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BPMN Research: What we Know and What we Don't Know

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Abstract. In this short keynote paper, I will briefly explore the current state of research and practice surrounding the BPMN standard. On basis of this analysis I will offer a personal outlook into the key emerging areas where I believe more research will be required to further understand BPMN, its premise and promise, and how we can shape – and join together – the landscape of BPMN practice and development in academia and industry.

Keywords: BPMN, process modeling, Known Unknowns, empirical research, design research, research agenda

1 Introduction

I think we all know by now that the Business Process Model and Notation standard is here to stay. What started of pretty much exactly ten years ago as yet another effort to define yet another modeling approach has over the years become the de facto global standard for the modeling of business processes, or as we call it, the modeling grammar of choice to analyze and design process-aware information systems. The efforts towards BPMN were driven by the ambition to provide a unifying standard notation that could serve all sorts of business users and application purposes [20]:

The primary goal of the BPMN effort was to provide a notation that is readily understandable by all business users, from the business analysts that create the initial drafts of the processes, to the technical developers responsible for implementing the technology that will perform those processes, and finally, to the business people who will manage and monitor those processes.

One may speculate about why BPMN has been successful in its effort to become a widely accepted standard. There are certainly a number of factors that can be attributed to the success: The differentiation of core and extended elements. The provision of advanced and extended modeling capabilities. The promise of model-driven code generation for executable processes. The move to form an OMG working group to gain official recognition of the standard. The realization of both advanced and basic modeling capabilities in a reasonably intuitive format.

In any case, the uptake of BPMN in its version 1.0 was significant, and truly global. By 2008, only one year after the official ratification as an OMG standard was finalized, BPMN was actively used in over thirty countries across all continents [10]. By now, these figures would have increased further. BPMN is available in version 2.0 since 2010 [7], and its application in industry as well as in academia is alive and well. And given the ten-year history, it is only benefitting to pause and reflect about BPMN and its role and prominence in academic research. I welcome the opportunity to share my thoughts on BPMN in academic research.

In reflecting, in this short position paper, I want to achieve two objectives.

First, to give a personal reflection on the type and trajectory of research around BPMN over the last ten years. This I will do in the section below.

In the subsequent section, I then attempt to identify themes and pathways for research on BPMN that are not fully on the radar screen of the BPMN academic community yet.

As a preamble I do wish to add that what follows are my own thoughts, interpretations and opinions. They are not based on rigorous research but instead based on selective reading, personal experiences and anecdotes.

2 A brief history of BPMN research

I have personally been involved with BPMN as a phenomenon of research interest since January 2005. At that time, BPMN was widely discussed if not hyped in the practitioner communities, which in turn raised its profile as a phenomenon of interest to the academic communities in business, information systems and computer science.

This interest, over the past seven years, has increased rather than diminished; but the themes of interest changed. Fig. 1 gives a visual display of my interpretation of the BPMN research themes over the years. Note that this graph is not based on a systematic review of the literature but rather describes a personal sketch of themes and efforts over time.

Two themes dominated the early years: how good is BPMN really? This question was probably academia's answer to the adoption speed and hype that was felt as a buzz in the community. Early work looked to examine actual and perceived capabilities from a variety of angles [17, 22]. Other research at that time examined some of the claims made – BPMN for different stakeholders, and BPMN for organizational redesign versus technology implementation. One key theme was to define the semantics of BPMN formally to identify how the promise of model-driven process execution could be realized [2]. Eventually (of course), an answer was found [8].

Moving forward, BPMN received increased attention and uptake. Capabilities were now well-established and so the community started to look at how these capabilities were implemented and used [24] – but also how they could be extended and improved, leading to input to the ongoing and planned revisions of the standard [12, 23]. One of the noteworthy findings of that time was a study that showed how much of BPMN was used in practice [25] – and what implications could be in terms of standard revision and modeling methodologies and training.

Somewhat linearly following was then research work that begin to these formal, analytical and empirical findings into normative advice – how BPMN should be used. Thus, we saw a set of textbooks and studies emerging around how BPMN was best applied and taught [15, 21]. BPMN also found its way into more general textbooks on Business Process Management [19].

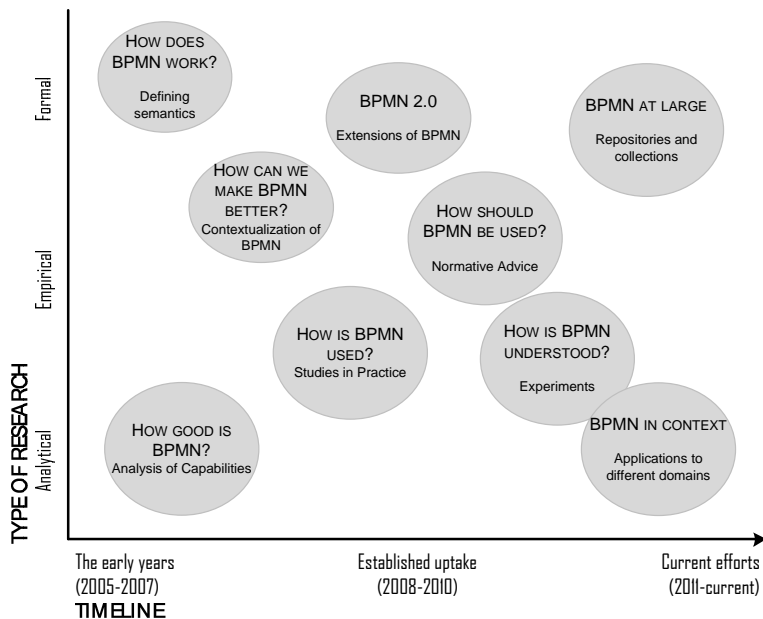


Fig. 1: Selected themes of BPMN research over time.

The most recent years saw yet another trend in research around BPMN. BPMN was now firmly established as a technological and organizational approach and thus was used more as a key instantiation of more general approaches– to modeling, say – that were being examined. One example of such research programs is the stream of work that looks at the understandability of process models – perusing BPMN as the models of choice [11]. Other work has started to look at collections of (BPMN) models and the management or technical realization of those [5, 18]. Finally, other work has looked to extend the applications of BPMN to new contexts and domains [6].

I should add that several of the ‘theme bubbles’ above suggest that a stream of research is complete and finalized. For instance, evaluations and empirical studies of BPMN continue well into the current time [3], as do formalizations and analytical works [13].

With this portfolio existing, alive and well, two questions emerge in my view:

- 1) Has the research to date been on the right track, i.e., have we focused our efforts on the important challenges?
- 2) What will be the relevant and important research agenda for the future?

Below, I am offering some thoughts on these two questions.

3 Knowns and Unknowns

There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know.

Donald Rumsfeld, U. S. Secretary of Defense, Statement to the Press on February 12, 2002.

This section is not about Donald Rumsfeld, his appropriation of a statement that presumably originated from the risk management literature, or the linguistic (let alone political) quarrels that emerged in consequence about the above statement. For the interested reader, the statement was made at a press briefing where Donald Rumsfeld addressed the absence of evidence linking the government of Iraq with the supply of weapons of mass destruction to terrorist groups. He was later criticized for his application of the English language, although some linguists lauded his statement as “impeccable, syntactically, semantically, logically, and rhetorically” [9].

Why do I bring this up? Because I believe his quotation can serve as a useful conceptual frame to examine past and future research around BPMN, and also identify the type of research that can be most beneficial to exploring the ways forward. I have tried to visualize this frame and its application in Fig. 2.

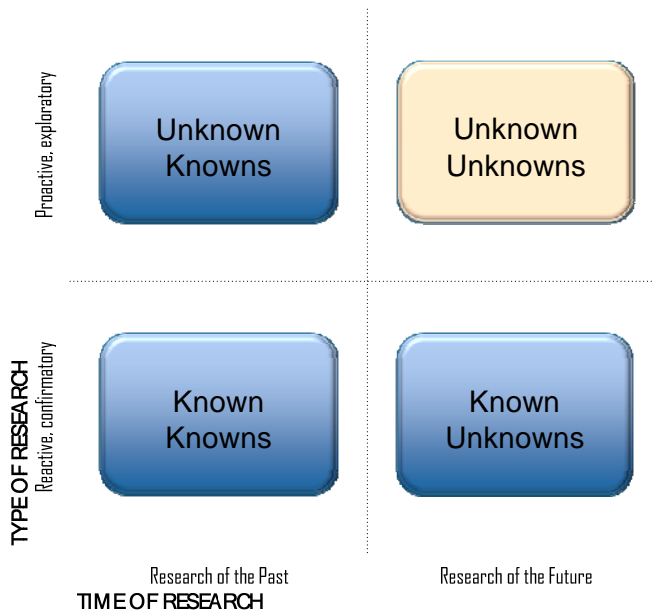


Fig. 2: A taxonomy of BPMN knowledge. Loosely based on Donald Rumsfeld’s press statement made as United States Secretary of Defense on 12 February 2002.

The taxonomy in Fig. 2 has two axes. On the x-axis I differentiate *knowns* from *unknowns* with the view to indicate research of the past and the possible themes for

the research of the future. The y-axis separates two different types of research – more *reactive* research to *confirm* known knowns and known unknowns – things that we know we know or things that we don't know but at least we know that we don't know them. This type of research – and likely the approach to research – is different from the more *proactive* research required to *explore* the unknowns – things we didn't even know we know, and (perhaps most interestingly), the things we don't know that we don't know. Of course, this last category is the most challenging state to predict – but perhaps also the most interesting to explore?

Perusing this frame, I have tried to instantiate the different categories to guide future research. The outcomes of this effort are described in Table 1.

Table 1. Known and Unknowns.

Known Knowns	Known Unknowns
BPMN is used selectively in organizations, and not to its full extent.	The level of errors in BPMN modeling is still high.
BPMN can be mapped to executable semantics.	What is the best way to apply BPMN for process modeling?
There are advantages and disadvantages of BPMN in comparison to other modeling approaches.	The use of BPMN in cultures with different aptitudes for forms, shapes and symbolic expressions.
BPMN is implemented in different ways by process engines.	The process of BPMN development. The impact of new technologies for BPMN modeling.
Unknown Knowns	Unknown Unknowns
Organizations use BPMN differently for different projects (redesign, implementation, compliance).	How do we use BPMN for different and emerging purposes?
The individual and organizational benefits that flow from BPMN use.	What extensions to the standard will be required in the future?
Defining and implementing workflow systems starting with BPMN models.	Will BPMN have a place in post-process paradigms?
The use of BPMN by experts and novices.	How will the BPMN community and its impact evolve?

The lists above are incomplete, subjective and debatable by nature. On this we can hopefully agree (to disagree). My point is to be stimulating rather than to be directive or instructing.

Most notably, the framework of known knowns draws our attention to the top right corner of Fig. 2 – the unknown unknowns. Researchers, I believe, are well-suited and even more so, required to conduct work that fits into this quadrant. With their array of methods and knowledge about rigor as well as relevance, researchers should not only explore and confirm knowledge but also proactively design new knowledge and bring implications that guide the development of the whole field for the years ahead. In other words, they are positioned to turn the unknown unknowns into known knowns or at the known unknowns. This move requires boldness and inspirational thinking – to identify areas that are ‘way out there’ and to identify appropriate ways of executing on such research.

Another key implication from thinking about BPMN research on basis of the known/unknown frame, I believe, is the question of “how do we best go about doing research on/around/with BPMN?”. The reactive/proactive distinction I have drawn in Fig. 2 suggests that a variety of streams will be required. Looking back at the research to date (as depicted in Fig. 1), we can identify several camps of studies – formal, analytical, empirical. There are also camps of design and development work. I argue that this diversity of streams is important and required; but also needs to be consolidated, integrated and applied holistically. The different communities of work around BPMN also need to collaborate more tightly: Participants in the academic community, representative from vendor and end user organizations, stakeholders in the standardization bodies and influencers from the teaching community should work together in exploring unknowns and confirming knowns. For us academics, this means that different methodological paradigms appear well-suited that, to date, we have not yet seen fully leveraged or exploited: Mixed method research [4], theory-driven development [1], design research based on participatory action [14] and scholarly work in terms of community engagement [16] are just a number of suggestions to explore and embed in the current portfolio of activities.

Broadening and deepening our perspectives are certainly ways not only to leverage BPMN as an interesting phenomenon for intellectual work, but also to influence positively the different communities impacted by BPMN – scholars, students, vendors, technology innovators, standard bodies and end user organizations alike. From my viewpoint as an academic scholar, I would like to see especially our cohort as leaders in this activity – as boundary spanners that explore, shift and create knowledge of benefits across all parties. Whether this assertion holds, however, is one of Donald Rumsfeld’s known unknowns: “*there are some things we do not know.*”

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