The Biggest Business Process Management Problems of Our Time

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1 Problems on the Enterprise, Process, and Event Level

In their contributions to the first edition of the Workshop on BPM Problems to Solve before We Die, the authors identified nine problems. We can categorise them along three levels: the enterprise level, the process level, and the event level (Fig. 1). Starting from the bottom of the pyramid in the figure, the event level is where detailed information on process activities resides. The second level is that of the individual processes. Multiple processes subsequently make up the top level of the enterprise. We introduce each of the corresponding problems in the following sections.

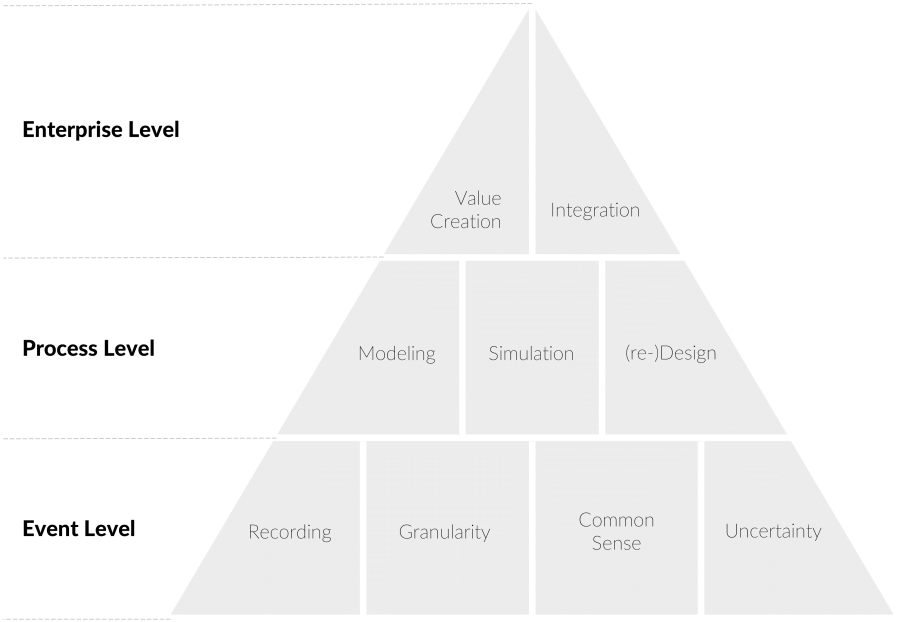

Fig. 1. Overview of the biggest BPM problems of our time

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Table 1. Overview of enterprise level problems

Author(s)	Problem	Challenge
Bandara et al.[1]	Fragmented BPM practices	Accomplishing a holistic BPM approach
Sadiq et al.[2]	Socio-technical barriers for value creation from data	Creating organisational value from data

1.1 Problems on the Enterprise Level

Starting with the highest level, that of the enterprise, Bandara et al. [1] and Sadiq et al. [2] identified BPM problems around value creation and integration, respectively. Both papers discuss the silos of BPM practices that currently exist, and the need for a more enterprise-wide coordination of these practices. Bandara et al. call for a move away from individual processes as the unit of analysis, towards integration with other BPM methodologies. Sadiq et al. focus on the diffusion of new data-driven approaches and the difficulties for enterprises to exploit those in an appropriate and value-adding way. Table 1 provides an overview of the enterprise level problems and associated challenges.

1.2 Problems on the Process Level

On the process level, three problems were identified related to process modeling, simulation, and (re-)design. Klinkmüller et al. [3] argue that the subjectivity of human modelers makes valuable activities such as model matching inherently difficult. The authors call for a more objective approach to process modeling in terms of granularity level, perspective, and terminology. Using such an approach may give rise to new opportunities for analysing processes.

New process analysis opportunities may also arise when the potential of using digital process twins is unlocked, a proposal made by Dumas [4]. Dumas identified the challenge of developing accurate simulation models that can aid the evaluation of (re-)design initiatives by predicting the impact of interventions on the process. The engineering concept of digital twins may provide a solution to that challenge.

Another problem in the (re-)design sphere is the one identified by Röglinger et al. [5]. They argue that the (re-)design phase is lagging behind other BPM phases in terms of its manual - and thus labour-intensive - work. According to

Table 2. Overview of process level problems

Author(s)	Problem	Challenge
Klinkmüller et al. [3]	Subjective process models	Developing objective process models
Dumas [4]	Inaccurate or unreliable what-if models for redesign	Predicting the impact of interventions
Röglinger et al. [5]	Labour-intensive (re-)design of business processes	Automating process (re-)design

Table 3. Overview of event level problems

Author(s)	Problem	Challenge
Muthusamy et al. [6]	The separation of work and the recording thereof	Automatically recording work across channels
Zerbato et al. [7]	Fixed granularity levels for process analysis	Choosing an appropriate level of granularity to analyse processes
Calvanese et al. [8]	Missing information in event data	Augmenting event logs with common sense knowledge
Cohen and Gal	Low quality data generated from devices and sensors	Dealing with uncertain event data

the authors, there are opportunities for exploiting the use of automation to make (re-)design more efficient and adaptable to changes. Table 2 presents the process level problems.

1.3 Problems on the event level

With regards to the event level, four problems were identified. The first is related to the recording of work. Muthusamy et al. [6] argue that in knowledge-intensive work settings, there is currently a separation of work and the administration thereof. Such work is performed in an ad-hoc fashion and workers are tasked with manual administration of their activities in a channel different from where they are working. The authors call for a more *worker-centric* means of recording across channels, such that it allows for more efficient and accurate analysis.

The second event level problem is that of granularity in the context of process mining and analysis. Zerbato et al. [7] discuss the current workflow of 'fixing' the granularity level of events during preprocessing and the consequences thereof for the patterns that can be found. Specifically, they note the direct link between the granularity level and the purpose of the analysis, a link that Klinkmüller et al. also highlighted in their discussion on objectivity in process models. This link makes the granularity and objectivity problem difficult to solve, but once solved, it will present many opportunities.

For the third event level problem, Calvanese et al. [8] coin the concept of *common sense knowledge*. This refers to information not currently present in event logs, which may relate to generic knowledge about the world, as well as specific domain knowledge. Augmenting event logs with such knowledge would allow for a more faithful application of algorithms and more accurate outcomes.

The fourth and last event level problem is posed by Cohen and Gal [9]. It relates to the increasing use of physical devices and sensors for event data analysis. The data that is generated from these sources is often of low quality, resulting in so-called *uncertain event data*. Dealing with such uncertain data is complex. Therefore, the authors call for an approach that accommodates probabilistic knowledge into process mining techniques. Table 3 presents an overview of the four event level problems.

2 Reflection

When considering the problems that we described, there is an interesting, cross-cutting concern that can be identified. Each problem illustrates in its own way that there is a tension between the role that humans play in work processes and the level of automation that is being applied within such processes. This tension relates to both the presence and the absence of humans.

2.1 Automation and the Presence of Humans

The first manifestation of this tension relates to the *presence* of humans. Over time, many human tasks are eventually being automated. Such efforts are often driven by objectives with respect to accuracy, efficiency, and scalability. However, whereas parts of the process are automated, humans continue to be involved in other parts of the processes, or in processes that are affected by the automation of tasks. Dumas argues that, for this reason, it is very difficult to predict the effect of automation interventions. Moreover, successful automation is often dependent on detailed recording and analysis of the process. Muthusamy et al., however, highlight the ad-hoc and multi-channel behaviour of knowledge workers, which makes it difficult to automatically track processes. As such, the presence of humans in processes makes automation difficult.

2.2 Automation and the Absence of Humans

The second manifestation of this tension relates to situations where the human is *absent*. Humans are creative and flexible, which allows them to deal with situations that are out of the ordinary or even completely new. They also master a wide repertoire of actions, which allows them to combine and integrate work of a varying nature. For these reasons it is difficult to develop an automated solution for a task that can satisfactorily replace the person performing it. Röglinger et al., for example, propose to automate (re-)design to make it "less dependent on human creativity", but also point out the importance of knowledge from human agents to achieve such automation. Therefore, what is often pointed out is the value of augmenting automation with human knowledge. For example, when relying on data-driven approaches for process analysis, there is typically a need for human knowledge to make sense of such an analysis. For this reason, Calvanese et al. propose to augment event data with general and domain-specific knowledge from human agents. Klinkmüller et al. emphasise the need for human agents to make sense of varying granularity levels, perspectives, and terminologies across process models. In order to truly create value from data-driven approaches, Sadiq et al. argue that automation and human involvement need to be appropriately balanced.

2.3 The Shifting Role of the Human

Are we trying to push humans out of our work processes while pulling them back in at the same time? This does not make much sense, unless we try to look at

these dynamics on a more fundamental level. Due to the advances of information technology, computing, and data science, the role of the human will keep shifting. In all likelihood, the importance of people as performers of traditional business activities will diminish, but we will need human flexibility, creativity, and ingenuity for unpredictable and complex work. At the same time, in our quest for better performing organizations and work processes, we underestimate how much we still need humans to put data in their context, to identify improvement opportunities, and – perhaps most importantly – to set the priorities for what we, as humans, want to get out of these processes. These considerations seem sufficiently attractive for any researcher to devote a lifetime on.

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