BPM: Foundations, Engineering, Management

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Abstract. This paper reports on the introduction of a track system at the BPM conference series and the experiences made during the organization of BPM 2018, the first issue implementing the track system. By introducing dedicated tracks for foundations, engineering, and management, with dedicated evaluation criteria and program committees, the BPM steering committee aims at providing a fair chance for acceptance to all submissions to the conference. By introducing a management track, the conference reaches out to the management community, which investigates phenomena in business process management from a non-technical perspective that complements the technical orientation of traditional BPM papers. We elaborate on the background of and motivation for the track system, and we discuss the lessons learned in the first iteration of the track structure at BPM 2018.

1 Introduction

This paper reports on the background of and motivation for introducing a track system at the International Conference on Business Process Management (BPM) conference series, and it discusses the experiences gathered during the organization of BPM 2018, the first iteration in the conference series implementing that structure.

The evolution of the BPM conference series towards the track structure is based on two observations. The first observation relates to the increasingly tough reviewing process that we could observe at BPM in recent years. There has been the trend that reviewers were asking not only for a strong technical contribution, but also for a convincing empirical evaluation. While these criteria are applicable to research approaches based on the design science paradigm, these are not well suited for papers looking at foundational aspects.

The second observation is concerned with the breadth of topics discussed at BPM conferences. BPM has its roots in computer science and information

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systems engineering, so that, traditionally, papers presented at BPM conferences have a significant technical contribution. Looking at real-world scenarios in business process management, however, an additional discipline plays an important role: management. Since traditionally BPM papers are expected to have a strong technical contribution, only few management-oriented submissions were presented at the conference.

To provide a fair chance for all papers submitted to BPM conferences, different evaluation criteria have to be employed to review foundational papers, to review papers with an engineering focus, and to review papers that investigate management aspects of business process management. These considerations have triggered the establishment of specific tracks covering foundational (Track I), engineering (Track II), and management aspects (Track III).

The reminder of this paper is organized as follows. The next section elaborates on the background of and motivation for the track structure. We then discuss the lessons learned in the first iteration while organizing BPM 2018, specific to each track. We close with an outlook on future iterations of the conference and concluding remarks.

2 Background and Motivation

Since its inauguration in 2003, the International Conference on Business Process Management has developed to a well-established conference that has shaped the business process management community. It has been a conscious decision by the BPM Steering Committee to position BPM as a conference with a technical focus. This decision proved important to establish the conference as a respected venue for research in computer science aspects of business process management.

As can be expected from an active research community and its flagship conference, the topics being discussed at BPM conferences have changed in an evolutionary manner over the years. The first issues of the conference mainly reported on formal aspects of business processes. With the rise of service oriented computing in the mid 2000s, topics like service composition and quality of service emerged. With the establishment of process mining and the general interest in data analytics, data-driven empirical research has become a major focus of BPM over the last decade.

Two observations can be made, each of which can be regarded as a challenge for the future development of the BPM conference series.

- With the shift in topics, a change in the evaluation criteria employed during the reviewing phase came along; evaluation criteria that are important in data-driven empirical research became the standard. This has led foundational and innovative papers having lower chances of being accepted at the conference, because these can typically not be empirically evaluated in a conclusive way.
- There is a strong stream of research that has not been represented at the conference in adequate strength, and this relates to management. Contributions

in the management field of BPM typically do not have a strong technical contribution. Since the typical reviewer at BPM conferences expect this, only few papers by the management community have been accepted at the conference.

Last year, the steering committee has decided to address these challenges by introducing a track system. It leads to a separation of foundational research, engineering research, and management research. Since papers following different research methods can only be evaluated fairly, if specific evaluation criteria are used, each track comes with a set of dedicated evaluation criteria. To implement these criteria, each track is led by a track chair, and each track has a dedicated program committee. A consolidation chair is responsible for coordinating the processes across the tracks. The reviewing process is enhanced with a dedicated consolidation phase, in which paper acceptance is discussed between tracks.

3 Track Structure

BPM 2018 features three tracks, foundations, engineering, and management. The tracks are characterized with respect to the phenomena studied, the research methods used, and the evaluation criteria employed during the reviewing phase. Notice that the following characterization is taken from the call for papers; we repeat it here for reference, because it tries to characterize the tracks as concisely as possible.

Track I [Foundations] invites papers that follow computer science research methods. This includes papers that investigate the underlying principles of BPM systems, computational theories, algorithms, and methods for modeling and analyzing business processes. This track also covers papers on novel languages, architectures, and other concepts underlying process aware information systems, as well as papers that use conceptual modeling techniques to investigate problems in the design and analysis of BPM systems. Papers in Track I are evaluated according to computer science standards, including sound formalization, convincing argumentation, and, where applicable, proof of concept implementation, which shows that the concepts can be implemented as described. Since papers typically do not have an immediate application in concrete business environments, empirical evaluation does not play a major role in Track I.

Track II [Engineering] invites papers that follow information systems engineering methods. The focus is on the investigation of artifacts and systems in business environments, following the design science approach. Papers in this track are expected to have a strong empirical evaluation that critically tests criteria like usefulness or added value of the proposed artifact. This track covers business process intelligence, including process mining techniques, and the use of process models for enactment, model-driven engineering, as well as interaction with services and deployment architectures like the Cloud. It also covers BPM systems in particular domains, such as digital health, smart mobility, or Internet of Things. Empirical evaluations are important to show the merits of the artifact introduced. A self-critical discussion of threats to validity is expected.

Formalization of problems and solutions should be used where they add clarity or are beneficial in other ways.

Track III [Management] invites papers that aim at advancing our understanding of how BPM can deliver business value, for instance how it builds organizational capabilities to improve, innovate or transform the respective business. Papers that study the application and impact of BPM methods and tools in use contexts based on empirical observation are highly welcome. Areas of interest include a wide range of capability areas that are relevant for BPM, such as strategic alignment, governance, methods, information technology, and human aspects including people and culture. We seek contributions that advance our understanding on how organizations can develop such capabilities in order to achieve specific objectives in given organizational contexts. Papers may use various strategies of inquiry, including case study research, action research, focus group research, big data analytics research, neuroscience research, econometric research, literature review research, survey research or design science research. Papers will be evaluated according to management and information systems standards.

4 Track I: Foundations

The foundations track focuses on papers that follow computer science research methods, with a strong emphasis on the core computing principles and methods underlying the BPM field. This ranges from the investigation of BPM systems and their extension through novel languages and functionalities, to the development of theories, algorithms and methods for (conceptual) modeling of processes and their (formal) analysis. In this respect, typical foundational papers show a strong and sound formalization, with convincing argumentation and rigorous exposition, but do not focus on an immediate, direct application of the presented results in concrete business environments. This is why proof-of-concept implementations are welcome, but it is not expected that they come with an empirical evaluation, as requested in the engineering track.

The accepted papers provide a quite fair coverage of recent developments of the foundations of BPM, with particular emphasis on multi-perspective process models, where decisions, data, temporal aspects, and multiple instances are considered alongside the traditional process dimensions. Some papers concentrate on conventional process modeling notations such as BPMN, while others delve into alternative modelling paradigms, with prominence of declarative, constraint-based approaches. Interestingly, papers employ a quite wide range of techniques, from computational logic to formal and statistical methods. Papers polarized themselves in two phases of the BPM lifecycle: modeling/analysis, and mining. In Track I, 9 papers were finally accepted at the main conference and 5 papers were accepted at the BPM Forum.

By comparing the call for papers with the submissions, reviews, and consequent discussion, the following critical points emerged:

- The evaluation obsession: Even though the call for papers explicitly indicated that evaluation is not the central focus of Track I, the lack of an extensive or on-the-field evaluation has been one of the most frequent reasons to lean towards rejection. During the discussion phase, this has been then clarified, still with resistance in some cases. The track system certainly helped, but more time is needed for the community to get acquainted with the fact that good foundational papers do not necessarily come with an evaluation that is based on data.
- The relevance question: We have observed a very diversified opinion of reviewers on the relationship between relevance of the presented results, and the targeted modeling notation. Some reviewers considered the choice of an unconventional modeling notation, or even alternative notations to the well-established ones, as a reason to consider the contribution weak, irrespective of the actual results therein. This is another point of reflection for the community, given that especially for foundational papers it is very hard to predict today what will be relevant in the future.

All in all, the initial reviews tended to be hypercritical about the submissions. Intense discussions were often needed to single out explicitly also the positive aspects of the contributions, and to assess them in their full generality. This was partly expected, also considering that Track I received quite many more papers than expected, consequently creating a quite heavy load for PC members.

In terms of covered topics, the main unifying theme among many of the accepted papers is the simultaneous consideration of multiple process perspectives. This witnesses the increasing maturity of the field, and the fact that it is finally time to "bring the pieces together". We expect this trend to continue in the coming years. Some accepted papers reflect on previously engineered techniques (in particular for process mining), witnessing that solid foundation papers do not necessarily focus on the formalization of process notations, but can also systematically study Track II contributions, creating a synergy between foundations and engineering.

An open challenge for Track I is how to create a similar kind of synergy towards Track II and Track III, so as to guarantee that strong foundation papers are consequently subject to extensive evaluation both from the engineering and management perspective.

5 Track II: Engineering

The engineering track of the BPM conference focuses on papers that follow the design science approach. In short: a new artifact (algorithm, method, system, or similar) is suggested and rigorously tested. Therefore the track has an emphasis on a strong, self-critical evaluation. The evaluation should expose the artifact to real or realistic conditions, and assess its merits relative to the objective of the design, e.g., under which conditions a new process discovery algorithm is better (or not) than the state of the art. In the call for papers, we also asked for a critical discussion of threats to validity. The implementation of the artifact

should typically have the maturity of a prototype, i.e., it can be evaluated in an application context. This is in contrast to the foundations track, where proof-of-concept implementations are sufficient, though not necessary.

In summary, the main topic of the set of accepted papers is conformance checking, with various proposals on improving the efficiency or accuracy, or applying it to online settings. As a new trend, it can be observed that machine learning and deep learning in particular play a big role as underlying technologies. People-specific aspects are considered in two, and complexities of realistic settings in all of the accepted papers.

Comparing the call for papers with the submissions received, we note that a discussion of threats to validity is the exception, not the norm. The criteria in the call for papers were formulated as hard targets, and only two submissions (or less than 5%) were judged as meeting these by the PC with a recommendation of direct acceptance – 7 papers were at first only accepted conditionally. Reviews were in part hypercritical of the submissions, and emphasized flaws more than positive aspects. In the reviews and discussions, the PC members made many constructive remarks, which resulted in the final acceptance of 9 papers, and 5 BPM Forum papers.

A critical question for the community and Track II PCs of coming years is where to place the bar on evaluation strength and quality: if the bar is as high as for top journals, authors are often inclined to submit to these instead; if the bar is too low, validity of the results may not be given, possibly invalidating technical contributions. One step forward would be a broader uptake of validity discussions in submissions. While it is clear that the BPM community has matured, professionalized, and also emancipated itself from other communities since its inception, there is room for further development.

Among the five BPM Forum papers from this track, two discuss the ways to integrate BPM and Internet of Things, which may be an indication that this topic might play a bigger role in the future. Process mining, and conformance checking in particular, are the topics attracting most submissions and accepted papers. Conformance checking only moved in the last few years from foundational works towards a phase of improvement and optimization of approaches, i.e., towards the kinds of contributions that fit Track II well. Business process execution and engineering of process-aware information systems, outside of process mining, did not yield any accepted papers in the main track. Predictive process monitoring, a topic that was present in previous BPM conferences, moved to the management track this year. In summary there is some indication that certain themes actually move from the foundations track to the engineering track and possibly further to the management track, which nicely shows the relationships between the three tracks.

6 Track III: Management

The management track focuses on applications of BPM in organizational settings. Papers investigate the development and impact of BPM capabilities in

order to deliver strategic goals, such as, innovation and improvement. Contributions account for the socio-technical nature of organizations, specifically aiming at an alignment of aspects related to technology, business and people in BPM initiatives in various organizational contexts. The disciplinary background, therefore, is that of information systems research, organizational science and management science, and a wide range of research methods established in these disciplines are applied.

In summary, all papers provide valuable insight to highly relevant issues organizations around the globe are concerned with today. These include digital innovation, business transformation, compliance management, and forecasting. The papers also advance prior contributions in that they embrace new technologies, such as data analytics, but also link to human aspects, such as leadership and values, and account for the multi-faceted requirements of different business contexts.

What is more, the papers show how different strategies of inquiry can advance BPM research, including case study research, interviews, literature reviews, experiments, survey research, design-oriented work, and conceptual studies. We find this inspiring, and it shall be particularly promising to compare findings from different strategies of inquiry in the sense of triangulation. The more we learn from different sources the richer our understanding of designing and managing business processes will become, and the more appropriate we will be able to serve the BPM practice. In Track III, 9 papers were finally accepted at the main conference and 4 papers were accepted at the BPM Forum.

We are very pleased that so many colleagues have followed the call to contribute research on management-related aspects of BPM to the conference. Given the plethora of contemporary organizational challenges, it is natural that many areas are yet to be explored, and these areas mark promising fields for future research, such as the use of machine learning, social media, blockchain, robotics, and other technological advancements in practice. It will be intriguing to explore the role of BPM in leveraging the potential of these technologies in real-world organizational settings.

The BPM conference with its new track structure will be an ideal place to present and discuss innovative contributions as they mature from conceptual and technical foundations to engineered artifacts to applications in practice. From a management track perspective, it will be particularly interesting for future research to take contributions from the engineering track and to investigate their application in real-world organizational settings.

7 Lessons Learned

Overall, we can say that the track system works. We received 140 full paper submissions, which is a very good number that exceeds submission numbers in recent issues of the conference. Submissions were very well distributed over the tracks. While keeping the high quality standards at BPM conference, we could accept 27 papers for the main conference and 14 papers at the BPM forum.

Many of these papers would not have made it in the traditional structure, so that our goal of opening the conference to the management community can also be considered fulfilled. Even if the first issue indicates a success, we share some experiences and lessons learned from organizing the conference, mainly related to the reviewing process. Introducing a new structure to a conference and extending a scientific community requires several years and several iterations of the conference to settle. We intend to support this transition by discussing the lessons learned while organizing BPM 2018.

The communication of the track system to the community actually started with the keynote by the first author at BPM 2017, where he motivated and introduced the new conference structure. The track system is the result of discussions within the BPM Steering Committee and with many colleagues of the community. During the preparation of the call for papers for BPM 2018, the PC chairs described the tracks as concisely as possible. This includes the phenomena studied in the tracks and the evaluation criteria used during the reviewing phase, as shown in Sect. 3.

The BPM 2018 publicity chairs did an excellent job in communicating the call for papers on various channels. In addition to the traditional channels BPM has used over the years, we also covered channels used by colleagues from the management discipline. In addition, peers were informed about the new track system through direct emails and many personal conversations, in order to solicit excellent submissions to the conference from the broader BPM field.

The main lessons learned relate to the reviewing phase. We were aware of the challenges when introducing a new structure and incorporating a new discipline to an established conference. Hence, we motivated the track system and we communicated the evaluation criteria and the reviewing standards used at BPM to the program committees of all tracks. Despite the effort to align the level of detail and criticality of reviews over the tracks, at the reviewing deadline, the situation in the tracks looked actually quite different.

On average, reviewers were quite critical in Track I, highly critical in Track II, and not very critical in Track III. Also, differences in the detail and quality of the reviews could be observed. In some cases reviewers based their recommendation on evaluation criteria of a different track, e.g., by asking for empirical evaluations to support foundational results in Track I. We tried to counter these issues by guiding the discussions to value positive aspects of papers, particularly in Track II, and by asking PC members to stick to the evaluation criteria of their specific track. These measures succeeded to a meaningful degree.

To balance between the reviews and the paper or, maybe more accurately, between the reviewers and the authors, we proposed conditional accepts in many cases. On the one hand, this has led to a high percentage of conditional accepts, on the other hand it allowed us to accept quite a large number of papers at the conference. All conditionally accepted papers were finally accepted; in several cases the final version exposed significant improvements over the submitted version. Overall, we accepted 27 papers, 9 in each track. This even distribution was not planned, it emerged as outcome of the discussions we had during the

consolidation phase. Based on the reviews and according to the discussions during that phase, we are confident that all accepted papers are excellent and definitely deserve to be presented at a high-quality scientific conference like BPM.

8 Conclusions

In this short paper, we have reported on the experiences gathered during the first iteration of the track system at the BPM conference. While there is agreement that the track system works in general, there are challenges to address in future editions of the conference. While we acknowledge that each year, there are slight differences in the orientation of the topics and – of courses – each reviewing process is different, we still hope that the experiences reported will help in shaping the BPM community, especially related to the reviewing process.

BPM will not abandon its high-quality and selective reviewing standards, but we encourage reviewers to take a slightly more positive attitude towards the submissions of the community. This applies in particular to Track II, which has seen the most critical reviews. The high level of criticality of reviews in that track might also relate to the fact that the evaluation criteria in Track II actually did not change at all, compared to recent issues of the conferences. In contrast, the evaluation criteria in Track I were adapted, and Track III does not ask for a technical contribution. Still, it is pleasing to see excellent papers in the core BPM topics while also witnessing a broadening of topics and research methods addressed at our conference.