Assessment of BAM with ANP Approach; Case Study: Bank Sepah

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ABSTRACT

In today's business environment in which coordination and adaptation with constant changes are the only ways of survival, real-time monitoring of activities and making the decisions accordingly are necessary. Since performance measurement cannot be managed independent of business processes, Business Activity Monitoring (BAM) systems should monitor performance metrics based on business processes. With fast development of information technology infrastructures, increased interests in business processes management concept and organizations' willingness in its application, organizations have become more attracted to activities monitoring. On the other hand, rapid market changes for maintaining competitive advantages are making the question of monitoring an even more important one. Business activities monitoring is a solution which helps the organization in making better decisions by gathering and analyzing relevant real-time data, monitoring Key Performance Indicators (KPI) and responding accordingly. Therefore, in today's business world, in which the ability to improve performance is critical for every organization, BAM is a vital element in achieving business strategies objectives.

In this research, first we will recognize the effective indicators in evaluating BAM, and then will solve the model with ANP technique by positing these indicators in the presented model and testing hypothesis. Finally, the best feasible option for evaluating BAM in Bank Sepah will be selected.

Keywords:

Business Activity Monitoring, Business Process Management, Key Performance Indicators, Analytical Network Process, Complex Event Processing.

1. INTRODUCTION

The term "Business Activity Monitoring" which was first coined in 2001 by Gartner Group aims to describe a technology which allows the real-time and random access and analysis of major business performance indicators [18]. In today's business world, most organizations are struggling with changing their business processes to agile product and customer-centric frameworks to survive in the global and competitive business environment. In today's dynamic business environment, the ability to improve business performance is a vital need for every organization. Recently, many organizations have pursued process innovation or improvement to achieve their objectives. Using BAM, organizations can monitor their business processes, identify their deficiencies or weak points, and address them immediately [12]. BAM is an approach that allows investment services to shift their "reactive approach" to a "preventive approach". Large and small financial service companies need such efficiency since the ability to understand internal or external opportunities and risks is a competitive requirement of today's world. In the past, daily sales measurement, asset level and cash flow control were instances of monitoring. However, now that almost all organizational activities are carried out electronically, monitoring has become a very challenging issue. Alignment with world markets and the necessity of quick reaction to market changes, opportunities and threats require application of real-time data in organizational decision making.

The main focus of BAM, in the first years of its foundation was on process measurement, which was certainty successful. But now the corporations are using the developed level of BAM for aiming definite Business issues, Which enable them to increase their improvement by predicating the market and take proper decisions. Nowadays, a set of second generations strategies have emerged in which BAM participates in business, generating a value more precious than first generation BAM measurement approach.

In first generation, BAM focus was mainly on measuring transactions and events in four main topics:

Volumes: The first use most companies make of BAM is to build on these basic measurements. Companies will usually define events related to these items, such as a pre-defined threshold being exceeded, or a statistical abnormality, and then use the BAM tool to generate an alert or take action

when the event occurs. This provides useful information on business transaction flow throughout the business.

Velocities: BAM tracks velocity measurements in a similar fashion to the volumetric ones already discussed, allowing them to be monitored and displayed and enabling events to be set up that have a time-related component.

Errors: Even in the best systems there will always be problems. These may be due to flaws in the processes, external problems such as hardware or software issues, or perhaps human errors. BAM defines the place of errors, their frequency and associated trends.

Special Conditions: These are not specifically errors; these are conditions that are defined by the user. As with all the other measurements of BAM, provide statistical and analytical information about them. For example, a company might want to be alerted to any orders beyond a certain size or the presence of non-standard shipping instructions.

By having all above factors, companies generate their own required KPIs, and by using their own knowledge and specialized comprehension, analyze KPIs and finally improve processes to increase their business profit [8]. BAM systems are in consistence with managers' expectations by issuing performance reports and using online information and they can be used as a powerful tool in strategic programming.

1.1 Expression of the Problem and the Necessity of Doing Research

Nowadays, BAM products are becoming increasingly popular due to the up-to-date nature of business. In the past, organizations would analyze their last month's data and employ experts to calculate many different algorithms in order to finally be able to determine whether any fraudulent action has taken place or not. But now BAM has revolutionized the process. Organizations now want to respond to an event at the time of its occurrence rather than taking a long time before analyzing their databases. For instance, a bank which uses BAM for detecting embezzlement identifies patterns of indication. When those patterns emerge, thresholds are set for taking required action. The benefit of BAM can be applied to organizations of different nature such as a hi-tech manufacturer [16], [8] or airplain companies [1].

Another example of BAM application in risk management is controlling credit cards transactions to prevent fraud. Moreover, BAM can be used in forecasting issues such as interest rate, shares price, fuel price, and even political election results and determining how those changes affect the management method of an enterprise. For instance, by using this tool, it can be understood that the perspective of parliament is to control prices and this will encourage energy suppliers to keep retail prices low in a short-term period. Therefore, as organizations move towards more integrated information technology (IT) infrastructures the application of BAM continues to increase [15].

Integrated infrastructures make organizations capable of managing events using applications in a more reasonable and efficient way. Moreover, since BAM is process-oriented and thus knows when a process is going to succeed for fail, it will provide valuable records of behaviors resulting in overall improvement of the process as well as being a useful tool for complaints management, business transactions assurance, and risk reduction.

BAM understands business activities in both process and content terms and thus if for example a product is mispriced, while the business process may still be carried on flawlessly, BAM can prove effective by analyzing the trend and reporting the error.

Modern BAM which is highly blended with CEP, enables the organizations to take control over operations and operate promptly when needed. BPM and BAM enables the agile organization to respond promptly to events in its ecosystem, increase the opportunities (e.g. Dealing with a potential valuable customer in a point of service), decreasing the threats (e.g. Violation of consent in an operation without customer)[8].

BAM aims to provide real-time information regarding the status and results of the operations, processes, and various business transactions. The major economic applications of BAM include reducing or eliminating delays, bottlenecks and deficiencies of material and human resources exploitation while at the same time, providing real-time financial and performance data. The usual capability of BAM is monitoring various systems simultaneously and displaying exceptional opportunities in its dashboard when signals of the problem are recognized by predetermined rules. However, BAMs face challenges in both academic and practical fields including what procedures can be examined and how much data is needed for obtaining useful information. BAM dashboards should be adjusted specifically for each organizational system and personal need. This can lead to their rejection, therefore, considering the characteristics of BAM sources of information and tools is highly important for finding out whether these two can be combined with one another or not. On the other hand, BAM has no specific model or standard to which one has to stick. Therefore, it could be concluded that using BAM is "an art to conceal art".

1.2 Conceptual Model

This research is conducted in Bank Sepah with the aim of listing the priorities of factors and sub-factors. In first step, the vital elements of BAM are defined which includes: Volume Factor, velocity Factor, Error Factor and Special Conditions Factor. For each one of these factors, sub-factors considered so that there are 18 sub-factors (Figure 1).

2. REVIEW OF RESEARCH LITERATURE

Of the research related to the Business Activity Monitoring, Chan [7] and Beretta [2] decomposed the business process hierarchically into sub-processes, and then proposed a method of calculating the performance measure by summing up the measures of the lowest level activities. Theirs is a top-down approach that defined the business processes level-by-level, and mapped the performance measure to each business process. Nevertheless, they suggested that the business process has a simple one-to-one relationship with a performance measure. Bititci conducted a case study that applied the information systems modeling techniques to the modeling of a performance measurement system and implied that KPIs are interrelated with multiple and weighted relationships [4].

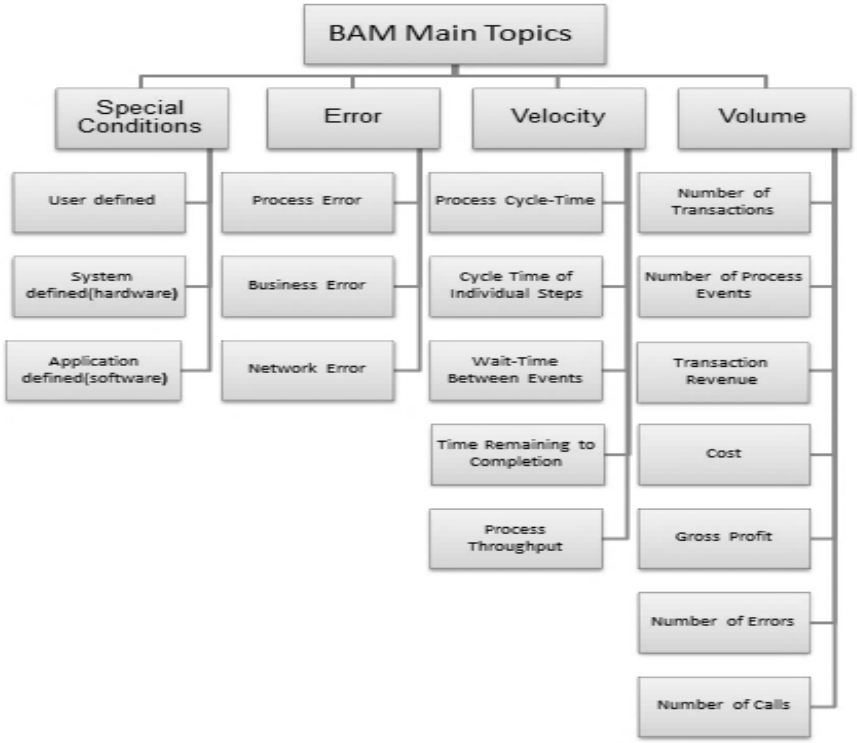

Figure 1- Conceptual model of research

Berler*et al.* classified a hospital's KPIs based on the concept of balanced score card (BSC) [3]. They also defined hospital workflows in detail, and then assigned a KPI to each unit task-level activity. However, they addressed the interrelationship between KPI and business process merely by simple one-to-one mapping at a single flat level. Munehira*et al*. suggested that it is necessary to identify which processes should be improved or created to achieve the business performance goals described in BSC [13]. For this purpose, they defined the relations between BSC structure and business model elements, yet they did not implement their proposed method to a real business case. In the previous research, authors of this paper proposed two-stage business process analysis, which precedes execution phase of BPM, based on PPMM and business process simulation for the new process design [10].

Broda and Clugage proposed key steps and critical success factors to BAM implementation [5]. The key steps are as follows: define a vision, establish the data model, build real-time data streams, and roll out operational dashboards. They suggested that the critical success factors are performance, heterogeneous data access, and usability. Buytendijk and Flint asserted that creating an effective BAM environment is not only about having the right technology and processes [6]. They pointed out that enterprises should define the right set of metrics for BAM. White proposed a BAM framework through the comparison with business intelligence (BI) framework [17]. Popovic*et al.* analyzed BI system's impact on performance on business performance improvement [14].

Friedenstab et al. emphasized that Real-time access to key performance indicators is necessary to ensure timeliness and effectiveness of operational business processes. The concept of Business Activity Monitoring (BAM) refers to the observation, analysis, and presentation of real-time information about business activities across systems' and companies' borders. Designing and maintaining BAM applications is challenging, as the involved concepts (e.g., business processes, audit logs, performance measures) — though being strongly interrelated— are developed by different communities of practice. Also, they reside on different levels of abstraction, and are handled by different IT systems. Hence, we developed a conceptual modeling language which extends the widely accepted Business Process Modeling Notation (BPMN) by BAM-relevant concepts. The main results presented in this paper are: (1) a meta-model which formally describes the conceptual aspects of the developed BPMN extension (abstract syntax); (2) graphical symbols as an exemplary representation of this abstract syntax (concrete syntax); (3) a demo scenario that illustrates the application of the language in a fictitious scenario [9].

Han et al. represented Business activity monitoring (BAM) which provides real-time access to key performance indicators or business processes is one of core elements for successful business process management (BPM) system. Since performance measurement cannot be managed independently of business processes, BAM system needs to monitor performance metrics in terms of business process. They propose BAM system design framework integrated with the process-based performance measurement model (PPMM),

in which monitored KPIs are closely related with business processes. The proposed PPMM consists of three sub-models: KPI model, process model, and K-P model. To show the applicability of proposed framework, BAM system prototype was also developed using a real case [11].

3. RESEARCH HYPOTHESIS

- Indicators such as volume, speed, error and exceptions are affective in BAM evaluation.
- Effective sub-indicators in each one of the KPIs in evaluating BAM don't have the same effect.
- Proposed model with ANP approach for evaluating BAM, is a practical model.

4. RESEARCH METHOD

In terms of the goal this research is an applied research and regarding methodology is a descriptive- survey. This research is going to study and consider the evaluating of BAM at Bank Sepah. Data is of the kind of the oral variables of Likret scale which is asked from the whole of statistical community through the questionnaire. In this research we use two forms of questionnaire to reach the objectives of research. First questionnaire for defining the most important factors and sub-factors of BAM and effective elements on evaluating them in Bank Sepah, and the second questionnaire used for making binary comparisons to get the priorities right.

5. DATA ANALYSIS

In this research, the analytical network method of ANP is used to determine the weight of model indicators.

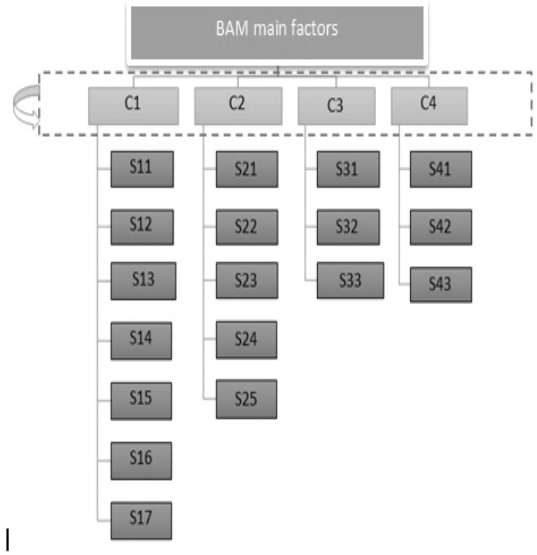

Figure 2.BAM Main Factors Priority Determining ANP Model

5.1. Determining the Priority of Model Elements by ANP Technique

For network analyzing, first the key indicators are compared binary according to the objective.

Table 1.Main Factors' Special Factors

Special conditions	error	velocity	volume
0.170	0.175	0.405	0.250

According to the achieved special vector, the speed factor with the normal weight of 0.405 has the most priority. Value factor with the normal weight of 0.250 has the second priority. On the other side, exceptions factor with the weight of 0.170 has the least priority. The incompatibility rate of the comparisons is 0.069 which is less than 0.1, so the comparisons are reliable.

In the second step of ANP method, sub-factors of each factor are compared in a binary system. There are four factors, each has sub-factors. Each bunch is compared separately. The results together form the w_{32} matrix.

Table 2.VolumeSub-Factors' Special Vector

Number of calls	Number of errors	Transaction Gross Profit	Transaction Cost	Transaction revenue	Number of process events	Number of transactions
0.067	0.209	0.100	0.074	0.170	0.228	0.152

According to the achieved special vector, the sub-factor of the number of process events with the normal weight of 0.228 is prior to other sub-factors. The incompatibility rate of comparisons is 0.067 which is less than 0.1, so the comparisons are reliable.

Table3.Velocity Sub-Factors' Special Vector

Process throughput	Time-remaining to completion	Wait-times between events	Cycle-time of individual steps	Process cycle-time
0.125	0.176	0.215	0.184	0.301

According to the achieved special vector, process time cycle sub-factor with the normal weight of 0.301 is prior to the other sub-factors. The incompatibility rate of the comparisons is 0.70 which is less than 0.1, so the comparisons are reliable.

Table 4.Error Sub-Factors' Special Vector

Network error	Business error	Process error
0.328	0.368	0.304

According to the achieved special vector, business error with the weight of 0.368 is the first priority, communication and network error with the normal weight of 0.328 stands in the middle priority, and process error with the weight of 0.304 has the least priority. The incompatibility rate of comparisons is 0.011 which is less than 0.1, so the comparisons are reliable.

Table 5.Special Conditions Sub-Factors' Special Vector

Software special conditions	Hardware special conditions	User defined special conditions
0.440	0.335	0.225

According to the achieved special vector, software special conditions with the weight of 0.440 has the first priority, hardware special conditions with the normal weight of 0.335 stands in the middle priority and the users recognized special conditions with the weight of 0.225 has the least priority. The incompatibility rate of comparisons is 0.006 which is less than 0.1, so the comparisons are reliable.

According to the research model, the next step is computing the internal relations of the main factors for achieving the w_{22} super matrix. We assume that all main factors are correlating.

table6. Comparison of Main Factors with Respect to Volume

C4	C3	C2
0.239	0.344	0.417

table7. Comparison of Main Factors with Respect to Velocity

C4	C3	C1
0.197	0.258	0.545

Table 8. Comparison of Main Factors with Respect of Error

C4	C2	C1
0.161	0.451	0.388

Table 9. Comparison of Main Factors with Respect of Special Conditions

C3	C2	C1
0.280	0.402	0.318

According to the recognized relations of this research, the primary super matrix of the study will be as follows:

$$W = \begin{bmatrix} 0 & 0 & 0 \\ W_{21} & W_{22} & 0 \\ 0 & W_{32} & I \end{bmatrix}$$

In this super matrix, W21 vector indicates the significance of each main index based on the objective. W22 vector makes a paired comparison of the relationships between main indexes. W32 vector indicates the significance of each sub-index in its respective cluster. And Zero elements indicate the insignificance of the factors at the junction point of columns and rows. The network pattern was designed using Analytic Network Process (ANP) by Super Decision software.

Table 10. Factors Final Priority with ANP Technique

name	Raw	Normal	Ideal	Priority
S11	0.023	0.046	0.517	13
S12	0.035	0.070	0.775	6
S13	0.026	0.052	0.578	12
S14	0.011	0.023	0.252	17
S15	0.015	0.031	0.340	16
S16	0.032	0.064	0.711	8
S17	0.010	0.020	0.0228	18
S21	0.045	0.090	1.000	1
S22	0.027	0.055	0.611	10
S23	0.032	0.064	0.714	7
S24	0.026	0.052	0.585	11
S25	0.019	0.037	0.415	15
S31	0.035	0.070	0.777	5
S32	0.042	0.084	0.940	2
S33	0.038	0.075	0.838	3
S41	0.019	0.038	0.423	14
S42	0.028	0.056	0.630	9
S43	0.037	0.074	0.827	4

So, the process cycle-time indicator with the normal weight of 0.090 is the most significant among the other indicators. Business error indicator with the normal weight of 0.084 is the second priority. Communication and network error indicator with the weight of 0.071 is also important. On the other side, indicator such as number of calls has less priority among the other indicators of the study.

6. Results

In this research, after testing 1st hypothesis, we found that all 4 main factors including volume,velocity, error and special conditions are effective in evaluating BAM. However their effectiveness are not equal and velocity stands in the 1st rank, volume is the 2nd, error is the 3rd and special conditions is the last.

After testing the 2nd hypothesis, we found that sub-factors also are not effecting equally in BAM evaluation. After determining the final weight by ANP Technique and using super-decision software , we found that process cycle-time is the most important sub-factor among the others. Business error has the 2nd priority and network error has the 3rd priority

and number of calls has the least importance. Finally we could say that the presented model for evaluating BAM is a valid model.

7. CONCLUSION

The results of prioritizing the evaluation factors and sub-factors of BAM indicate agility to have the greatest weight among the indexes while the weights of process time cycle, business errors and communication and network errors are the greatest among sub-indexes, respectively. This means the more attention is paid to agility, the more accurate and improved the monitoring process would be. Therefore, for maximizing agility in processes, necessary steps should be taken. In this regard, since the process time cycle is the most significant sub-index, it should be minimized as much as possible. In other words, the speed of the process should be maximized. To this, not only the employed hardware is of importance but also the definition and implementation of processes are to be revised. Moreover, paying attention to business errors and communication errors are of great importance. Measures should be taken to minimize the number of volume scale errors in order to achieve a desirable and optimized model.

8. SUGGESTIONS

Due to the significance of Business Process Management and subsequently Business Activities Monitoring in today's world, working in the field of BAM can attract the attention of many researchers. Considering that, particularly in Iran, little research has been done in this field there is room for various studies. This paper only investigated the first generation of BAM and sub-indexes were localized according to the working field. More sub-indexes and different statistical method can be used to carry out a similar study and compare results. Further studies can also take into account the second generation of BAM. It is also recommended that studies conduct regarding the evolutionary effect of BAM on Business Intelligence (BI) since the question of monitoring can complement BI; a combination that can lead into interesting results.

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