Business Process Modeling: Perceived Benefits

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Abstract. The process-centered design of organizations and information systems is globally seen as an appropriate response to the increased economic pressure on organizations. At the methodological core of process-centered management is process modeling. However, business process modeling in large initiatives can be a time-consuming and costly exercise, making it potentially difficult to convince executive management of its benefits. To date, and despite substantial interest and research in the area of process modeling, the understanding of the actual benefits of process modeling in academia and practice is limited. To address this gap, this paper explores the perception of benefits derived from process modeling initiatives, as reported through a global Delphi study. The study incorporates the views of three groups of stakeholders – academics, practitioners and vendors. Our findings lead to the first identification and ranking of 19 unique benefits associated with process modeling. The study in particular found that process modeling benefits vary significantly between practitioners and academics. We argue that the variations may point to a disconnect between research projects and practical demands.

Keywords: Business process modeling, benefits, modeling advantages, Delphi study.

1 Introduction

Business process modeling – an approach to depict the way organizations conduct current or future business processes – is a fundamental pre-requisite for organizations wishing to engage in business process improvement or Business Process Management (BPM) initiatives. In their most basic form, process models describe, typically in a graphical way, the activities, events and control flow logic that constitutes a business process [1]. Additional information, such as goals, risks and performance metrics for example, can also be included. Accordingly, process models are considered a key instrument for the analysis and design of process-aware Information Systems [2], organizational documentation and re-engineering [3], and the design of service-oriented architectures [4].

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Globalization, recent economic turbulence, and regulatory body mandates for process compliance have further contributed to an increased interest in BPM [5] and, hence, business process modeling. A recent study showed that process modeling is behind four of the top six purposes of conceptual modeling [6]. The increased interest is in part manifested by an increase in enquiries and requests for process modeling executive training in the Australian market (e.g., www.bpm-training.com). Anecdotal evidence further suggests that this phenomenon is also present in the USA and the European market. Other indications include, for example, the rapidly growing popularity of the Business Process Modeling Notation (BPMN) [7].

Process modeling on a large, company-wide scale, however, can require substantial efforts in terms of investments in tools, methodologies, training and the actual conduct of process modeling. This scale of modeling demands sound business cases. Studies indicate that individuals (for example, business analysts, managers) have difficulty in obtaining executive management support for process modeling initiatives in organizations [e.g., 8]. Typically, they are unable to communicate and quantify the benefits that can be expected from process modeling activities. In return, executive management often does not see enough evidence to support investments in process modeling initiatives. While substantial research over the last decade contributed to a significantly matured process modeling capability, a wider uptake of process modeling is often limited by such economic assessments. In fact, demonstrating the value of process modeling (and not specific methodological or grammar related issues) is seen as the major challenge by process modeling professionals [9], yet little guidance or related study exists in this area. This finding is a significant problem for initiating process modeling initiatives since rational decision makers make decisions on the basis of their net benefits as perceived by them for their circumstances - that is, benefits outweighing costs. Decision making theory tells us that this has to be evaluated from individual stakeholder perspectives [10]. Therefore, as a first step in this process, we were motivated to explore the perceptions of benefits of process modeling though a large Delphi study.

The main goal of this study is to identify and explore the most compelling benefits that can be derived from process modeling. In reaching such a goal, we are able to provide guidance to organizations on the main process modeling expectations, as well as identify implications for consultancy and tool development and future process modeling research. Accordingly, our study is based on the following research question: *What are the main perceived benefits of process modeling?* We explore this question in a Delphi study setting with three main stakeholder groups of the process modeling ecosystem*, viz.*, *academics* in the business process modeling domain, business process modeling *practitioners*, and *vendors* of business process modeling software tools and consultancy offerings. Our objective is to identify the most compelling benefits believed to be associated with process modeling initiatives, reach consensus on these benefits, and identify how the perception of benefits differs across the three stakeholder groups.

2 Research Approach

2.1 Delphi Study Design

The technique chosen to facilitate the collection of, and consensus on, the benefits of process modeling was the Delphi technique [11] – a multiple-round approach to data collection. Delphi studies are useful when seeking consensus among experts, particularly in situations where there is a lack of empirical evidence [12]. The anonymous nature of a Delphi study can lead to creative results [13], reduces common problems found in studies that involve large groups [12] and allows for a wider participant scope due to the reduction of geographic boundaries [14].

One of the main determinants of success of a Delphi study is the selection of the expert panel, i.e., the study participants [15]. Instead of utilizing a statistical, representative sample of the target population, a Delphi study requires the selection and consideration of qualified experts who have deep understanding of the domain or phenomenon of interest [14].

2.2 Participant Selection

To obtain a comprehensive understanding of the core process modeling benefits, it is important to acknowledge different key stakeholders. The perception of benefits, and/or the perception of their centrality, may vary depending on the perspective taken by respondents. We identify three groups of stakeholders: first, the *practitioners* of business process modeling, that is, the business analysts, system designers, managers and other staff that actively conduct business process modeling projects or have an vested interest in process modeling in their organizations. These participants are chosen because they have first-hand experience with process modeling or its outcomes, and an overall awareness of process modeling advantages and pitfalls. The second group identified is that of the *vendors* of business process modeling software and consulting solutions providing support to the end users. These participants are chosen because they are in close contact with the user community, typically provide first-hand support or active engagement in process modeling initiatives, and have valuable user feedback as well as insights and observations from their consulting activities. The competitive environment within this stakeholder group enforces ongoing innovation, which overall positions vendors as boundary spanners [16] between the academic and the end user community. The last group identified is that of the *academics* in the business process modeling domain, who provide educational services and create new approaches and new knowledge in the business process modeling domain. These participants were chosen because they drive the development of the process modeling research domain, assist the development of methodologies and tools, and also train new generations of process modelers. We took care to ensure a representative sample of the academic community, including academics from the domains of computer science, information systems, and business.

Using these three groups, we designed a Delphi study that was conducted between August and October 2008 in three rounds separately for each group. The risk of being unable to obtain consensus between heterogeneous panelists [17], particularly in the exploration of a potentially broad topic, was further motivation to divide the study

into the three related groups of stakeholders to narrow down the possible perspectives of each group. Invitations were based on the expertise of the potential participants. For academics, we screened the program committee of the Business Process Management conference series (www.bpm-conference.org), the most reputable conference in this area. A key selection criterion was the related research track record of a PC member. For vendors, we contacted key management staff from leading software and methodology providers, as reported in current market studies [e.g., 18, 19]. For practitioners, we contacted process managers, and similar roles, of large corporations, who the research team knew through previous collaborations. For each of the three stakeholder groups we aimed for a balanced international representation.

Typically, Delphi study involvement rates of 10 participants are recommended [20] to overcome personal bias in consensus seeking. Seeking to surpass this recommendation, invitations to the study were sent to 134 carefully screened experts (40 practitioners, 34 software vendors, 60 academics), including 11 invitations based on referrals from invited participants. Of these experts, 73 agreed to participate - representing a 55 percent response rate. By the 3rd round of the study, 62 experts were involved – an outstanding ongoing participation rate of 85 percent. At the end of the third round of the Delphi study, the group sizes were *at least* 80 percent greater than the recommended minimum for Delphi studies [20].

3 Study Conduct

3.1 Delphi Study Rounds

In the first round, each participant was asked to list five benefits of business process modeling, together with a brief description of each benefit. Overall, we received 70 (participants) x 5 (benefit items) = 350 individual response items. To overcome challenges related to the number of responses, differences in terminology, term connotation and writing styles, we then codified each response item into a higher level category – e.g. a response of "process models can be used for performance evaluation (mainly using simulation)" was coded as "process simulation", as was "ability to validate a proposed capability ahead of implementation".

In ensuring reliability and validity of this coding, we performed the exercise in multiple rounds. First, three researchers independently coded each of the 350 response items into a higher level category. In a second round, two researchers were independently exposed to the three codifications from the 1st coding round, and created individual, revised 2nd round coding drafts. In a third round, the fourth research group member consolidated the revised codifications and resolved any classification conflicts. Through this multi-round approach we ensured inter-coder reliability as well as validity of the codification exercise.

The second round of the study was designed to obtain consensus from the participants on the codified benefits, as well as on the definitions of the new higher-order categories. The communication for this round provided each participant with a personalized email containing his or her original responses, the agreed classifications per response item, and descriptions of the classifications. The participants were asked to indicate their level of satisfaction with the classification of their responses and the

definitions of the classifications, and to provide additional information or suggestions if they were not satisfied with the classification. We received mostly positive responses on our codification (e.g., *"Your categorization is close to the mark."*) as well as a small number of coding and/or definition improvement suggestions (e.g., *"Row 2, 4 and 5 are rightly codified. For row 1 and row 3, I feel the codification is little abstract."*), which were carried out where appropriate.

While it has been recognized that there are times when consensus between study participants may not be possible [17], there is a lack of indication in the literature as to possible measures for determining consensus. A recent Delphi study [22] utilized a satisfaction rating of 7.5 (out of 10) as an indication of consensus. In our study, we also asked the participants to rate their satisfaction with our codification on a scale of 1 to 10 (10 being highest). For the identification of process modeling benefits, being a potentially broad topic, we followed the previous study and assumed consensus at an average satisfaction level of 8 and a standard deviation below 2.0. The average satisfaction scores ranged from 8.569 (Academics), 8.771 (Vendors) to 9.230 (Practitioners) with standard deviations ranging from 1.609 (Academics) to 1.176 (Practitioners).

While our initial study plan allowed for multiple rounds of consensus building, the results obtained indicate that the participants achieved the required consensus levels at the first iteration of the second round. This allowed us to stop the consensus-building process. At the end of round two, and after making required changes to categories/definitions, all response items were ranked in descending order of frequency of occurrence, with items such as *understanding* (17 times*), model-driven process execution* (14 times), *process improvement* (12 times), *documentation* (10 times) and *communication* (10 times) being most frequently mentioned.

Frequency of occurrence is not an accurate measure with which to identify core process modeling benefits. Accordingly, in the third round of the Delphi study, the experts were asked to assign to the benefit items a weighting that reflected the respondent's relative importance of the particular item. In this round, data collection was carried out via an online web form, with separate logins for the different expert panels. The participants were provided with the list of frequently mentioned process modeling benefits (we defined 'frequently mentioned' as each item that was mentioned more than once in the first two rounds). The lists for each Delphi study group also included the consensus definitions of the process modeling benefits and were ranked by frequency of occurrence in descending order. Overall, there were 19 process modeling benefits that were mentioned more than once in the previous Delphi rounds across all groups. Per group, coincidentally, a list of 14 benefits was mentioned in that group's earlier study rounds more than once. Each participant was given 100 points to assign across any of the 14 benefits. The participants were free to assign the 100 points in any distribution, with the only condition being that exactly one hundred points were assigned across the list.

The collected data was analyzed, and the average weightings of each process modeling benefit were derived. From these calculations, we were able to derive top 10 lists of business process modeling benefits, based on the average weightings, for each of the three Delphi study groups. The results are listed in the Appendix and form the basis of the classification of results described in the next section.

3.2 Classification of Results

To better understand the nature of the core process modeling benefits, and their potential impact on organizations and their investments, we sought to classify the benefits into categories based on a benefit typology. A review of literature on the classification and realization of benefits in Information Systems as well as Management domains uncovered several classification schemes [e.g., 23, 24, 25]. We selected Shang and Seddon's [23] benefits classification framework, which is a widely cited and established framework for classifying the benefits of enterprise resource planning (ERP) systems, and its five main dimensions, *viz.* strategic, organizational, managerial, operational, and IT infrastructure. A review of the framework, and its twenty-one sub-dimensions, revealed a close fit to process modeling and process improvement initiatives (for example, sub-dimensions of *cost reduction, cycle time reduction, quality improvement* are directly relevant to processes). Other benefit classification schemes, for example Murphy and Simon's tangible versus quantitative and temporal benefit classification schemes [24], would have been less prescriptive in light of the data available, and would have hence resulted in a biased classification.

We adopted the five dimensions of the framework for our purposes and use the dimension definitions, as listed below, and the sub-dimensions in [23] to guide the mapping process (scope modifications highlighted in *italic*):

- **Strategic benefits:** Benefits *from process modeling* for strategic activities such as long-range planning, mergers & acquisitions, product planning, customer retention.
- **Organizational benefits:** Benefits *from process modeling* to the organization in terms of strategy execution, learning, cohesion, and increased focus.
- **Managerial benefits:** Benefits *from process modeling* provided to management in terms of improved decision making and planning.
- **Operational benefits:** Benefits *from process modeling* related to the reduction of *process* costs, increase of *process* productivity, increase of *process* quality, improved customer service and/or *reduced process execution time*.
- **IT Infrastructure benefits:** Benefits *from process modeling* relating to the IT support of business agility, reduction of IT costs, reduced implementation time.

The adoption of the framework allowed us to map benefits from each of the three top ten lists to one of the five dimensions. In turn, this mapping provides a clear representation of the types, and potential impacts, of process modeling benefits perceived by the three Delphi study participant groups. Similar to the coding exercise discussed earlier, the mapping of the top 10 lists of benefits used a multi-coder approach in order to reduce bias in the classification. Four members of the research group separately classified each benefit on the process modeling benefit list for each of the three study groups. The classifications were then consolidated and agreement statistics were calculated. We estimated inter-rater agreement using Cohen's Kappa [26]. In the first round, we achieved a Kappa of 0.369, which is considered somewhat moderate [27]. In a second round, we then consolidated the individual mappings. In particular, the consolidation involved a review of situations where the four coders had mapped a benefit to a combination of organizational and managerial benefits. Due to some subjectivity in separating organizational and managerial benefits, and due to the overlap in their definitions, situations in which majority rule was exhibited (i.e., three coders

mapped a benefit as managerial and one as organizational, or vice versa) were deemed to be classified according to the majority-rule benefit type. We calculated the second round inter-rater agreement using Brennan and Prediger's variation of Cohen's Kappa [26], which was modified to allow calculation of agreement in instances with more than two coders present, and achieved a free-marginal Kappa of 0.639. The obtained Kappa result is classified as one of "substantial agreement" and is the second highest possible Kappa outcome that indicates inter-coder agreement [27]. After these two rounds, the four research team members discussed and amended the mappings until 100% agreement was reached.

4 Findings and Analysis

The design of the study allowed us to derive lists of top 10 process modeling benefits as perceived by three groups of process modeling stakeholders. The full details of each list, including rankings of the benefits based on their centrality, are presented in the Appendix. Inspection of these lists shows that the three groups of stakeholders differ markedly in their perceptions of benefits. While practitioners and vendors share the most commonalities, the academics in general have more dissimilar perceptions of benefits.

Most notably, both the practitioner and vendor groups agree that *process improvement* (the greater ability to improve business processes) is the top process modeling benefit. Similarities also exist in the perception of *understanding* (the improved and consistent understanding of business processes) as a core benefit, being ranked as #2 and #3 respectively by vendors and practitioners. Academics, however, perceive *model-driven process execution* (the ability to derive process execution code from process models), which is not identified by practitioners at all, as the number 1 benefit derived from process modeling activities. The relative mean rating (13.44[1]) indicates that this perception by academics is a particularly strong one. Indeed, it is the strongest weighted item across each of the three lists. Notably, vendors rank this benefit fifth in their top 10 list, with a mean rating of 8.17. The Academics group also identifies *process simulation* and *process verification* as some of the top-5 process modeling benefits – benefits that are not identified by practitioners or vendors, indicating a gap in perception and priorities between academia and industry.

Focusing specifically on the practitioner top 10 process modeling benefits list, we obtain some insights into the drivers of process modeling in organizations. The list of benefits indicates that practitioners make use of process modeling not only to improve processes and measure their performance, but also to elicit, determine and specify system requirements. Moreover, practitioners see advantages in the use of process models to support the identification, capture and management of organizational knowledge, as well as to support business change management practices. Uniquely to the other stakeholder groups, practitioners also realize the value of process modeling in assisting the alignment of organizational practices with organizational goals or other strategic perspectives.

[1] Recall that participants were asked to distribute 100 points to the list of identified benefits based on the perceived importance.

In respect of the main *types* of benefits that can be obtained from process modeling, Table 1 shows the results of the mapping of process modeling benefits to Shang and Seddon's benefit framework [23].

Table 1. Top 10 business process modeling benefits for each Delphi study group

	Strategic	Organisational	Managerial	Operational	IT Infrastructure
1				P, V: Process Improvement	A: Model-driven Process Execution
2		V, A: Understanding	P: Process Performance Management		
3		P: Understanding V: Communication		A: Process Improvement	
4			P: Change Management V: Process Performance Management A: Process Simulation		
5				P: Requirements Specification A: Process Verification	V: Model-driven Process Execution
6		A: Communication	P, V: Process Analysis		
7		P: Communication V: Knowledge Management		A: Re-use	
8	P: Alignment	A: Documentation	V: Transparency		
9		P: Knowledge Management	V: Visualisation		A: Ease of Use
10		A: View Integration	V: Governance	P: Re-use	

P: Practitioners, V: Vendors, A: Academics

The clearest indication from the benefit framework mapping is that process modeling in itself does not have significant strategic benefits beyond the improved ability to align business processes with strategic goals or other perspectives. One would expect that the core strategic benefits would derive from Business Process Management initiatives, rather than the initial stages of process modeling. IT infrastructure benefits are also not well represented in process modeling initiatives, with mostly Academics considering some benefits of this type. Because process modeling can be performed without IT support, it is not surprising to see a lack of benefits of this type, particularly from the practitioner perspective. The majority of benefits lie in the organizational and managerial dimensions, with the operational dimension also being well represented. Operational benefits in particular were to be expected given the close link between process modeling and process improvement initiatives. Further investigation of the organizational and managerial benefits indicates that many benefits are intangible in nature – consider, for instance, benefits such as improved transparency, or visualization – indicating why some benefits are hard to demonstrate to executive management in early stages of modeling projects.

Regarding similarities in perceived process modeling benefits across the three groups, we note that of the overall thirty top benefits, the three lists contain 19 unique

items, with three process modeling benefits, *viz. process improvement, communication,* and *understanding,* appearing in all three lists, and 5 further benefits appearing in two of the three lists. In Table 2 we present a consolidated ordered list of perceived process modeling benefits across the three stakeholder groups, ranked by the combined average rating and equal weighting of each group independent of the number of participants. We also include in Table 2 the consensually agreed definitions of the overall top ten perceived benefits.

Not surprisingly, support for *process improvement* is identified as the core benefit of process modeling initiatives, followed closely by improved and consistent *understanding* of organizational processes. The third identified main benefit of process modeling is the improved *communication* between process stakeholders and various departments through the use of process models. Interestingly, *model-driven process execution* (a hotly debated topic in academia [e.g., 28]) is the overall fourth ranked process modeling benefit despite the lack of ranking by practitioners. Its high standard deviation – the highest of all benefits in the overall top 10 list – confirms a significant difference of opinion between the three stakeholder groups.

Table 2. Overall (across all 3 stakeholder groups) top 10 business process modeling benefits

Rank	Issue	Description	Mean Rating	Std. Dev.
1	Process improvement	Greater ability to improve business processes	11.452	1.452
2	Understanding	Improved and consistent understanding of business processes	10.787	1.861
3	Communication	Improved communication of business processes across different stakeholder groups	7.539	0.909
4	Model-driven process execution	Ability to facilitate or support process automation, execution or enactment on the basis of the models	7.202	6.771
5	Process performance measurement	Issues related to the definition, identification or modeling of adequate levels of process abstraction.	6.207	5.464
6	Process analysis	Greater ability to model processes to analyze them for possible problems, and/or time/cost reductions	5.266	4.619
7	Knowledge management	Support for identification, capture and management of organizational knowledge	4.276	3.721
8	Re-use	Greater ability to re-use previously designed and validated processes	4.006	3.496
9	Process simulation	Greater ability to see how a current or re-designed process might operate, and its implications	3.093	5.357
10	Change management	Support for business change management practices, results or impacts	3.035	5.256

5 Discussion

The three lists of top 10 benefits derived from different stakeholder groups (refer to the Appendix), and the differences between the lists, allow us to comment on the

presence of realized and unrealized benefits of process modeling. We consider practitioners to have the most accurate perception of process modeling benefits in light of actual demands, constraints, modeling capabilities and economic realities. This presumption is because practitioners have first-hand experiences and observations of process modeling initiatives on a daily basis. By contrast, we consider the benefits perceived by academics to be benefits that are mostly yet to be realized in practice, due to the academics' insights into leading research and future developments in the process modeling domain. We expect that vendors, being boundary spanners between academia and industry, perceive the benefits they observe through their clients as well as through provision of new tool or methodology solutions, and changes in the overall business environment.

In other words, we consider the benefits ranked in the practitioners' list to be a representation of benefits that organizations considering process modeling realistically want and expect to achieve. This includes benefits such as *process improvement, process analysis, performance measurement, requirements specification,* and *knowledge*.

The practitioners' and academics' perceptions of process modeling benefits share only four common items, *viz. understanding, process improvement, communication* and *re-use*. Beyond these items, the benefits mentioned by the academic study group appear to be benefits that are yet to be realized in practice. In particular, benefits such as *model-driven process execution* – the ability to facilitate process automation on the basis of conceptual process models – or *process verification* – the ability to verify the syntactical and behavioral correctness of processes on the basis of the models – are benefits that have a stronger link to leading research and prototypes, rather than existing practice. Accordingly, we see the benefits perceived by academics as the future benefits that may be realized once leading research is incorporated into software tools and consultancy offerings by vendors.

Vendors of tool and consultancy offerings, therefore, represent a cohort that is able to observe and influence current process modeling practice whilst at the same time identify novel features or practices from leading research that will be incorporated into future tools or consulting practices. As such, they are positioned as the ideal boundary spanners between these two communities. Given the lack of continuous interaction between practitioners and academics, we see vendors as the 'bridge' that will assist the transition of unrealized benefits to realized benefits. The vendors' list of benefits has in common five benefits with the practitioners' perception, and it also includes benefits that appear to be linked to the current business environment. In particular, benefits such as *transparency, visualization* and *governance* appear to be related to the increasing expectations of compliance to legal and regulatory mandates. We would expect that such benefits will be on the radar of organizations in the near future, especially as the cost of compliance management in organizations increases.

However, it could also be argued that perceived benefits are an explication of the drivers that motivate dealing with an issue, i.e., here process modeling. The significant disconnect that can be observed in the comparison of the two lists of academics and practitioners potentially also points to a misalignment of allocated research resources to practical demands. Process execution, verification and simulation offer without any doubt countless intellectual challenges. However, there is a serious

danger that these topics keep a large research community entertained without a sufficient validation that these topics sufficiently matter in practice.

Overall, we see the lists of top 10 benefits as indicative of several situations. The list of practitioners' process modeling benefits suggests currently realized benefits of process modeling. Nevertheless, our own experiences indicate that many organizations still struggle to justify investments in process modeling initiatives. Many of the benefits agreed on by practitioners are indeed benefits that are intangible in nature, difficult to quantify, and for which it is difficult to make a business case. Accordingly, we see a need for the exploration and publication of success and failure case studies relating to these benefits, and in general for further research that explores how such benefits might be measured or estimated. The list of vendors' top 10 process modeling benefits indicates some adoption of leading research and indicates moves towards better visualization of processes as well as support for automation of processes based on conceptual models. The list of top 10 benefits as perceived by academics is indicative of some lack of awareness of the state of current practice in industry, combined with a focus on research developments in the process modeling domain. In particular, benefits such as process verification and view integration are topics that are at current principally discussed in academic literature [e.g., 29]. While process verification, for example, is already available in some prototype tools, it is clearly not yet seen as beneficial to industry practice as the academic community perceives it to be. Accordingly, we see a need for increased communication between academia and practice to better align academic research. Thoroughly identified lists of perceived benefits, as presented in this paper, have without any doubt the potential to re-shape current research agendas. At the same time, they can assist the adoption of research innovations in the process modeling domain to practitioners, and provide further arguments for the wider uptake of process modeling.

6 Conclusions

This study addresses a gap in research on the benefits that can be expected from process modeling initiatives. Through a global Delphi study, we explore the benefits of process modeling, as perceived by three stakeholder groups, *viz.* practitioners, vendors and academics. The study shows that the top 3 expected process modeling benefits are those of *process improvement, understanding* and *communication.* The study also indicates that practitioners also see the benefits of process modeling beyond its link to process improvement. For example, practitioners indicate that requirements specification and knowledge management are also some of the top 10 benefits obtained from process modeling initiatives. Our analysis further shows that the three stakeholder groups have varied perceptions of process modeling benefits, indicating the difference between *realized* benefits in organizations and *unrealized (i.e.,* potential) benefits. The study also highlights the intermediary effect of vendors in helping to transition some of the *unrealized* benefits (as perceived by academics) to realized benefits in actual process modeling practice.

We identify the Delphi study approach as a potential limitation in our work. Delphi studies are said to be susceptible to a number of weaknesses including (1) the flexible nature of study design [13], (2) the discussion course being determined by the

researchers [11], and (3) accuracy and validity of outcomes [30]. In our study, measures were taken to minimize their potential impact. Such measures included: (1) establishing assessment criteria for measuring inter-rater agreements; (2) use of multiple coders; (3) using multiple coding rounds and (4) following established methodological guidelines for the conduct of Delphi studies [e.g., 14, 15, 21].

In our future work we seek to provide a detailed analysis of additional qualitative responses gathered in a later fourth round of the study, which exposed the top 10 lists to all participant groups and elicited the comments of the participants. We plan to synthesize the results with those on process modeling issues and future challenges, collected as part of a larger study [9].

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Appendix

Rank	Practitioners		Vendors		Academics	
	Benefit	Mean Rating	Benefit	Mean Rating	Benefit	Mean Rating
1	Process improvement	11.24	Process improvement	13.00	Model-driven process execution	13.44
2	Process performance measurement	10.29	Understanding	10.17	Understanding	12.88
3	Understanding	9.32	Communication	8.56	Process improvement	10.12
4	Change management	9.11	Process performance measurement	8.33	Process simulation	9.28
5	Requirements specification	8.84	Model-driven process execution	8.17	Process verification	7.84
6	Process analysis	8.63	Process analysis	7.17	Communication	6.80
7	Communication	7.26	Knowledge management	6.78	Re-use	6.44
8	Alignment	6.74	Transparency	6.44	Documentation	5.88
9	Knowledge management	6.05	Visualization	5.78	Ease of use	4.92
10	Re-use	5.63	Governance	5.44	View integration	4.64