

Dimensions of Business Process Intelligence

POSITION PAPER

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Abstract. Some approaches to support decision making in the context of business process management exist since a couple of years. Most of them are not systemized. This fact leads to the necessity of a classification of this broad area. The paper's objective is to evaluate and differentiate approaches of Business Process Intelligence (BPI) within the last decade. The results of this analysis are a morphological box and a definition to clarify potentials of Business Process Intelligence. The definition integrates the most frequently used characteristics as well as different understandings of BPI and it indicates a holistic view on the dimensions of this area. Additionally, the literature-based propositions regarding current shifts provide the author's perspective to the field of BPI and point out a guideline for further research.

1 Introduction

This position paper contributes to the fields of Business Intelligence (BI) and Business Process Management (BPM) in providing a classification of different understandings and potentials of process oriented BI. The methodology is a literature review, which focuses on international scientific and practical papers from the year 2000 until 2010. Hereby, the main characteristics of the terms Operational Business Intelligence (OpBI), Process Mining (PM), Business Process Intelligence (BPI) etc. are identified. Based on the analysis of different definitions and descriptions in these papers, similarities and potentials are extracted and filtered. This process leads to a morphological box, which contains characteristics and types in the area of BPI.

2 Definitions and Concepts of Process Analyses

Several approaches referring to process analyses models are discussed in the Business Intelligence and Business Process Management oriented literature (cf. Table 1). These approaches are presented in the following to clarify the point of view on analyzing processes from a BI perspective.

CASTELLANOS / WEIJTERS [3]	Broadly speaking we can say that BPI is the application of business intelligence to business processes so as to improve different aspects of how such processes are being conducted.
GENRICH / KOKKONEN / MOORMANN / ZUR MUEHLEN / TREGEAR / MENDLING / WEBER [4]	BPI builds on techniques such as data mining and statistical analysis that were developed or inspired by business intelligence techniques such as data mining or statistical analysis, and adapts them to the requirements of business process management.
GRIGORI / CASATI / CASTELLANOS / DAYAL / SAYAL / SHAN [6]	Business Process Intelligence (BPI) relates to a set of integrated tools that supports business and IT users in managing process execution quality.
HALL [7]	Recently, Business Process Intelligence (BPI) has emerged as another term for using Operational BI to inform business process management decisions.
HARMON [8]	We will use Business Process Intelligence (BPI) to refer to the products being offered by the BI and Data Warehouse and Packaged Application vendors who seek to drive executive dashboards with data from processes.
HOSNY [9]	BPI refers to the application of various measurement and analysis techniques in the area of business process management. The goal of BPI is to provide a better understanding and a more appropriate support of a company's processes at design time and the way they are handled at runtime.
INGVALDSEN / GULLA [10]	Ingvaldsen and Gulla present the need to combine data from external sources, such as the department and employee involved in a process with actual process logs to achieve better knowledge discovery results.
KANNAN [11]	More than Sales Intelligence or Financial Intelligence, Business Process Intelligence provides you with objective measurement of your various activities within the company.
PÉREZ / MÖLLER [12]	The management of business process and thus the concept of business process management (BPM) are central and one of the techniques is process intelligence (BPI).
ROWE [14]	The business process intelligence derived from this analysis can then be used to optimize different elements of the predictive enterprise and enable all components to react to changes in the external business environment.
VAN DER AALST / REIJERS / WEIJTERS / VAN DONGEN / ALVES DE MEDEIROS / SONG / VERBEEK [15]	Business process mining, or process mining for short, aims at the automatic construction of models explaining the behavior observed in the event log. For example, based on some event log, one can construct a process model expressed in terms of a Petri net.
VANTHIENEN / MARTENS / GOEDERTIER / BAESENS [16]	Business Process Intelligence (BPI) is a concept that can be described as the application of Business Intelligence (BI) techniques (such as performance management, OLAP analysis, data mining, etc.) in BPM in order to understand and improve the company's processes.

Table 1. Extract of definitions in the area of Business Process Intelligence

Operational Business Intelligence focuses on the analyses of business processes and their connection with analytical information. BAUER and SCHMID [1] differentiate between classical Business Intelligence and Operational Business Intelligence regard-

ing process status and process result. A decision support regarding analytical information can only be made reactively, which means that latencies mostly exceed reaction time. Because of its focus on process execution and control, OpBI is directly related to existing approaches like Business Activity Monitoring (BAM) as well as Business Performance Management.

The term *Business Process Intelligence* appeared almost at the same time like OpBI. This dilution has been supported by software vendors, who used BPI as a signal word for management dashboards in order to stimulate their business [8]. As a result, the boundaries between these terms are considered to be indeterminate. That is why BPI and OpBI are often used as synonyms especially in the Anglo-Saxon area [7].

CASTELLANOS and WEIJTERS [3] point out the confusion of ideas and the different aspects of BPI and their relation. According to them, BPI aims at the improvement of processes, which focus on process identification, process analyses, process simulation and static and dynamic process improvement. HOSNY [9] states, that the aim of BPI is a better understanding and support of business processes at the time of construction and during the runtime of a process. According to KANNAN [11], BPI represents an objective measure of different activities within a company that gives an indication of current efficiency and bottlenecks of business processes.

PEREZ and MOELLER also come up with a distinction consisting of many degrees of freedom. According to them, Business Process Management offers the central concept, while BPI is just a method which reflects this concept [12]. In terms of the usage of BPI, GRIGORI et al. [6] point out a selection of tools. These tools support companies' IT and include the domains *analyses, prediction, control* and *improvement of business processes*. On the one hand, those methods are supposed to allow an integrated approach regarding networks and electronic business platforms. On the other hand, they are supposed to identify, analyze and forecast a process, in order to improve the whole process [5, 8]. These analyses are executed by use of data mining methods and statistical proceedings. According to GENRICH et al. [4], the methods have to be assimilated to specific demands of Business Process Management.

3 Classifying the Characteristics of Business Process Intelligence

This section presents the identified characteristics within the literature review. Thus, the morphological box (cf. Table 2) classifies the above mentioned distinctions. Morphological boxes are used in the literature to arrange and visualize concept characteristics [13]. Task and process oriented descriptions were taken and mapped to each other to identify characteristics and types to structure the term *Business Process Intelligence*. In this context, the Business Process Management steps *process identification, process implementation, process control* and *process improvement* [2] constitute as a core of BPI.

OpBI concerns a process oriented decision support including process control. In contrast to this approach, BPI tries to offer decision support regarding process design. Against this background, BPI focuses on process design and process redesign with a business orientation. For this purpose, ratios are used to implement measurements, structure analyses and efficiency of business processes. This leads to a process improvement beyond IT and organizational boundaries. Therefore, automated techniques find conspicuous events and determine potentials regarding core and supporting processes.

Characteristics	Types			
Focus	Process Design	Process Redesign	Process Control	
Direction	Business		Technology	
Management Level	Operative	Tactical	Strategic	
Data Level	Instance Level	Model Level	Meta Model Level	Meta Meta Model Level
Process Phase	Identification/Definition/Modelling	Implementation/Execution	Monitoring/Controlling	Continuous Improvement
Kind of Process	Business Processes		Technical Processes	
Time Relevance	Real Time		Historical	
Range of Users	Small	Middle	Broad	
Technology	Business Activity Monitoring	Service-orientated Architecture	Complex Event Processing	Process Warehouse
Information Sources	Internal Data		External Data	
Kind of Information	Unstructured Data		Structured Data	
Type of Process	Support Process	Business Process	Management Process	
Process Execution	Manual Processes	Semi-automated Processes	Automated Processes	
Process Structure	Unstructured Processes		Structured Processes	
Decision Intensity	Low	Middle	High	

Table 2. Extended Morphological Box of Business Process Intelligence

In the context of BPI, simulations and what-if-analyses investigate processes, generate guidance and support decisions made by the tactical and strategic management. The tactical and the strategic management level receive process information, because the information does not only describe indicators for the creation of value but also an addition to a periodic description of business performance. Accordingly, the user group stays functional focused and small, especially in contrast to operative process control. Due to this, BPI works as well as classical Business Intelligence. This relies on the inspection of historical data. According to the time relevance, a Process Warehouse (PWH) plays an important role, because process logs which have to be analyzed are stored within a PWH. The Process Warehouse receives structured and unstructured data from internal and external data sources. In this context, an application of Process Mining [17] is necessary, concentrating on the identification of process structures. Thus, the result of such analyses and simulations is an improvement of whole process landscapes and not of single processes. The following definition can be

stated on the basis of this systematization and the existing distinctions in the academic literature.

Business Process Intelligence (BPI) is the analytical process of identifying, defining, modelling and improving value creating business processes in order to support the tactic and strategic management.

In conclusion, the data and information concerning business processes within the concept of OpBI can be used in favor of BPI, in order to develop a valid process design for management purposes. Business Process Intelligence is understood as a generic term, which includes areas like the shown data storage and data analysis and brings it on a holistic level.

4 Conclusion

This position paper provides a framework of guidance implications in favor of Business Process Intelligence. It is the aim of BPI to advice analytical activities and the dynamic assimilation of business processes. It is important that BPI supports not only the adaptation, but also the construction of business processes. In this sense, a strategic and tactical integration of Business Process Management and Business Intelligence offers innovative concepts for supporting management's decisions. The fundament for these propositions is the literature review of international scientific and practical papers of the last decade and the analysis of the main characteristics of the terms Business Process Intelligence, Process-centric Business Intelligence, Operational Business Intelligence, Process Mining etc. These characteristics are systematized in a morphological box, which indicates a holistic view on the different dimensions in this area so far.

Finally, it can be constituted, that the future activities will focus on the integration of external data (e.g. involving dynamic market changes) and its impact on the dependencies and alignment of business processes and whole process landscapes of a company.

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