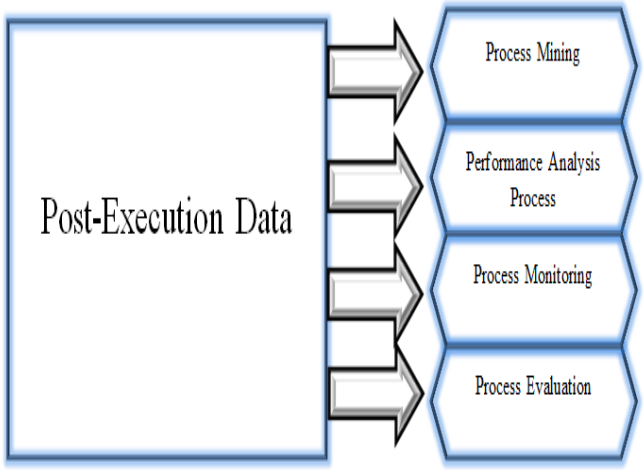

Figure 2. The Importance of Post-Execution Data

As mentioned above, in finding the components of the proposed framework a comparative and comprehensive review was conducted on a sample of previous studies and existing pertaining to use Data Warehouse in BPM. The main facts gathered from various studies are summarized in very brief way in Table 1. Nevertheless, the outcomes of the comparative analysis are also used to formulate the framework and has enabled researchers in this field to get a quick overview of the important aspects pertaining to these studies, and refer to the original references for more details.

3. Evaluation Framework for DW Approaches in BPM

In this section, The Framework which was proposed by Shahzad [18, 29] has been used and extended, in order to identify the areas of interest which should be viewed when it is intended to evaluate the existing approaches of BP evaluation, this paper has expanded a number of studies that will be covered by the evaluation. Figure 3 shows the evaluation framework [18, 29].

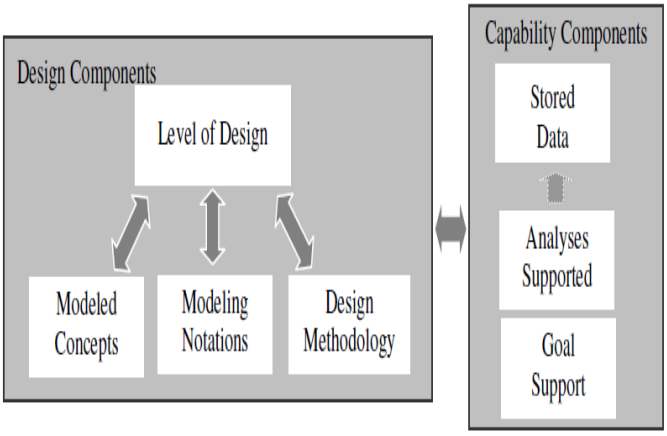

Figure 3. Evaluation Framework for DW Approaches

4. The Proposed Framework (FBPEA)

In this section, we develop an extension for the framework that is aforementioned, Target of it is to evaluate the performance of existing approaches and especially the outputs and maintenance. According to [18, 29] the target of this framework is to determine the specific areas that are supposed be considered for evaluation and comparisons between studies concerning the evaluation of BP. Figure 4 shows the extension of evaluation framework.

In line with the above situation, it has been realized that, the main aim of extension of this framework have been neglected unintentionally output and maintenance components of these studies. It is necessary to evaluate any approach, study, method or any technology must focus on the things that belong to the input, processing and output in addition to the maintenance process [30-32]. By which we mean here to update the data sources and the possibility of adding additional processing of the data. It can be concluded that, the intimate knowledge of the outputs of any process or approach and evaluated in terms of being responsive to the purpose of the constructed or not is very important to know the glitches and weaknesses of this approach and find alternative methods and techniques that will be applied in this approach in order to develop to achieve its desired goal. Figure 4 illustrate the extension of evaluation framework (FBPEA).

For design components and capability components shown in figure 4, see [18, 29]. Output and maintenance components include three elements data updating, re-design which mean the possibility of adding other data sources or not, and deliver timely information. We also have been interested in applying user support to capability components, to our sense, it is possible to have such additional and important elements during evaluation any DW approaches [33-37].

Table 1. Data Warehouse Approaches In BPM

Approach	Brief Descriptions
1) Goal driven process Improvement [18].	1) PW is a DW used to store business data. 1) The purpose of the method is to facilitate PW designer in integrating goals with PW. 2) This method target is to diagnose the weaknesses related to a process and make changes to the process for possible improvements 3) The method consists of three steps, - Goal structure. - Integrating goals. -Analyzing and improving BP.
2) Warehousing Workflow Data [19]	1) This study presented in order to overcome and to resolve the limitations of the use of Log files (WfMS) 2) Extract data from logs file to DW 3)Target to improve BP 3) This approach has three steps - Extracting data from logs and put them in database. - Cleaning these data and put them in shadow. - Loading these data to DW.
3) Warehousing BP Data [19].	1) Covering the extension the contribution which proposed by [19]. 2) Dealing with data from multi sources 3) Mapping and viewing the data between low level and higher level.
4) Performance DW[21].	1) This approach is combined with techniques (DW and DM). 2) Target to analysis and prediction to improve BP by reducing and eliminating the exceptions.
5) Process-Oriented DW [22].	1) This approach imports the information from workflow audit trail as well as business object data into a unified repository using ETL 2) Data from workflow or business objects transformed into respective metadata is used to define the format and semantics of the fundamental raw data structures 3) Proposed data is applied to solve the problem of DW size
6) ProM Import Framework for Process Event Logs[3].	1) This proposed framework is used to build a stable and consistent basis for the process of extracting event logs data from any Process-Aware Information Systems (PAISs). 2) This framework uses data mining technology
7) BP Intelligence [21].	1) This approach will be materialized into a set of tools. 2) Uses DW and DM. 3) This approach will be referred to as BP Intelligence tool suite because it will be based on BI techniques.
8) Performance DW [23].	1) This approach explains how capability of DW can be applied on BPI. 2) This approach focuses on how to design performance DW.
9) Data Warehouse for Logs [14].	1) In this approach, ADAPT notations (Bulos, 1996) are used for modeling of process warehouse. 2) Explicitly collected queries are collected to be the requirements. 3) The time is added to meta model
10) Process Data Store [24].	1) The process data store provides nearly real-time access to critical performance indicators of business processes. 2) No formal modeling method is proposed in this study.
11) Goal-Oriented DW [25].	1) Use of goal-oriented methodology designing DW. 2) The approach recommends that two different perspectives (organizational modeling and decisional modeling).
12) DW for Audit Trial [26].	This study suggests that a data model should be developed for capturing workflow audit of trial data.
13) Goal-Driven DW Design [27].	According to this approach, goals are defined and then analyses is used to produce sub goals and measurement goals.
14) DW Design Approach [28].	1) This approach is sufficient for identifying relevant dimensions. 2) Extended entity relationship (EER) notations are used to assist the process.
15) Multidimensional Modeling Approach[38].	1) The approach records the scheme of a process into a UML class diagram. 2) The approach is developed for surgical process model.

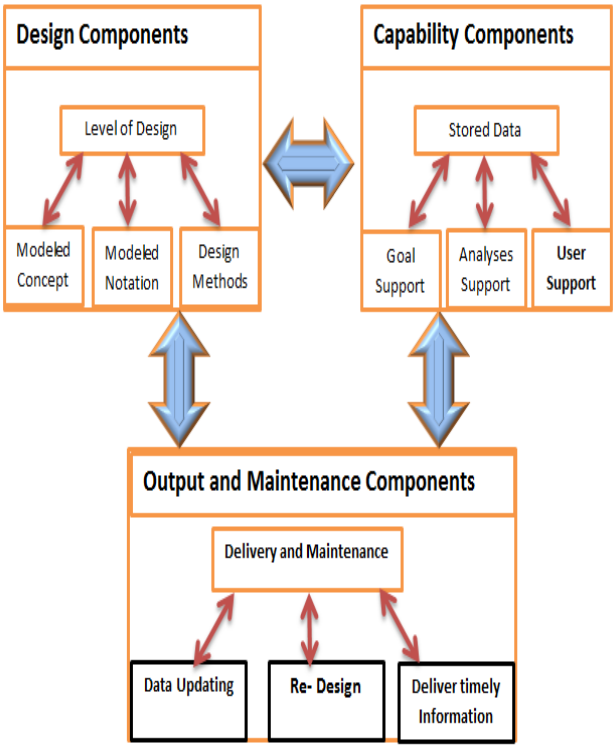

Figure 4. The Proposed Framework (FBPEA)

5. Use FBPEA for Evaluation

Using the proposed framework, we analysed fifteen approaches to determine the shortcomings that we have to overcome in the future. For an analysis of the approach, it will be limited to what has been added to the framework described in the previous above, but for anyone who wants to identify the full analysis, it should be combined with the analysis in the [18, 29]. The parameters for updating manner is offline and online that means the result should be Yes if the approach can update online and No if the approach can update only in offline manner. On the other hand the parameters for re-design will be radical and incremental that means the result should be Yes if the approach have ability to add new sources otherwise, the result is No. While the deliver Timely Information have one parameter that is real time, and the result will be Yes if this approach have ability to provide a live date otherwise, the result is No. Finally, the last component we add is user support which includes one parameter user-driven method, and the result will be Yes If the intended approach use this method during its design, Otherwise, the result is No.

6. The Evaluation Results

Obviously, the findings showed in Tables 2 and 3 illustrate the evaluation results for fifteen approaches from the standpoint of data delivery timely information and using user-driven methodology with respect to table 2. Table 3 shows the results of the evaluation of those studies with respect to the style of the update and the ability to add other sources of data. In the same aspect, for researchers who want to see the full results of the evaluation, they should review the references and combined with the results of this paper [18, 29]. From the results obtained from the use of the proposed framework, it is shown t very clearly that the use of Data Warehouse did not meet fully the needs of BPM. Then, it is important and necessary to reconsider the application of alternative technologies approaches, and methods designed to overcome these failures in order to get a better evaluation of the BPM.

Table 2. Evaluation Results in terms of Deliver Timely Information and User-Driven Methodology

	Approach Name	Deliver Timely Information	User Support
		Real Time	User Driven
1	Goal driven process Improvement	No	No
2	BP Intelligence	No	No
3	DW for Logs	No	No
4	A Generic Import Framework for Process Event Logs	No	No
5	Process Data Store	No	No
6	Improving BP	No	No
7	DW for Audit Trial	No	No
8	Goal-Driven DW Design	No	No
9	DW Designing	No	No
10	A Generic Solution for Warehousing Business Process Data	No	No
11	Warehousing Workflow Data	No	No
13	Multidimensional Modeling Approach	No	No
14	Goal-Oriented DW Design	No	No
15	Performance DW	No	No
16	Process Oriented DW	No	No

7. Conclusion and Future work

The study shows the evaluation of the BPM based on the adoption of the full data resulting from the post- execution process. The emergence approach and the use of BI tools, such as Data Warehouse and Data Mining to improve the performance of BP yielded greatly to improving performance. In the other aspect, many studies in the field of the introduction of technology and the DW, tried to resolve and improve the process of storing, processing and cleaning Post- execution data in order to configure it to use these data during the evaluation process. Obviously, the findings show that it is important that the very existence of the critical part of the work of the task of a comprehensive assessment of these studies to see glitches and try to fix it and use substitutionary techniques in order to obtain acceptable

pattern to assess the BPM . In line with the above situations and from the observation results from the use of the framework proposed in this paper it is shown clearly that there are many problems accumulated and cause obstruction in the BPM, and it is important to reconsider and pay more attention to the application of modern techniques such as Data Virtualization technology and also to try to combine methodologies of data integration, such as User- Driven, Goal-Driven, and Data-Driven and to use them in reaching a convincing case for reducing these problems.

Table 3. Evaluation Results in terms of Updating Manner and Adding New Sources.

	Approach Name	Updating Manner		Adding New Sources	
		Offline	Online	Radical	Incre mental
1	Goal driven process Improvement	Yes	No	Yes	No
2	BP Intelligence	Yes	No	Yes	No
3	DW for Logs	Yes	No	Yes	No
4	A Generic Import Framework for Process Event Logs	Yes	No	Yes	No
5	Process Data Store	Yes	No	Yes	No
6	Improving BP	Yes	No	Yes	No
7	DW for Audit Trial	Yes	No	Yes	No
8	Goal-Driven DW Design	Yes	No	Yes	No
9	DW Designing	Yes	No	Yes	No
10	A Generic Solution for Warehousing BP Data	Yes	No	Yes	No
11	Warehousing Workflow Data	Yes	No	Yes	No
12	Multidimensional Modeling Approach	Yes	No	Yes	No
13	Goal-Oriented DW Design	Yes	No	Yes	No
14	Performance Data Warehouse	Yes	No	Yes	No
15	Process Oriented DW	Yes	No	Yes	No

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