From Scientific Process Management to Process Science: Towards an empirical research agenda for Business Process Management

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Abstract. Business Process Management (BPM) as a research field integrates different perspectives from the disciplines computer science, management science and information systems research. Its evolution has by been shaped by the corresponding conferences series, the International Conference on Business Process Management (BPM conference). As much as in other academic discipline, there is an ongoing debate that discusses the identity, the quality and maturity of the BPM field. In this paper, we will formulate recommendations to further develop BPM research based on the major findings a larger study by Recker and Mendling, which will be published in the Business & Information Systems Engineering journal in 2016. This recent study of the BPM field provides a good basis for discussing how BPM research can be further developed towards a true process science, which will eventually provide insights for practitioners on how to apply *scientific process management*.

1 Introduction

Van der Aalst and Damiani recently observed that the current discussions on data science needs to be extended towards a *process science* perspective [1]. In this paper, we build on a recent study by Recker and Mendling [2] that examines the state of the BPM field based on the proceedings papers of the BPM conference. It is specifically interesting to focus on the BPM conference, because a recent analysis [3] indicated that papers at the BPM conference are somewhat reductionistic in scope, often pursuing either popular problems (such as process modeling languages) or "exotic or even non-existing problems" [3, p.29]. These observations emphasize the need to discuss how BPM research can be further developed towards a true process science, which will eventually provide insights for practitioners on how to apply *scientific process management*.

We proceed as follows. Section 2 presents findings to which extent the BPM lifecycle is covered in recent research. Section 3 discusses to which extent certain research components are utilized in BPM research. Section 4 presents recommendations for future BPM research.

2   Coverage of the BPM Lifecycle by BPM Conference Papers

Business Process Management is often described as a lifecycle in order to clarify how different BPM-related tasks fit together. Figure 1 shows a lifecycle with six phases [4]. It also visualizes the coverage of BPM conference papers of each of the phases with a pink dot. An important observation in [2] is that the phases of the BPM lifecycle are covered to a different extent. Most research of the BPM conference is dedicated to questions that are associated with the process discovery and the process implementation phase. Typical matters that are studied in these two pockets are models and modeling languages together with techniques for verification, formal analysis and process mining. The least covered phases are topics associated with monitoring and with redesign.
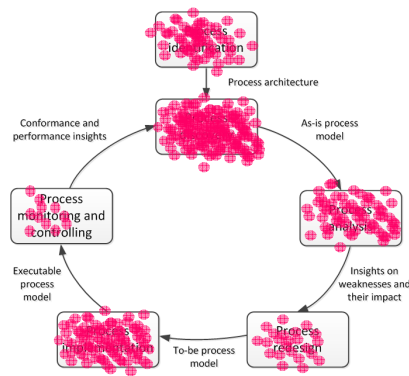

Fig. 1: The BPM Lifecycle and Plotted Conference Papers

3   Research Components

The maturity of the research contributions are arguably linked to the quality of methodological aspects as report in BPM conference papers. Therefore, Recker and Mendling [2] examined whether papers explicitly discuss components of research designs such as variables and hypotheses (for empirical research), or artifact and theory (for engineering and design papers). They observe that, first, the maturity in terms of methodological rigor appears to be a two-sided coin. On the one hand, it appears that engineering papers that report on artifacts and formal concepts are traditionally well-represented at the BPM conference. On the other hand, from the viewpoint of empirical and theoretical work, however, there are only a handful of BPM conference papers explicitly developing hypotheses,

and very few stating independent or dependent variables. The share of papers with explicit discussion of theory or hypotheses is also not notably increasing over time. This is a concern, because one would expect that with increasing maturity of research that is presented at a conference, studies would increasingly evaluate and falsify theoretical predictions rather than explore empirical evidence without a priori expectations. This also indicates concerns about the possibility of retroduction as a means of scientific appraisal.

4   Recommendations

Developing BPM towards a true process science requires strengthening the empirical side of BPM including research methods from behavioural science and design science. Based on their analysis, Recker and Mendling formulate the following recommendations [2].

Progressing BPM as Formal Science: It appears that BPM as a formal science is well-represented in the BPM conference series and that it is well-understood by its key contributors. This is, for instance, reflected in the extensive reference to formal Petri net concepts, algebraic definitions and utilization of formal logics in many papers.

Progessing BPM as Behavioural Science: BPM as a behavioural science is concerned with human and organizational behaviours in the context of managing business processes. Such aspects are important for studying, among others, how process knowledge can be effectively documented, which redesign suggestions provide better efficiency, or how processes can be effectively monitored. It appears that there is a need to further strengthen BPM as a behavioural science. Methodological guidelines is available in neighboring fields. The software engineering community has turned to empirical research methods already in the 1980s, most strongly inspired by works of Victor Basili [5]. There has been a growing uptake of experimental research and corresponding methodological guidelines as, for example, summarized in the book by Wohlin et al. [6]. Behavioural research on BPM can benefit from adopting such guidelines from software engineering research.

Progressing BPM as Design Science: BPM as a design science can be considered a third line of inquiry. It perceives BPM as an engineering discipline with the research objective of designing artifacts that provide superior utility in the context of managing business processes. It requires the capability of a researchers to design algorithms and systems, but it also requires empirical research methods [7] for artefact design and evaluation. There appears to be a need for taxonomies to structure the field and the relevant artifacts. This would start with a definition of types of processes [8, p.11] but could expand to a typology of improvement approaches, management techniques or BPM systems.

5   Conclusion

In this paper, we reflected upon BPM research as published in the BPM conference proceedings between 2003 and 2014. Our review of this study focused on the retrospective analysis of research approach, methodological maturity and impact of BPM papers, and we generated a set of varied recommendations for progressing research published at the BPM conference. More details of the study including analyses and recommendations are published in [2].

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