"Simply Modeling": BPM for Everybody-Recommendations from the Viral Adoption of BPM at 1&1

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Abstract

(a) **Situation faced**: 1&1 is a German Internet service provider that embraced business process management (BPM) in 2010 as a way to optimize its processes. The company expected BPM to increase corporate performance by realizing such customer-centric goals as high quality standards, reduced set-up times, shortened time-to-market cycles, and increased adaptability to changing customer requirements. 1&1 decided to use the Business Process Model and Notation (BPMN) for its business process models, but the specification offers no pragmatic advice on how to introduce and adapt the modeling method in a company. 1&1 started with a conceptual process architecture—a lightweight process modeling infrastructure—and invested in a BPM initiative using a bottom-up approach. The resulting viral spread of BPM led to a "success disaster" with a high adoption rate and a high number of models but low model quality.

(b) **Action taken**: 1&1 turned around the proliferating trend of low quality and barely usable process models by means of carefully targeted decisions. An initial analysis showed that the key factors in the disastrous situation were insufficient training and the lack of modeling conventions. While no changes were made to the process architecture, the company increased the integration of system architecture components, resulting in improved knowledge management as increasing amounts of information became retrievable through the enterprise information portal. Quality assurance

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was mandated through a few selected modeling conventions to guide and constrain but not restrict the modelers. Finally, the BPM initiative grew larger with more volunteer trainers and more differentiated courses that helped to ensure an appropriate level of process modeling competence for each employee's tasks.

(c) **Results Achieved**: Because of its lightweight implementation, BPM at 1&1 can enable continuous process adjustments triggered by any employee at any time and on every level, so it can achieve short time-to-market for core business products and services, as well as rapid changes in business processes. Business knowledge and expertise is extracted from all of the company's corporate levels and is merged and presented in the process models. The company currently uses as its production environment the Signavio Process Editor, which relies on a repository of more than 12,000 process models and more than 1800 active process modelers.

(d) **Lessons learned**: The BPMN specification provides no guidance on how to introduce and use BPMN in the individual corporate context. While it is often useful to follow a reference approach for the adaptation and use of a modeling method and the associated IT infrastructure, there is none available for BPMN. Based on the 1&1 case, we present recommendations that can be considered best practices for setting up and steering a large-scale BPM initiative based on process modeling that emphasize process modeling technology, user training, modeling regulations, employee management, and time management.

1 Introduction

On March 29, 2016, Martin Petry, expert in business process management (BPM) at 1&1, gave another training course on Business Process Model and Notation (BPMN). Petry's training courses, which contain a high degree of interaction between trainer and participants, had been held since 2010, but this one was different. At the beginning of the course, Petry often asks attendees to say in what department they work, and the participants often answer that they work in such departments as finance, human resources, and customer support, but most of them work in one of the technology and development departments. On that day, however, not a single person with a technical background was in the room. Although the number of participants from non-technical departments had been increasing, this was unusual because the historical nucleus of BPM was the technology and development department, which had a clear focus on executable processes. "This has never happened before," Petry pointed out, going on to associate this phenomenon with how process modeling has spread in the company. Apart from the introductory event in which new employees learn about the availability of the BPMN training courses, there is no central initiative or dedicated program that obligates employees to take part. Instead, Petry likens the situation to a *viral dissemination* of modeling in 1&1.

In this context, "viral" refers to a behavior that spreads quickly and widely using person-to-person communication (Merriam-Webster Online Dictionary 2016). Translated to 1&1, "viral" behavior means that there is no need to motivate people to take part in such training nor to increase participation levels by stressing the value of modeling because, as employees who have participated in the trainings have observed, "We make full use of process models in our finance department [so] I need to deal with them" and "Processes are ubiquitous in meetings, working instructions, etc., [so] when I became aware of that, I enrolled in the next BPM training immediately."

Of course, this viral behavior was not present from the outset; it was a gradual process that started with a customer-facing project. As a turning point while progressively developing BPM, 1&1 experienced a "success disaster," as Petry calls it. Because of the lack of pragmatics in the BPMN specification, large quantities of qualitatively low-quality process models spread throughout the enterprise. The models could not be executed within the BPM environment, and continuous maintenance of such a large quantity of process models was out of the question. However, despite these difficulties in the adoption of BPM in the initial few years, 1&1 has managed to institutionalize BPM in a way that not only overcame these difficulties but also increased the company's efficiency and led to the rise of a community of cooperative process modelers who virally spread the idea of process modeling throughout the entire enterprise.

Several factors were decisive, including adapting a process architecture, interventions in the training concept, and adjusting the level of governance. Therefore, the case of 1&1 offers a set of best practices on how to adopt BPMN in large companies and how to support the development of a collaborative community of process modelers. In order to depict the development as a whole, we first recapitulate the prerequisites for BPM when it was first implemented at 1&1. We then detail the adjustments that were introduced in response to the "success disaster." Finally, we describe a set of best practice recommendations, which are discussed in the lessons learned section. This case shows that even large companies can implement BPM in a bottom-up and lightweight way that neither restricts modeling nor leads to inflexible structures.

2 Situation Faced

2.1 Origin of BPM at 1&1

1&1 is a German Internet service provider whose head office is in Montabaur, Germany. It specializes in Internet-access products and hosting and e-business solutions in the cloud. Companies like 1&1 operate in highly competitive and dynamic markets that are characterized by rapid price changes, increasing interchangeability of products, and/or short product lifecycles. Participants in such markets have no guarantee of long-term prosperity, so enhancing productivity increasingly appears to be a key factor to success. As a result, companies began

to reflect on their business processes to maximize their performance (Dumas et al. 2013). To provide companies with the ability not only to depict process models but also to analyze and improve them, the Business Process Management Initiative (BPMI) and later the Object Management Group (OMG) published BPMN in 2004. The notation has evolved to become today's de-facto standard for process modeling and is used in companies all over the world (Recker 2010). Its current version also includes execution semantics (OMG 2013).

1&1 acknowledged the merits of BPMN's graphic representation in managing business processes when the enterprise delved into BPM as a way to optimize its processes in 2010. Gradually superseding a function-oriented management approach implemented by an enterprise resource planning system, BPM was initially intended to support the simultaneously launched Customer Satisfaction Offensive (CSO). (This approach is common in other companies as well.) In doing so, 1&1 sought to increase corporate performance by realizing such customer-centric goals as high quality standards, reduced set-up times, shortened time-to-market cycles, and increased adaptability to changing customer requirements. The CSO primarily dealt with process standardization and automation with the initial goal of making processes executable, but over time it became key to promoting BPMN as the graphic representation of business processes. Employees recognized the ease of using process diagrams as a means of communication in a process-oriented enterprise.

BPMN became a popular means of communication, although using the notation was not always straightforward. A lack of clarity concerning linguistic subtleties yielded to uncertainty, redundant design, and even low-quality process models, partly because, in contrast to its well-defined syntax, the BPMN specification (BPMI 2004; OMG 2013) offers no pragmatic advice on how to introduce and tailor the modeling method to a company's needs. Several general purpose frameworks are available (e.g., Becker et al. 2011; Rosemann and vom Brocke 2010), but not all were as refined in 2010 as they are today, and they often do not focus on modeling or BPMN. Specific advice on how to adapt and institutionalize BPM(N) outside a consulting project is scarce, so 1&1 had to take matters in its own hands.

2.2 Prerequisites and Early Decisions at 1&1

Here we introduce 1&1's process architecture and its IT infrastructure. Figure 1 shows the *system architecture*, which consists of a *Process Editor*, a *Business Process Management System (BPMS)* for executing processes, an *Enterprise Information Portal (EIP)* for gathering and analyzing information from across the enterprise, and a connection to the organizational user management using an *Identity Management System (IMS)*. The EIP is a tailor-made portal for importing data from other systems and providing data via sophisticated information-retrieval options. The EIP also takes care of in-house knowledge management. We refer to knowledge management at 1&1 as "the systematic and explicit management of

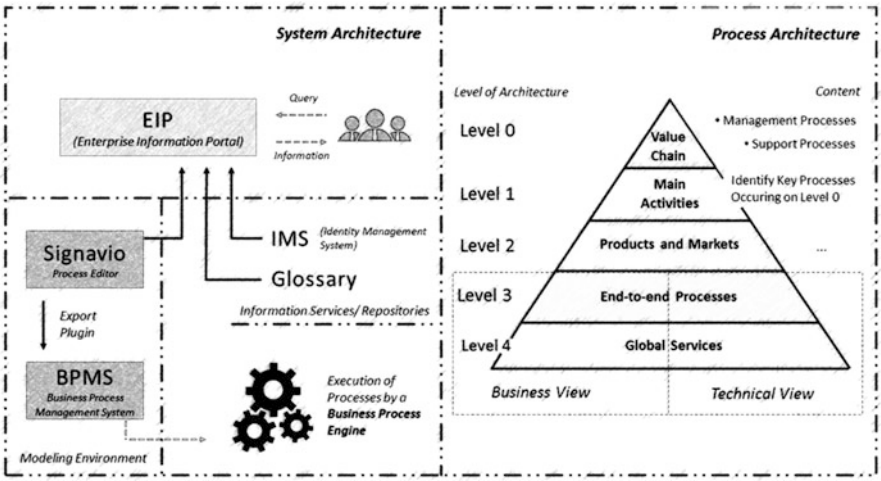

Fig. 1 System architecture and process architecture at 1&1

knowledge-related activities with the goal to build and exploit intellectual capital effectively and gainfully" (Wiig 1999, p. 3–3).

The five-level *process architecture*, which provides an overview of the existing processes by classifying them into levels of abstraction, is depicted symbolically as a pyramid. The interplay between the system architecture and the process architecture helps to integrate an intuitive-to-use modeling environment in order to integrate BPM fully into the company.

However, in order for the architecture to function as intended, 1&1 had to meet five prerequisites. First, 1&1 had to identify the value-adding processes and map them in an overall framework. At 1&1, the process architecture starts with *level 0*, the highest level of abstraction, where management and support processes are displayed as value chains and the management processes are kept simple and functional. They are based on four core activities, which cover the full spectrum of added value, such as *Offer to Order* and *Order to Fulfillment*. Each management process has sub-processes, such as the new orders, tariff change, and termination of a contract sub-processes for *Order to Fulfillment*. The main activities on *level 1* identify the key processes that complete the business transactions that occur in the value chains (level 0). *Level 2* clarifies which product- and market-specific variants exist to implement the main processes. *Level 3* is the most important layer for modeling, as it covers the end-to-end processes. On this level, specific tasks are depicted that describe how a specific business case is performed. On *level 4*, global services, which support the execution of level 3 processes, are detailed.

Management processes are clearly communicated to employees, but there is no substantial limitation or constraining guidelines for modeling on lower levels, especially on level 3. The process architecture is neither fully or centrally managed nor—with the exception of level 0 and level 1 processes—prescribed in its structure

and content. The process architecture with all its processes is often referred to as a process map or a *process house*. (The meanings of the terms *process architecture* and *process house* differ only slightly at 1&1, where the process architecture describes the overall structure of the five levels of processes in the enterprise, and a process house is a running instance of the process architecture that is adapted to the needs of the particular department to which it is applied. Consequently, each department has its own process house that adopts its activities on level 0 and level 1 from the overall architecture but acts independently on levels 2, 3, and 4.)

As a second prerequisite, 1&1 had to develop a suitable *system architecture* to support the modeling and execution of processes (Fig. 1). For modeling purposes, 1&1 uses the *Signavio Process Editor* (Signavio GmbH 2016), which can be used either as software as a service (SaaS) or as on-premises software. 1&1 runs the latter, a self-hosted deployment model, to escape receiving the automatic updates of SaaS applications that are subject to increased risk of integrity issues with pre-existing models (Cheng et al. 2010). Such is the case in particular for executable process models. Signavio's process model editor appealed to 1&1 because of its ease of access and ease of use.

Third, 1&1 had to decide which management approach to apply for BPM: a *bottom-up approach* or a *top-down approach*. The OMG offers no official support regarding how to implement BPMN and its methods and procedures into an individual business environment—the *pragmatics* of modeling (Freund and Rücker 2014; Imgrund and Janiesch 2016; Zur Muehlen et al. 2010)—so 1&1 had no substantial advice on implementing its process architecture, ensuring the system architecture's integrity, or selecting an appropriate direction of action. The last is the reason for highly varying application scenarios in practice (Bjeković et al. 2014), which focus on either strong top-level management support or a more user-oriented bottom-up approach.

Fourth, 1&1 had to choose between a top-down or a bottom-up approach for BPM. It chose a bottom-up approach in part because it did not want to create only a small user base that can read and create process models, but instead wanted to make the capability of modeling available to a large number of employees. When 1&1 decided to apply a bottom-up approach, it was aware of its large number of product-specific processes with a strong focus on technical feasibility using the BPM system, but the company follows a highly user-oriented modeling approach and does not want to neglect the actual users' needs. Furthermore, 1&1 considers activities on level 3 as its starting point for each modeling activity, so it rejected a fully managed process architecture and accepted the risk of isolated, stand-alone solutions for specific problems.

Finally, 1&1 started a small *BPM initiative* to provide governance, to keep the technical infrastructure operative, and to teach modeling by providing training. Even if processes play a central role and can be found everywhere in the enterprise, Petry is the only person who is responsible for BPM full time. All other BPM coaches are volunteers a variety of divisions, although most are from the technology department.

2.3 The *Success Disaster*

As a result of its bottom-up approach, 1&1 observed a rapid spread and popularity of process modeling in the enterprise shortly after it was introduced—that is, BPM "went viral." However, this development did not provide only benefits for the company. What at first seemed positive when thinking about 1&1's objectives emerged as problematic in 2013, when the enormous number of new users (i.e., process modelers) and new process models became a serious organizational and administrative challenge. As Petry explains, "In light of the significant number of process models, in a certain sense it was not clear whether this was a success, a disaster, or both." The reasons for this initially mixed assessment of the approach's outcome were closely related to the quality of these models.

3 Action Taken

3.1 Identification of Issues and Associated Responses

1&1 has an operational system architecture and a well-structured process architecture that carry the company's vision. At first glance, neither the process architecture nor the system architecture differs significantly from that found at its peer companies. 1&1 provides training to enhance its employees' modeling capability, but it faced serious organizational and administrative problems with BPM in 2013. However, during this success disaster, another unplanned effect of the approach became apparent: the employees at 1&1 used almost every opportunity to share process models. Despite the suboptimal quality of some of these models, 1&1 identified a promising advantage in this mentality of "simply modeling" as offering the potential and opportunity to transform 1&1 into a highly process-oriented enterprise. Consequently, the first activity in addressing the success disaster was to identify causes that contributed simultaneously to the initiative's success and failure. 1&1 also sought to identify effective countermeasures for the issue of poor-quality models while retaining the drive of the grass-rooted viral effect. Naturally, the number of users—about 2000 process modelers by 2016—and the approximately 12,000 shared process models were a main reason for the models' erratic quality. Variance is to be expected with such numbers because, as Petry puts it, "At 1&1, you can compare the creation of process models with the creation of a PowerPoint presentation: no one asks for a specific use case of a single model. No matter if a process model maps an executable process or if it is just for individual use or serves as a basis for discussion, there is virtually no limitation for the case of process modeling."

Despite the resulting low quality of many process models, 1&1 did not want to reduce or limit this development, as it considered employees' eagerness to engage in modeling as a highly positive improvement and provided access to every employee who was interested in modeling. Hence, 1&1 tried to strengthen this

Table 1 Objective of actions taken, divided by area

Area	Actions	Objective
Process architecture	None	– Five-level architecture with end-to-end processes on level 3 – Adoption of a bottom-up approach to guarantee an open system architecture
System architecture	Minor adjustments	– Full integrity and availability – Full interoperability of all software programs and tools
Quality assurance	Minor adjustments	– Improved training system – Increased number of volunteers – Enterprise-specific modeling conventions without too many restrictions
BPM initiative and governance	Minor adjustments	– Ensuring both the quality of modeling and the functioning of the overall process architecture, without enforcing overly restrictive quality rules – Maintaining the quality of BPM in full at a high level using volunteers and by spreading important content throughout the enterprise
Knowledge management	Major adjustments	– EIP as a central operational database that is fed with data from all relevant systems – Availability of structured data – Availability and company-wide access

phenomenon with several adjustments, such as automated rule checks, that were intended to improve quality while not constraining users with too many guidelines.

At first glance, insufficient training may have been seen as the only cause of poor-quality models and as a bottleneck for improving model quality. However, a detailed investigation of possible reasons revealed that the causes for the situation were more complex. Hence, 1&1's sophisticated reaction multiple interdependent factors into consideration.

Table 1 displays each area that is associated with process modeling activities and the important adjustment opportunities for improving the quality of modeling in a process-oriented enterprise like 1&1. In the case of the process architecture, 1&1 decided that no further adjustments were necessary.

3.2 The Technical Baseline: Process Architecture and System Architecture

The general *process architecture* outlined above worked well and was not affected by the changes made to increase model quality, so no action was taken.

The *system architecture* is the process architecture's technological counterpart. The four core applications—the Signavio Process Editor, the BPM system, the EIP, and user management—have to be synchronized, which entails a full integration of and interchangeability between the tools. Therefore, a primary focus lies on the EIP, as it may be represented as the nerve center of the enterprise. All information that is relevant to the day-to-day business is gathered or linked here, so not only are

access and links made to all shared process models from Signavio, including metadata and information about employees and their organizational units, etc., but the EIP is fed through interfaces to almost all of 1&1's systems (e.g., tracking and project management tools, intranet, contact databases). The minor adaptions mentioned in Table 1 deal with interface-connection optimizations to the applications. For example, the attachment of an extended glossary to the system architecture enables Signavio to reuse document templates or system-specific information.

3.3 Improving Process Modeling Quality: Quality Assurance

Meaningful data is the backbone of today's enterprises, as there are strong relationships between data quality and system quality (Wixom and Watson 2001). However, because of 1&1's user-oriented approach to modeling, it is a major challenge to have not only quantitative data but also qualitative data. To improve data quality sustainably, 1&1 had to put several measures into place. The *quality-assurance measures* included training and the nature and content of modeling conventions.

Concerning the organization of *training*, 1&1 increased both the number of trainers and the frequency of training. The main topics in the 1-day basic course on BPM—"Introduction to BPM and BPMN," "Introduction to Signavio," and "Modeling with Signavio (hands-on)"—have not changed much, but short, 2-h courses offer interested employees the opportunity to deepen their knowledge by learning how to build high-quality process models and learning about topics like release notes on new Signavio versions.

Petry has remained the only full-time employee responsible for BPM, while each of the other eleven trainers teaches voluntarily. Course announcements and the internal marketing also remain unchanged; only new employees are specifically made aware of the courses in their introductory event. There are other ways employees can be informed about courses, although none is actively promoted. Even incentives to take part in such courses barely exist.

At the same time, the *modeling conventions* have been tightened. 1&1 takes a clear stand in giving as much freedom as possible and constraining or restricting only where it is deemed necessary and/or useful to do so, such as in providing conventions that prevent common pitfalls. Signavio distinguishes between "errors" and "warnings," as the software's rule engine recognizes both but treats them differently in the conventions: if the process model contains one or more errors, the modeler is required to correct them in order to save the diagram, but if the process contains warnings, the software tool merely warns the modeler with a listing of the findings. While warnings might be incorrect or missed labels, errors might refer to mandatory fields or type definitions in the process model. For example, if the type of the process model is missing, the modeler can choose the process to be a level 3, a level 4, or a sub-process. If nothing is suitable, the process model can be clarified as unofficial. If the modeler chooses level 3, the process has

to be associated with the appropriate part (or sub-part) of the value chain, and if a process is declared to be executable, an operator has to be clarified.

Beyond errors, 1&1's modeling conventions advise its process modelers that a task should have only one input and one output, that an AND gateway should not merge with multiple conditions, and that a process name should follow a specific format. Other than errors, recommendations do not prevent the modeler from storing the process model but indicate that there are shortcomings in the model, as minor conventions have been violated.

However, 1&1 does not restrict the modeler in other areas, such as regarding limitations on a process's granularity, which is directly dependent on the objective of the model. Because of the variety of modeling cases in the enterprise, 1&1 sees no value in limitations on that level. The same applies to the folder structure in the modeling tool, as there is no higher-level control system on the naming or the structure of folders and no restriction on how to classify process models. The adjustments in response to the success disaster tended to be subtle changes that took the form of minor adjustments to the conventions.

3.4 The BPM Initiative's Lean Governance

The main task of the BPM initiative at 1&1 is to guide the development of BPM and process modeling to ensure transparent and high-quality processes with a focus on practicability. It is fair to assume that the workload increased significantly after the activities related to the quality-assurance measures were introduced, yet there were no changes in support for Petry. Petry's main duty is to coordinate and execute governance activities and to increase the quality of modeling sustainably. However, to meet the increasing demands, Petry is supported by a growing number of qualified volunteer trainers, who deliver, according to their skills, basic courses, advanced courses, or intensive (short) courses on selected topics. Since all courses could hold interest for each of 1&1's employees, there are no barriers to participation—but there is also no obligation to participate.

For their part, the approximately 50 BPM coordinators, act as multipliers in the enterprise by attending regular meetings and spreading news concerning BPM or modeling to their departments. While the BPM initiative coordinates the overarching governance at 1&1, the same activities on the department level are left to the multipliers, who decide what information is relevant to their particular departments.

3.5 Making Knowledge Visible

Knowledge management is increasingly critical in the management of an enterprise's corporate memory and intellectual assets (Geisler and Wickramasinghe 2015). The purpose of knowledge management is to generate and provide meaningful information to the right people at the right time (Duffy 2001). 1&1 is aware

of the need for a high-quality knowledge database to prevent another proliferation of low-quality process models.

The main focus and effort in this area was to make knowledge centrally and transparently available. In doing so, knowledge management provides a way to make employees' tacit process knowledge retrievable by other colleagues. The increased networking of systems plays a major role in this context, as the system architecture provides the basic building block of any activities in this area. Knowledge management was also already available to employees who regularly used Signavio. The necessary skills consist merely of identifying and structuring important knowledge and making it available to stakeholders, the latter of which was achieved by using the centrally available EIP as the access point. Actions like introducing a ranking algorithm for processes and an intelligent search function now assist in the purposive representation of the desired information, helping the users.

1&1's primary concern was to develop a sophisticated concept to improve the quality- and quality-assurance of models. Although the individual changes described here were minor, the result was more than the sum of the actions taken. Multi-annual and always progressing adjustments were necessary to sustainably increase the quality of modeling. 1&1 took the situation seriously, responded with focused actions while retaining the positive viral effect, and achieved not only a wealth of knowledge and experiences, but also the valuable results that are described in the next section.

4 Results Achieved

In 2013, 3 years after the introduction of BPM, 1&1 was in the middle of its success disaster. Today, after about 5 years of continuous adjustments and improvements, the enterprise sports a high-quality, mostly maintenance-free BPM approach that has created a highly dynamic and innovative process-oriented environment. A closer examination reveals two key aspects of the company's success in particular: An unusually strong viral spread of *modeling ability* and substantially improved *architecture*, *governance*, *quality assurance*, and *knowledge management*. "To be frank," Petry says, "neither development was expected on this scale, [but] [because of] the way BPM evolved and is applied, it is now an irreplaceable capability in the enterprise."

4.1 Benefits of Today's Situations

Here we explain the value of BPM from a user-centric perspective, taking the viewpoint of Ana-Maria, a *Solution Designer* at 1&1. We start from her first day at the enterprise:

"I already knew that 1&1 was a very process-oriented enterprise. Both my vocational education and my personal interests focused strongly on BPM. It did

not surprise me when I heard that there was a "BPM basic course" and the "availability of short courses on priority topics." However, the information that each employee could apply to be a potential trainer did. But after a few weeks at the enterprise and after completing the first two training sessions on BPM (basics) and BPM (advanced), the overall situation became clear. BPM can be found almost everywhere at 1&1 and it is on virtually everyone's lips. It's like, "Hey, how was that again with that order process?" and the answer is "Have a look at the process model; EIP or Signavio will link you, and you will find everything you need," or even "What do I have to do to in order to get my business trip approved?" and anyone would reply something like, "Search for 'business trip' in the intranet. The search results will link you to the process that describes how to apply and which documents to fill in. Don't forget to search for 'travel expense accounting.'" Almost any information you do need for your day-to-day business can be acquired through tool-based process models. The EIP is particularly useful when seeking helpful information."

In fact, asking questions using the EIP yields consolidated search-and-retrieve results from 1&1's distributed databases. Its index and data are updated every night. Without the need for additional input, this new solution designer can learn about literally every process that occurs in the enterprise. This structured and explicit knowledge base is also a useful tool to document tacit procedural knowledge, as another positive impact of the widespread use of modeling is the spread of modeling capability. Process innovation can occur at any employee level in 1&1's large and proactive user community, where everyone can help everyone. As a result, the company is a strong, cooperative workplace and has a high level of expertise regarding process modeling. The strong viral effect and the improved knowledge management is the overall outcome from the implementation of several sub-targets. We illustrate them using again the example our new process designer at 1&1.

The basic training on BPM taught Ana-Maria a lot about the basic infrastructure at 1&1. She learned about the activities in the value chain and their levels of abstraction, which form the enterprise's process architecture. At this point, she observed an important characteristic regarding the direction of action, as 1&1 uses both top-down and bottom-up approaches. While the activities of the value chain are prescribed using the top-down manner, the employees' activities, i.e. level 2 to level 5 processes, follow a bottom-up approach. Metaphorically speaking, drawers are provided that build the classification framework for activities on lower levels of the process architecture, and other activities are coordinated and carried out at the employee level. This approach not only reduces the administrative effort considerably but also gives the employees with a high level of responsibility. Therefore, it is up to the departments to optimize their functions and to build and manage their own processes and even their process house, which contributes to the value of the enterprise. Effectively, this approach for 1&1 applies to function-oriented departments like HR and finance as well as to departments that have to demonstrate consistency for auditing purposes.

Moreover, the direction of action affects how modeling is done at 1&1. As there is neither regulation nor restriction on the use case of modeling, once an activity *can* be supported by creating a process model, it *is* supported by creating a process model. By now, the resulting process models fulfill the quality requirements, demonstrating the success of the training courses and the viral spread of modeling capability.

Now that Ana-Maria has learned about the basics of BPM, she takes a short course that deals with the EIP. Once she hears a short explanation of the system architecture at 1&1 and a more detailed one on the EIP, she understands that the interplay between the components is a prerequisite for requests like "What systems are relevant to or affected by the process XY?," "To which processes am I linked?," "In which processes is System X used?," "In how many (and which) processes is my department involved?," or even "How many findings/errors (syntactical or semantical) do my process models include?." The high degree of crosslinking between the underlying systems makes the EIB a highly effective knowledge-management tool. Ana-Maria remembers the unguided folder structure in Signavio, which she at first interpreted as an obstacle to the management of processes and as difficult to understand for employees from other departments. However, in combination with the EIP, which sorts processes clearly, and depending on the needs of the user, the unguided folder structure turns out to be more advantage than disadvantage. Without an enforced structure, similar to a process house, the folders are governed by their users and so are generally up-to-date. The short course concludes with the statement that the EIP obtains its power by evaluating structured information from various data sources and providing bundled information in a central location—an added value that a tool run in isolation could not provide.

4.2 Capabilities Necessary for Success

On completion of the advanced training, Ana-Maria seized the opportunity to ask the trainer some questions. She wanted to know how a company with about 2000 process modelers could employ just one person working full time to coordinate the BPM efforts. The answer describes one significant characteristic that is most responsible for the whole concept's ability to work: everyone realizes that process modeling supports his or her daily work, so they not only use BPM but are also willing to help others directly or by delivering training courses. In addition, the lightweight restrictions imposed by the *modeling conventions* increase the *quality of modeling*. As Petry argues, "While it was almost impossible for a token in a process model to move from left to right a few years ago, today these errors happen rarely. Moreover, not only the quality of the process model is improved, but also its administrative management. Signavio forces the modeler to declare the type of the process so it can be classified and found more easily."

These lightweight adjustments entailed not only a viral spread of the models themselves but also a viral distribution of modeling capability. As Petry also notes, "The spread of BPM capabilities has accelerated at a rate no one expected. After

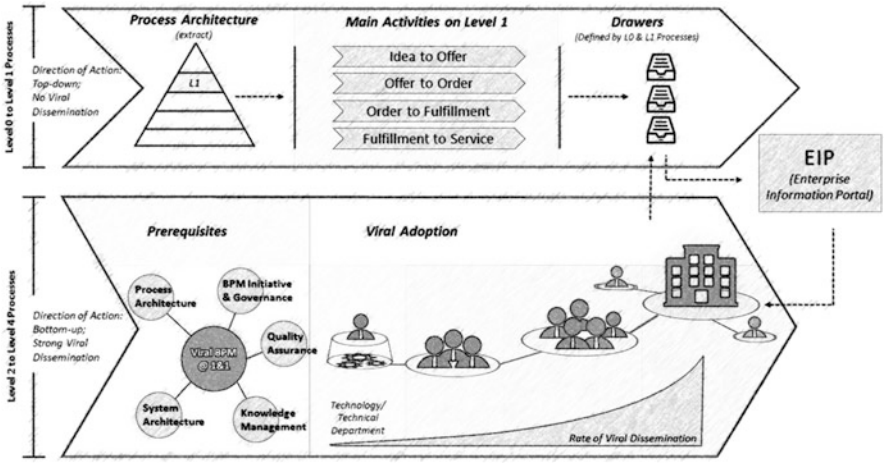

Fig. 2 Viral BPM adoption at 1&1

facing this situation barely 3 years ago, today it is not necessary to constantly remind employees to take part in training courses. Process modeling has penetrated various application contexts, and the majority realized quickly that they have to learn the skill of modeling in order to boost their efficiency." In particular, widespread tool support and meaningful modeling conventions that enabled a less formal interpreted governance that was not prone to inflexible regulations and so retained a high degree of flexibility laid the groundwork for the viral spread of BPM at 1&1.

Figure 2 provides a summary of how process modeling went viral at 1&1 and indicates how knowledge was made transparent and available in the company. The system architecture provides the required infrastructure, the process architecture provides the framework for structuring or classifying the process information through the process house, the quality assurance ensures meaningful content, and both the BPM initiative and lean governance ensures the sustainability of the whole. Bringing these factors together allows employees to find high-quality information using the EIP. 1&1 created both the opportunity and incentives for modeling. While a proper system architecture and process architecture served as enablers of process modeling, the ease of use and increasing acceptance of process models as a standard of communication encouraged use of the notation. Eventually, the presence of a large number of potential process modelers promoted the viral dissemination of BPM. At 1&1, the adoption and use of process modeling spread exponentially in several stages, starting in the technical department and then penetrating departments involved in business analysis, requirements measurement, and enterprise business intelligence before reaching departments with broader operational and business-oriented orientations, such as finance and human resources.

1&1's BPM approach has been successful and has helped the company to increase its efficiency in many ways. The organization was able to adopt and use BPM(N) holistically in its entire value chain. With a deliberately lightweight implementation, the approach is highly responsive to change from inside or even outside the enterprise and enables continuous process adjustments triggered by nearly any employee on every level while also providing top management support and respecting the users' requirements and those of the integrated BPM system. As Petry explains, "This approach offers several advantages for us: from a macroeconomic perspective, the efficiency promises short time-to-market cycles and the ability to make rapid changes in organizational processes. 1&1 is globally competitive and can adapt quickly to changing customer needs. Although virtually all activities in the organization are mapped by processes, the administrative effort is still kept at a minimum." BPM became a highly valuable asset in creating a dynamic and innovative process environment. In short, BPM has become indispensable for 1&1.

5 Lessons Learned

The case of 1&1 provides useful insights that can be summarized in recommendations for the adoption of BPM as a paradigm. Figure 3 provides a graphic overview and structure. The list of recommendations is in no particular order of importance or urgency, but all can be related to the five areas of improvement that were introduced in Table 1.

(a) **Create a working process-modeling environment.**
Creating new knowledge by modeling is the first and most important use case, so users should be able to start modeling whenever they see the need to do so.
- Provide a sound and integrated infrastructure that facilitates the creation, viewing, and sharing of the result. Ensure that all conditions for implementing a BPM modeling tool are met.
- Provide a sound BPM modeling platform that is well integrated into the existing system infrastructure. Ensure that the tools in the system architecture do not interfere with each other.
- Consider separating executable and non-executable processes with at least one lightweight modeling environment for casual users and a BPM system for technical users. If you use SaaS, consider that executable processes can be fragile and can break after (automatic) updates.

(b) **Create a working process-viewing environment.**
Process models provide value to a BPM initiative only if they can be found, retrieved, and viewed at high quality. Modeling is not an end in itself but can be used to support communication, training, and automated execution. The modeling software alone often cannot ensure this level of service.

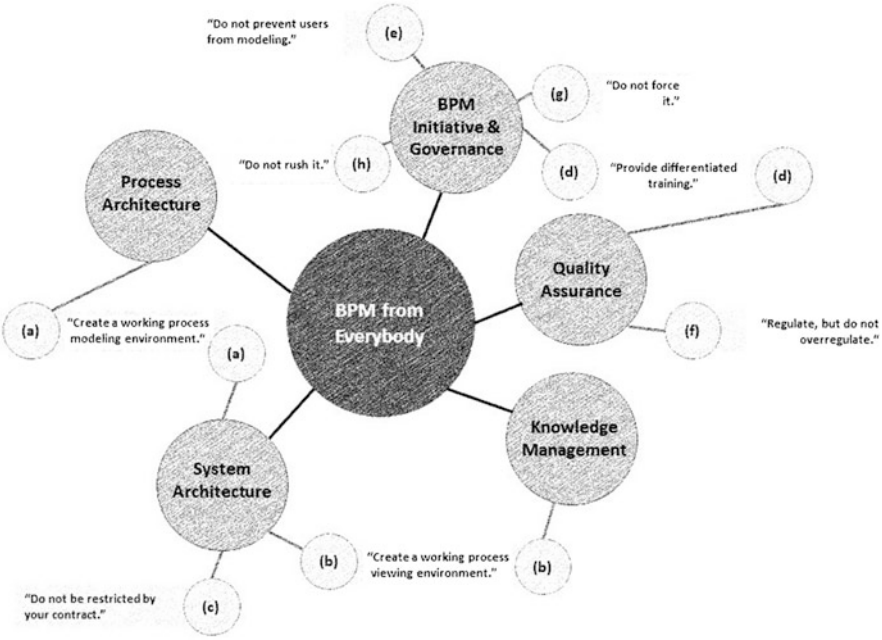

Fig. 3 Overview of guidelines for adoption of BPM

- Evaluate modeling software for its ability to structure and present process models, including both online viewing and export functionality.
- If additional systems must be integrated, consider an information portal as an aggregator to consolidate information in one place, index it, and disseminate it.
- Similar to the modeling recommendations, lightweight approaches make it easier for the casual user to get started and to be won over to BPM.

(c) **Do not be restricted by your contracts.**

Use software that enables everybody to create and access models. Software with tight user restrictions does not allow everybody to model, or logins have to be shuffled around. It does not create a free and open environment that enables creativity.

- Ensure that your software comes with a license that enables everybody to model and access the information.

(d) **Provide differentiated training.**

Not everybody knows the basics of BPM or BPMN or how to use a particular BPM software. Differentiated training is the key to raising everyone's level of expertise. Straightforward application procedures and cost center allocation, if any, will help spread acceptance.

- Provide basic and advanced courses for those who are new to the company or unaccustomed to BPM and those who know their way around,

respectively. Advanced courses should be differentiated into smaller and more targeted courses.
- Provide short, long, and intense courses. Every employee has a different time budget to spend on BPM. Cater to those with only a few hours as well as to those who can spend a full day or two.
- Empower employees to teach. While a professional teacher may be a good start, grow the capability to teach about modeling in-house. Employees who teach learn when teaching too (Cau 2015).

(e) **Do not prevent users from modeling.**

Process modeling can only work for everybody if all interested users can benefit from it and incite others' interest in using it. It is impossible to centralize this dissemination of interest, so do not try to prevent anyone from creating a model.
- Process modeling should be like creating a PowerPoint presentation: while it is not perfect for knowledge management, it is better than chasing tacit knowledge.
- The model that was useless today may be important tomorrow. As it is impossible to foresee all use cases for process modeling in a company, it is similarly impossible to judge a model in advance.

(f) **Regulate but do not overregulate modeling.**

Process modeling, like any other modeling activity, requires some framing; otherwise, the resulting models will not be useful to anyone—not even the person who created them. However, do not overregulate how models can be designed. Based on the experience of the 1&1 case, we suggest six guidelines for regulating models:
- Provide a high-level structure into which all models should fit, whether the five levels of modeling 1&1 used or another kind of structure.
- Anchor all models within this structure through naming and conventions on how to name and/or categorize/tag the models.
- Provide a managed glossary, rather than an open, wiki-like glossary. Central terms should be managed centrally.
- Do not restrict modeling to specific purposes. Models may be created for a purpose you do not yet know, and departments may try to use process modeling in ways other than those initially anticipated.
- There is no "one size fits all" approach or solution. There are different views and, therefore, different versions of one use case or of processes that have the same sequence/effect. Do not limit the number of concurrent versions to one.
- Allow the creation of technical and non-technical process models. While BPM initiatives often originate from technical departments, much of its potential lies in other departments. Not every model has to be executable.

(g) **Do not force it.**

After experiencing the viral spread of BPM at 1&1, we are sure that a similar adoption elsewhere will work only if the employees see the benefits of

process models for themselves. While employees should be encouraged to become process modelers, do not to force this concept.

- Do not force users who do not see the immediate benefit of using process modeling use it. They will not see the benefit after creating an uninspired model.

(h) **Do not rush it.**

In contrast to research facilities or universities, initiatives in enterprises often have to demonstrate success within the fiscal year, rather than a couple of years, or the project will be scrapped. BPM initiatives need some time to get rolling. A viral spread always starts with a small population and experiences slow growth in the early stages before reaching observable exponential growth.

- Give your BPM initiative enough time to get started so you can set up technology and training and start creating content before you expect a return in investment through your employees' mind shift. All exponential curves are slow starters, while logarithmic curves have a ceiling.

Much of our private lives are impacted by the Internet and social technologies, which build on the Web 2.0 principle of user content creation. It is difficult to incite this viral behavior in a business context, and many enterprises have failed in doing so (Turban et al. 2011). 1&1 provides a working example of where user content co-creation was successful despite initial setbacks and only moderate incentives. The recommendations given above can assist other enterprises to enjoy similar benefits when introducing or improving their BPM initiatives. Viral adoption is difficult to incite and predict, and research on its context (particularly with respect to BPM) is scarce, so there are no guarantees.

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