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Business Process Performance Management: Theoretical and Methodological Approach and Implementation

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Summary

A process must have appropriate objectives and structure enabling it to function teleologically and efficiently. To function performantly, a process must be managed appropriately. Business process management (BPM) includes: (1) target management, which includes functional sub-targets at each critical project stage; (2) performance management, which includes receiving regular feedback on the process outputs, monitoring the actual performance by measurement dimensions set in targets, providing feedback, identifying and correcting the process shortcomings, i.e. monitoring and controlling process progress and performance; (3) resource management, which includes supporting each step in the process of managing equipment, human resources and budget required for achieving set goals in all process stages; (4) process interface management. This article also presents the results of empirical, i.e. development-based research conducted by the authors on a sample of organisation, for the purpose of a composite and complex process, well modelled and automated with ERM functionalities. Process compositeness is determined by the fact that it includes several processes mutually connected through single interface, with postulates of radical holisms. Results obtained by this research point to the need to integrate ERP systems and BPM tools. ERP is necessary, but not sufficient, for its functionalities support and point to cross-section-outcomes in process activities, while BPM, with its set of various tools largely built in BI technology, points to events, outcomes and latent sets of flows, dynamics and hidden clusters of process flow, dynamics and longitudinal process overview.

Keywords

process, management, performance, ARIS, target, performance indicator, BPM

1. Business Process Performance Management

In the context of this article, we approached business performance process management based on Rummler & Brache's (1995). The authors highlight and explain three performance levels theoretically: those of organization, process, and task, including three perspectives in each level: targets, design and management.

At the process level, three perspectives are interpreted:

Process targets refer to external users (such as sale, service etc.) and can be derived from the organisation's targets and other user requirements. Process targets related to internal users (such as planning, budgeting, etc.) can be derived from internal user requirements.

Process design is primarily required for achieving the set process target. The process needs to be an appropriately structured, formed, rational, logical, relevant way of achieving set goals and purposes.

According to this concept, process management is the third most important perspective. A process must be managed appropriately. Process management includes:

1. Target management (including creating functional sub-targets in each critical process stage);
2. Performance management (including obtaining regular feedback on process outputs, monitoring the actual performance by measurement dimensions set in targets, providing feedback, identifying and correcting the process shortcomings, and resetting targets so that they reflect the current user requirement and internal limitations);
3. Resource management (including support to each step in the process of managing equipment, human resources and also budget required for achieving set goals in these process stages;
4. Process interface management (including having interface managed between process stages, and especially, at transfer points between functions) (Harmon, 2003).

2. The Control System in Business Process Performance Management

To manage business process performance properly, it is necessary to monitor and control process implementation and execution throughout their lifecycle. Modern control models are highly complex, as they include several aspects of BPM. The model shown in Figure 1 illustrates the complexity of the business performance management controlling system, and includes: process modelling and implementation, planning, monitoring, measuring and performance enhancement.

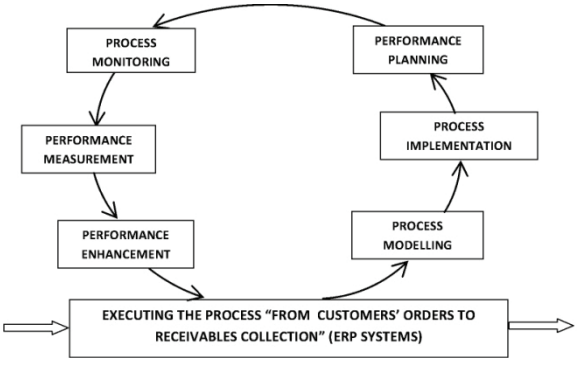

Figure 1 BPM complexity

Business process management leads to business innovation and optimisation through implementing business strategies by way of modelling, developing, deploying and managing business processes throughout the business cycle.

Performance planning, monitoring, measuring and enhancing is the essence of performance control. In the performance management process, process monitoring implies constant observing, surveying and tracking an organisation's activities, processes and segments, an also the effect of these activities, in order to insight into the scale and rate of progress towards achieving the set objectives and producing specified desired results. The purpose of monitoring is to view a broad range of events in the organisation's environment and the organisation itself that could make an impact on the course of process performance planning and achieving the planned targets. This requires appropriate performance measurement, performance assessment, comparison between the achieved and the planned, and providing appropriate feedback on achievements. Comparison of achieved performance with planned, i.e. expected performance identifies discrepancies. Analysing these discrepancies in performance will result in implementing measures contributing to planning performance enhancement. Implementing the performance implementation plan and monitoring enhanced progress leads to continuous business process performance enhancements (Devis & Brabander, 2009).

Performance control creates a close integration of operative and analytic environment, corporate and IT environment, and integration of strategies and daily operation. A unified business process management system combines business processes, information and IT resources, coordinating the main parts of the organisation's assets: staff, information, technology and processes, with the aim of creating a unified view of real-time intelligence approach.

3. Case Study: Managing a Composite Process "from Customers' Orders to Payment collection"

3.1. Defining a Business Problem

From the control aspect, performance management is, in fact, monitoring the translation of objectives into results, notably products or services required by internal or external users. Results are normally expressed in terms of quality, quantity, timeliness and costs, and it is of essence to provide appropriate compliance of specified results and the organisation's set objectives. In addition, it is necessary to identify the measures used as a basis for assessing the achieved results (Heß, 2005; Kruppke & Bauer, 2005).

In this research, the defined and set general model of a business problem was applied on a so-called composite process, which we named "from customers' orders to payment collection", integrated from the following constituent sub processes:

- Receiving customers' orders;
- Assessing the ability to fulfil the order;
- Assessing the customers' creditworthiness:
- Issuing delivery orders;
- Preparing delivery;
- Loading goods;
- Despatching and transport;
- Delivery of goods;
- Invoicing;
- Collecting payment.

The process is modelled in ARIS tool, and performance measures were set with determined appropriate performance indicators.

2.1. Ways of Resolving a Business Problem: Research Methods

2.1.1. Process Modelling

To achieve process measurability in the objective achievement context, all activities in the process and their progress must be unequivocally defined. The starting point in business process modelling is defining the execution flow for a sequence of activities. Process flow modelling also includes modelling the decision-making nodes in processes, and all the branches in the process. Having built the process flow model, it is necessary to make a more detailed definition of all activities comprising the process. Thus, activities are associated with agents/participants in the activity, inputs and outputs of the activity, as well as automated support to the activity (if any). To operationalise the activities, they can have certain attributes defined, which will be the starting point for determining performance benchmarks. This includes defining the duration and cost of the activities, frequency and number of agents, etc (Kiraka & Manning, 2005).

3.2.2. Setting Performance Indicators

In this research, performance indicators (PIs) are understood and interpreted as values whose measures describe whether and to what extent the defined and modelled process is executed effectively and efficiently, as well as whether performance measures, as qualitatively and/or qualitatively expressed values obtained by measuring indicators, are achieved in compliance, i.e. against the set objectives of business processes. Performance indicators are a set of measures focussed on the process performance aspects that are the most critical for current and future success of this process. The following key PIs have been developed and included in the system for managing the performance of the "from customers' orders to payment collection" business process

- Order execution indicator (OEI) = the number of executed orders / aggregated number of orders * 100;
- Average order execution time in hours (AOET) = SumNi (despatch time – creation time) / number of orders;
- Percentage of changed orders (PCO) = number of changed orders / total number of orders * 100;
- Order growth indicator (OGI) = number of orders in the current month / number of orders in the previous month * 100;
- Average order value 2 (AOV2) = aggregated monthly sales / monthly number of orders
- Percentage of paid orders within due date (PPOwDD) = (number of collected orders within due date / aggregated number of orders * 100;
- Sales performance (SP) = achieved total sales / planned sales * 100;
- Average order collection time (AVCT) = SumNi (collection time – creation time) / number of collected orders;
- Average loading time (ALT) = SumNi (final distribution time – distribution creation time) / number of loaded orders.

Performance indicators were developed with the nominal group technique (NGT). In order to obtain econometrically valid indicators and a feasible performance measurement model, this technique was used for research in the following methodological steps:

1. Defining performance area and level;
2. Determining the group composition for the nominal group technique;
3. Choosing the TNG session leader;
4. Planning, preparing and implementing the TNG session;
5. Compiling a preliminary indicator list;
6. Assessing and final selection of performance indicators;
7. Specifying data gathering methods for chosen indicators;
8. Implementing key performance indicators;
9. Following and perfecting key performance indicators; and
10. Monitoring, assessing and enhancing key performance indicators.

For each of the set PIs, criteria for performance deviation from performance benchmarks were developed, and stored into the ARIS Process Performance manager base. The term "performance deviation" marks the discrepancies between achieved and targeted performance, i.e. set performance benchmarks, obtained by comparing the achieved performance with the set performance benchmark. The performance of the "from customers' orders to payment collection" process is also understood as a multidimensional construct (as it will be shown by the results, their analysis and interpretation), for performance includes both effectiveness and efficiency, qualitative and quantitative aspects, including behaviour and behaviour outcomes. In brief, performance includes several essential components for a holistic

approach to managing the performance of this process (Parmenter, 2007).

3.2.3. Instruments and Tools

BMP development-based research can be performed by various instruments and tools. Our choice was Software AG's ARIS tool platform (www.softwareage.com). *ARIS* Business Architect was used for produce modelling, while ARIS Process Process Peformance Manager was used for performane management. The choice of tools was conditioned by the volume and intensity of coverage of all the stages in the process management lifecycle: the possibility to set up and implement and strategic initiatives (the strategy phase), the possibility to model processes up to the level of functionalities, modelling organisational structures, documents, automated systems and support to activities, modelling the product and service map, process execution simulation (the design phase), programming the business logic services based on modelled processes, information system design (the implementation phase) and planning, monitoring, measuring, analysing and enhancing process performance (the control phase). Software AG ARIS tools were therefore chosen before they cover all the above stages (Scheer, Kruppke, Jost, & Kindermann, 2007).

As we have pointed our earlier in Section 2 that performance control process requires narrow integration of business and IT environment, it is necessary to point out some other relevant factors of this integration. Buyers place orders using application developed for PDA devices and/or B2B applications. Orders are collected and synchronised in the ERP system, to be reviewed, analysed and fulfilled. The entire process of dispatching, distribution, transport and delivery is automated with the Sales&Distribution ERP module. All data created by intention of completing process activities are recorded in a database, and corresponded with the process model, so that we can note at all times how the process instances flow in comparison with the model-oprimised process. Variables for forming metrics required for calculating PI are taken from the Tables in the ERP base, and copied in to the ARIS Process Performance Manager base, where the performance benchmarks are already set.

3.3. Development-Based Research Results

3.3.1. Process Model

The "from customers' orders to payment collection" is modelled with the ARIS Business Architect tool shown in Figure 2. We have already fairly sufficiently discussed all the specific features of modelling, and further interpretations are not necessary at this point, apart from one. The figure shows aggregated values (N cases, about 20%) in a "single instance" of the process. The bold line, therefore, shows the frequency of passage of individual cases down the almost the same, best path, where these, as it were, effective and efficient process instances are propagated around the developed Event Process Chain EPC model.

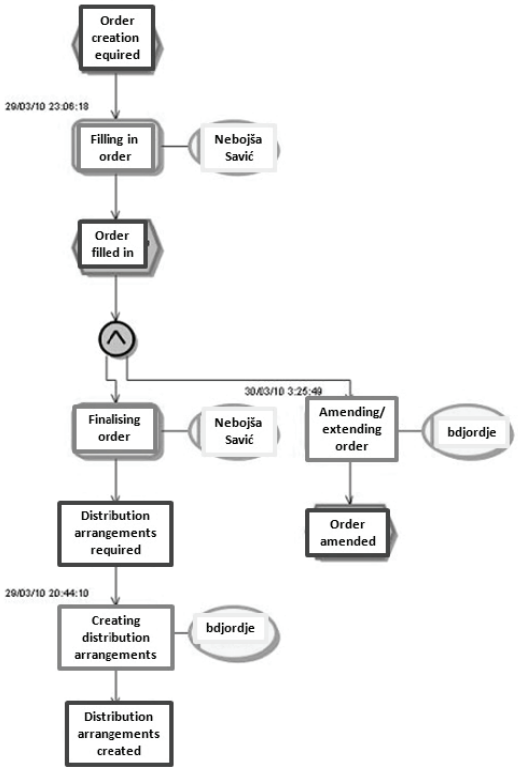

Figure 2 "Single instance" of the proces in EPC notation

3.3.2. Analysises

The system also enables multiple and highly diverse analyses: graphic representations, statistical and data mining analyses. We shall dwell on those that are noteworthy, illustrative enough and most important. The first analytic reference refers to the problem and results of process performance results, but not all defined, developed and set performance indicators are in focus. Figure 3 shows the Print Screen of the Sales Report Dashboard for top management, indicates the problems. Apparently, the "payment time" and "sales time" are citical KIPs, and are currently in the red area, leading to a conclusion that they exceed the limits of set duration times, i.e. do not match the planned performance benchmarks.

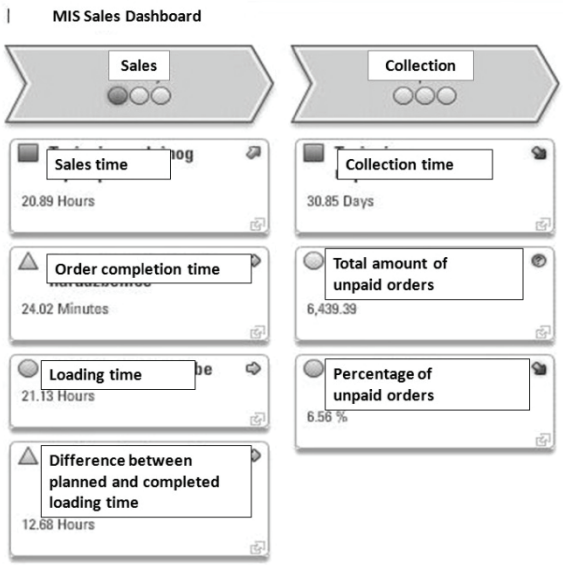

Figure 3 Sales report Dashboard

Taking a more detailed look into the Key Performance Indicator (KPI) "Collection time" in PPM (Figure 4), we will notice that it exceeds 30 days on the average, exceeding our expectations, i.e. the set planned performance.

Figure 4 Average collection time for the group of the process instances

A more in-depth, more refined analysis will point to differentiated causes of extending collections over the set standard. If we study the KPI "Collection time" according to the criteria of order amounts and volumes, we will notice that this vital activity is defined by this criterion to a high extent. The larger the order amount, the longer the collection time (Figure 5).

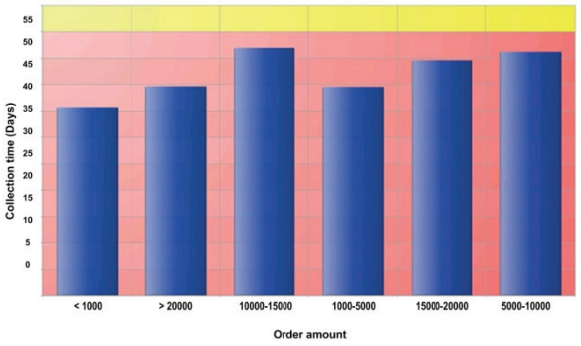

Figure 5 Collection time according to order amounts

Having visualised process instances, one can see that KPIs "Collection time" and "Sales time" are highly dependent on the parameters of amended orders. The more amendments in customers' orders, the longer the delivery and distribution period, and the broader, deeper and more intensive discrepancy between the process and its optimised model. Figures 6 and 7 visually reinforce this claim, and show an instance of expressly inefficient process execution and an instance of an expressly efficient process execution respectively (Ray, Barney, & Muhanna, 2004).

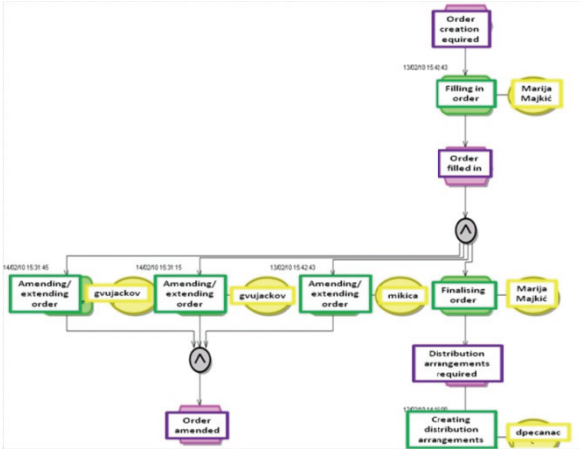

Figure 6 "Single instance" of inefficient process execution (Ray at al., 2004)

Another noteworthy illustration out of a multitude of possible analytic cases, which can be analysed individually or as statistical categories, is the fact that a considerable number of customer accounts are closed repeatedly. Fact and data support the assumption: the higher the account amount, the more fragmented and longer the collection time.

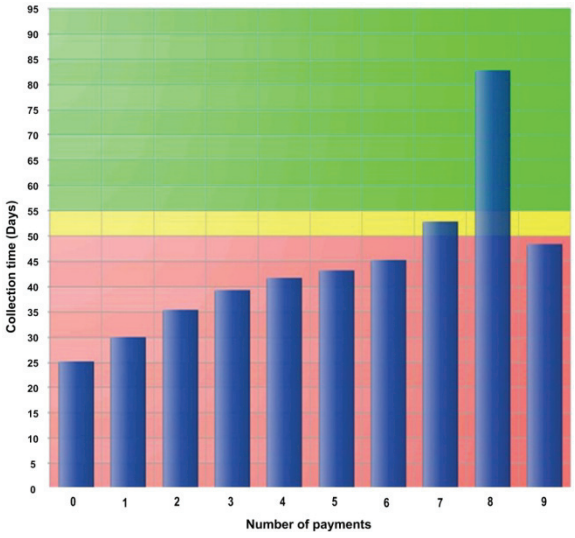

Figure 7 Collection time according to number of customer payments

When we observe all of the above through the payment fragmentation prism of KPI, the findings are even more obvious: the larger the bill, the more instalments it takes to settle the account. That is to say, Figure 8 shows that the frequencies of account settlements stand in an almost causal relation to the amount of the bill. It is, therefore, possible to single out and analyse the customers disrupting planned performance, and thus the flow of organisation. We can scan and see when they are in arrears, which products or time periods are the issue, and make comparative analyses with similar customers, of similar or directly opposite behaviour profiles.

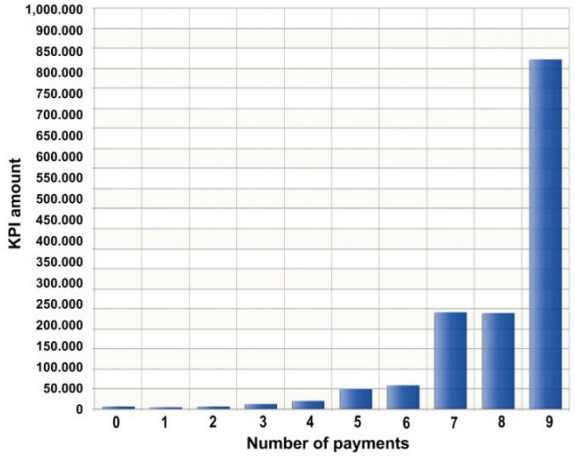

Figure 8 KPI payment amount accourding to number of customer payments

4. Conclusion

Business process performance management also means managing the organisation's business operation. BPM is therefore a very important process, and the presented results of the published development-based research clearly and unequivocally point to this. The research was conducted on the same process in a major number of samples of sampled organisations using the same ERP system (MIS2OPEN). Extracting data from the ERP system into the database of the *ARIS* Process Performance Manager tool related the produced results with the dynamic activities of the process. This enables synchronous performance management:

a. Monitoring the progress of the process in a large number of cases;
b. Measuring performance by each developed indicator set in the integral solution;
c. Establishing the discrepancies between achieved performance and the planned standards; and
d. Proactive performance enhancement;

BPM tools also enable the use of data exploration models aimed at full tapping information from the data. Explorative analyses include search for structures, clusters, dimensions, and trends in time series data arising as an intention at the heart of carrying process activities. Tools are also possessed of functionalities supporting users (process owners, analysts, managers etc.) with the opportunity to transform these data into valuable information in a rapid, consistent, interactive manner and access to various data, thus noting actual and multiple dimensionalities of their business processes. Information support to effectiveness and efficiency of the system as a whole, and/or its sequences, is obtained is acquired by simple processing and presenting numerous reports, or conducting complex analyses along various dimensions or their combinations: when (time dimension), who (the organisational unit and/or sales manager dimension), who for (customer dimension), where (market dimension segment), abd how often (frequency dimension). Simulation and analysis of the modelled and monitored process will produce interim models and significant indicators required for creating and building business process models as best business practices. Thus developed models in the corporate management of large and complex systems, can be successful implemented into all system structures and segments. Contributions to business enhances are multidimensional, multilayered and multiple in the context of business model and IT system integration.

References

Devis, B., & Brabander, E. (2009). *ARIS Design Platform – Getting Started With BPM.* Berlin: Springer.

Harmon, P. (2003). *Business process Change, A Manager`s Guide to Improving, Redesigning, and Automating Processe.* San Francisco: Morgan Kaufman Publishers.

Heß, H. (2005). From Corporate Strategy to Process Performance – What Comes after Business Intelligence? In A. W. Scheer, H. Jost, H. Heß, & A. Kronz (Eds.), *Corporate Performance Management* (pp. 7-29). Berlin: Springer.

Kiraka, R., & Manning, K. (2005). Managing Organizatios Through a Process-Based Perspective: Its Challenges and Benefits. *Knowledge and Process Management, 12* (4), 288-298.

Kruppke, H., & Bauer, T. (2005). No Business Intelligence Without Process Intelligence. In A. W. Scheer, W. Jost, H. Heß, & A. Kronz (Eds.), *Corporate Performance Management.* Berlin: Springer.

Parmenter, D. (2007). *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs.* Hoboken: John Wiley & Sons.

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, Business Processes, and Competitive Advantage: Choosing the Dependent Variable in Empirical Tests of the Resource-Based View. *Strategic Management Journal, 25* (1), 23-37.

Rummler, G., & Brache, A. (1995). *Improving Performance, How to Manage the White Space on the Organization Chart.* San Francisco: Jossey-Bass.

Scheer, A. W., Kruppke, H., Jost, W., & Kindermann, H. (2007). *Agility by ARIS Business Process Management.* Berlin: Springer.

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