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How German hospitals govern IT - An empirical exploration

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TOWARD THE CONCEPT OF POCKETS OF CREATIVITY IN BUSINESS PROCESSES

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Abstract

Creativity-intensive processes such as the development of marketing campaigns or the production of visual effects increasingly find their way into the agenda of process managers. Such processes often comprise of both well-structured, transactional parts and creative parts that often cannot be specified in terms of their process flow, required resources, and outcome. Moreover, the processes' high variability sets boundaries for the possible degree of automation. In this paper we introduce the concept of pockets of creativity as an analytic device which is hoped to support process managers in their efforts to identify and describe creative sections in business processes. We argue that this step of identifying and describing is imperative to successfully allocate resources, integrate creativity into the overall process, and introduce process automation for those parts that are well-structured and can actually be automated. Our argument rests in the examination of existent literature as well as in findings from exploratory case studies that were conducted in the film and visual effects industry in order to study processes that rely on creativity.

Keywords: Creativity Management, Business Process Management, Media Industry, Workflow

1 INTRODUCTION

Creative people and their practices play a prominent role in business processes as organizations seek to deploy the merits of business process management to more than just the set of transactional processes (Hall & Johnson 2009). Product development and marketing campaigns are just two examples of such creativity-intensive processes (Seidel & Rosemann & Becker 2008) that increasingly find their way into the agenda of process managers. Besides this, there are entire and quickly growing industries designed around creativity-intensive processes with the entertainment industry being the most prominent example of a creative industry.

To make the merits of business process management available, process modeling has emerged as an important enabler. Existing process modeling languages normally focus on modeling the process flow (e.g. Engels & Förster & Heckel & Thöne 2005). However, business processes that involve creativity are characterized by a high demand for flexibility. Whereas parts of processes in creative environments may be well-structured and easy to model, other parts may be not. For example, a visual effects production process includes tasks such as *receiving materials* where references or scans are received from different sources. Such tasks are well-structured and may even be automated. However, the same process also includes tasks such as *modeling* or *animation* which require the creativity of the involved artists, and generate creative products. Creative products are characterized by novelty and appropriateness and creativity can be described as the process that leads to the generation of such products (Woodman & Sawyer & Griffin 1993). Particularly two facets of creativity within business processes demand special attention: (a) Creative tasks/sub-processes usually do not have a predefined process structure and (b) creative tasks have outcomes that are – at the minimum to a certain extend – hard to predict (Seidel 2009, Seidel et al. 2008).

It may seem appropriate to view these creative sections as 'black boxes' as the underlying processes are complex and hard to predict. However, we argue that this approach would not be sufficient and leaves too much to the individual conducting the creative task. Based on the awareness that the more creative tasks have a significant impact on business processes we believe that it is necessary to create more transparency. We do not suggest to model and prescribe the process flow as in many cases this might prevent people from being creative. However, we propose to identify how creative tasks are characterized, how creative tasks can be supported and how they can best be integrated into the overall business process they are part of.

In this paper, we introduce the concept of *pockets of creativity* as a means to identify and describe parts of business processes that are characterized by creativity. The challenge is to identify what is actually known about a creative section within the business process. We propose a set of constraints that enable process managers to determine whether a process section is indeed creative and to then describe this section.

With this paper we make two primary contributions. First, we shed light on the characteristics of creativity from a business process management perspective and provide researchers with an analytic device that can guide further studies. The device is the result of a design process (Hevner & March & Park & Ram 2004) which is grounded in empirical data. Second, we introduce a means that process managers can use in order to identify and describe pockets of creativity in business processes in order to effectively manage creativity-intensive processes.

We proceed as follows. First, based on the awareness that creativity in business processes becomes manifest in high process variability (Seidel 2009, Seidel et al. 2008) we discuss recent work on variability in business processes and develop a framework that gives structure to our subsequent reasoning (section 2). We then briefly discuss an exploratory study of processes in the film and visual effects production (sections 3.1 and 3.2). Based on three key observations we introduce the concept of pockets of creativity as a means to denote creativity in business processes and relate the concept back to the framework of variability (section 3.3). We then describe an example from the film industry so as

to illustrate how such pockets of creativity can be identified in business processes (section 3.4). In a chapter on related work we link our work back to existent research (section 4). The paper concludes with a discussion of contributions and limitations and provides an outlook to our future research agenda (section 5).

2 FRAMEWORK OF VARIABILITY IN BUSINESS PROCESSES

Recent years have seen a number of studies concerned with variability within business processes. Much of this work has been carried out by scholars who focus on automation and implementation of business processes. In the following we explore some classification schema for process variability that originate from this discussion before we then introduce a framework, which rests in the argument of our colleagues.

Sadiq et al. (2005) identify three dimensions of change in workflow management. The first dimension is labeled *dynamism* and addresses a workflow's ability to change when the related business process evolves. The second dimension is that of *adaptability*, which refers to change that does not affect the underlying business process but instances of such processes. In doing so, this dimension subsumes a workflow's ability to react to exceptional circumstances, which may or may not be foreseen. The third dimension is that of *flexibility* which describes a workflow's ability to execute based on only partially specified models. Thus, the complete specification of the model only becomes available at runtime.

Similarly, Weber et al. (2008) distinguish three different types of process flexibility: *built-in flexibility*, *schema evolution*, and *ad-hoc changes*. While built-in flexibility and schema evolution resemble Sadiq's dynamism and flexibility dimensions of change, ad-hoc changes always occur on an instance level and, thus, have a meaning different from Sadiq's adaptability dimension which addresses both foreseen variability at a schema level and unforeseen exceptions that have to be dealt with at an instance level.

Van der Aalst et al. (2005) classify process support systems according to the level of structure of the underlying processes. They distinguish support for *unstructured processes*, for *ad-hoc processes*, and for *implicitly* and *explicitly structured* processes. According to this framework, support for unstructured processes does not impose any control flow, whereas ad-hoc workflow management systems allow for the modification of workflow specifications during execution of workflow instances. Yet, an explicit process model is required for every workflow instance. Systems that support processes with implicit structure rely on process specifications that do not explicitly define every possible route within a process. In contrast to explicitly structured process specifications, such systems rely on the definition of restrictions and authorizations that merely set out boundaries for altering a process instance.

In the area of creativity-intensive processes (Seidel 2009, Seidel et al. 2008) we are faced with another level of variability which transcends the understanding of an exception as a "deviation from the ideal" (Klein & Dellarocas 2000) and also the notion of flexibility, that denotes last-minute lashing of control flow structures prior to instance execution (Sadiq et al. 2005, Weber et al. 2008). In creativity-intensive processes variability is deliberately injected as these processes rely on divergent thinking and exploration of various options (Runco 2007). Consequently, we advance that creativity is another dimension of change and extends the levels of process flexibility. In creativity-intensive processes, variability remains until a process terminates. The process is not straight-jacketed before execution – neither by explicitly defining every option at build time via a detailed workflow model, nor by deferring decisions as far as possible by providing a loosely specified, flexible workflow model. In a creativity-intensive process it is impossible to specify every decision in advance. Yet, it is not the case that creativity-intensive processes are not eligible for management. As various industry examples exemplify, such processes not only comprise of completely unstructured sections, but also contain sections that indeed may be specified explicitly. In consequence, also the creative parts of a process must heed restrictions and contextual conditions so as to fit into the overall process.

In the remainder of this paper we will apply a two-dimensional framework for addressing creativity in business processes that rests in the above discussion (cf. Figure 1). In order to expose how the occurrence of creativity in business processes relates to the introduced levels of variability, the first dimension distinguishes different points in time in the life cycle of a business process when variability may be eliminated. These are *build-time*, *pre-run-time*, and *run-time*. Although Sadiq et al. (2005) and van der Aalst et al (2005) refer to decision-making at run-time, we advocate to understand these eliminations of variability as to happen prior runtime: Processes or process fragments of these categories have to be explicitly specified before they can be executed. Therefore, merely unstructured and implicitly structured processes as specified by van der Aalst et al. (2005) and process fragments that bear creativity imply de-facto variability at run-time.

The second dimension depicts three key aspects of a business process. Besides the control flow aspect discussed above, there are other facets of a business process to be considered from the vantage point of a holistic perspective (v.d.Aalst et al. 2005, Weber et al. 2008). First, there are resources which actively conduct a business process or are applied or consumed within a process (Russel & v.d.Aalst & ter Hofstede 2006, Weber et al. 2008). Second, there is the process related object or product, which is altered in the course of a process (v.d.Aalst et al. 2005).

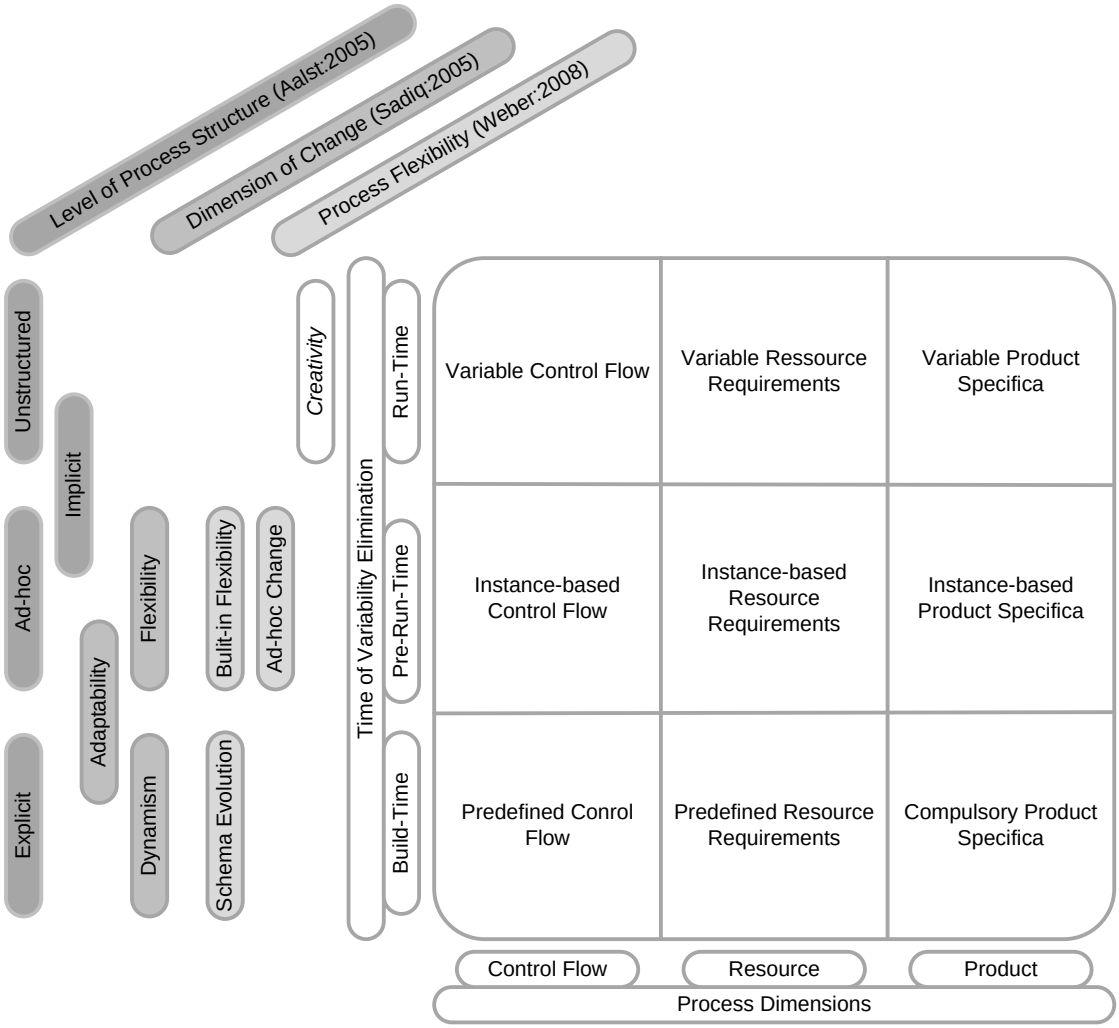

Figure 1: Variability in business processes

3 POCKETS OF CREATIVITY

3.1 A study of organizational creative processes

In an exploratory study on creativity in business processes Seidel (2009) and Seidel et al. (2008) investigated processes from the creative industries. The study aimed at getting an in-depth understanding of business processes that highly rely on creativity. Data was collected from three organizations from the field of film and visual effects production. These organizations are very much characterized by the creativity within their processes. Thus, organizations were selected, where "the process of interest is 'transparently observable'" (Eisenhardt 1989, Pettigrew 1990). The study focused on so-called post-production (Clark & Sphor 1998) and visual effects (VFX) production processes. These processes usually start in parallel to the actual production of a film or TV commercial (the process of *filming*) and are carried out until the product is finally delivered. The processes that were investigated not only rely on creativity, but are also repetitive. For example, many VFX sequences have to be produced for a feature film. The sourcing strategy involved semi-structured interviews and the use of process modeling techniques. Table 1 provides an overview of case study organizations, interviewed people, and analyzed processes.

Organization	Area	Interview Partners	Analyzed Processes
Organization 1	Teaching	Management, directors, producers, post production supervisor	Post-production processes
Organization 2	Post Production: Visual Effects Production	Management, visual effects supervisors, technical directors, artists (compositors, lighters, etc.)	Visual effects production processes
Organization 3	Post Production, TV Commercials	Management, technical directors, visual effects supervisors, artists	Post-production processes, visual effects production processes

Table 1: Case studies and analyzed processes

In the following section we first discuss some major findings with regard to the nature of the processes that were studied (section 3.2) and then relate these findings to the above introduced framework (section 3.3) before an example case is provided where the application of the concept of pockets of creativity is further illustrated (section 3.4).

3.2 Study findings: process creativity versus product creativity

With regard to the main characteristics of creative sections within the analyzed business processes, three key observations could be made (Seidel 2009, Seidel et al. 2008):

1. In most cases the outcome of a creativity-intensive process is not entirely known in advance. Yet, often it is not the case that nothing is known about the creative product. Just think about a particular animation sequence for a film or a visual effect in the next Hollywood blockbuster. As a producer who needs that sequence to complete the film, you would certainly know the technical format and you might also know its length (not necessarily though). However, some aspects remain unknown until the process commenced. Particularly creative aspects (e.g. what characters occur in a particular sequence, or what do the characters look like etc.) are not known in advance.
2. Not only the process outcome is not known in advance, but also the actual process that leads to this outcome. Required process steps and iterations are not entirely predictable. For example, when producing a particular visual effect for a feature film, the organization does not

know what iterations are necessary for what process step (e. g. creating the skeleton, creating the surface, lighting). Also, required process steps may not even be known in advance as the product and its properties are further developed throughout the process. However, it is not the case that nothing is known about the process structure. For example, particular well-structured sub-processes such as review processes, or aspects of data management may be known in advance.

3. As required process steps and iterations are not entirely predictable, so are resources and involved people not known in advance. For example, within visual effects production processes in organization 2 (cf. Table 1), while the process is conducted, it may become necessary to involve further people with particular skill sets. Again, it is not the case that nothing is known about required resources. Certain resources that are required (e.g. a particular editing suite) may be known as well as resource restrictions (e.g. available time).

Based on these three observations, we propose to distinguish two facets of creativity, namely *product creativity* and *process creativity*. The study suggests that the primary reason for process creativity must be seen in product creativity; as certain features of the product are not known in advance it is hard or even impossible to predict what is needed to carry out the process. Product creativity refers to the outcome of a creative process– the creative product of which many aspects are not known in advance (supported by observation 1). If the characteristics of the output are clearly defined and there is no (intended) variance in the output, there is no product creativity. Process creativity refers to the process of creative thinking or the process of creative problem solving. Thus, it refers to the variable structure of the underlying process (supported by observation 2) as well as vague information about required resources (supported by observation 3). If the process is highly repeatable or its structure is at least pre-defined, there is no process creativity. This is usually not the case in processes that rely on creativity.

However, as has been indicated, even though there is a certain degree of unpredictability, processes in organizations underlie certain constraints regarding resources, product, and control flow: a product has to fulfill certain requirements (this is reinforced by the awareness that creative products are always purposeful) and the process is restricted by both the required resources and the availability of resources such as human resources, time, budget, and equipment and by dependencies between different process fragments. Consequently, we introduce three types of constraints that describe what elements of a pocket of creativity are known in advance: *product constraints*, *control flow constraints*, and *resource constraints*. When the process is carried out it must adhere to those constraints. Thus, these constraints limit the degree of freedom of a process due to business imperatives.

By specifying these constraints, that is, defining required and available resources as well as demanded characteristics of the output and required process steps, the process designer can (a) allocate resources as well as identify potential strategies or software tools in order to support a particular pocket of creativity and (b) to better plan for precedent and subsequent process steps. In a visual effects company, for example, the digital format of the deliverable of a creative task will be known so that the equipment that is used in subsequent tasks can be planned. However, knowing that certain characteristics are not known in advance, can also require the process designer to plan for subsequent process steps, such as review cycles to make sure that the (creative) product actually meets the requirements. Also, identifying the required resources of a pocket of creativity is of high importance as it is well-known that a lack of resources may even kill any creativity (Amabile 1998). At the same time, providing more than the required resources may not foster creativity. Yet, in many cases, the demand for certain resources might not be known in advance.

Table 2 provides an overview of the relationships between product creativity, process creativity, and the three types of constraints.

Aspect	Constraint	Description
Product creativity	Product constraints	Product constraints limit the degree of variance in the outcome of the process. Product constraints are important for review cycles involved in a

		process and for subsequent sections of a process. Explicating characteristics of the product enables to define how the process can continue after a particular task. In pockets of creativity not all requirements to the product are specified in detail. That is, there is variance in the outcome of the process.
Process creativity	Control flow constraints	These constraints describe how much of the process-flow can be pre-determined and, therefore, be explicitly modeled. In pockets of creativity, often only fragments of the control flow are known in advance.
	Resource constraints	These constraints describe what resources are needed to carry out the process; this may involve alternatives. In pockets of creativity, not all required resources are known in advance.

Table 2: Types of constraints in pockets of creativity

3.3 Relating the findings to the framework

Figure 2 highlights how the different aspects of creativity can be related to the above introduced framework and thus describes the main characteristic of pockets of creativity. Process creativity becomes manifest in variable control flow and variable resource requirements at run-time. That is, both control flow and resource requirements are not known before the process is actually executed. Product creativity becomes manifest in variable product specifics. That is, the actual characteristics of the product are not known in advance but evolve while the process is executed. The three types of constraints restrict the degree of variability.

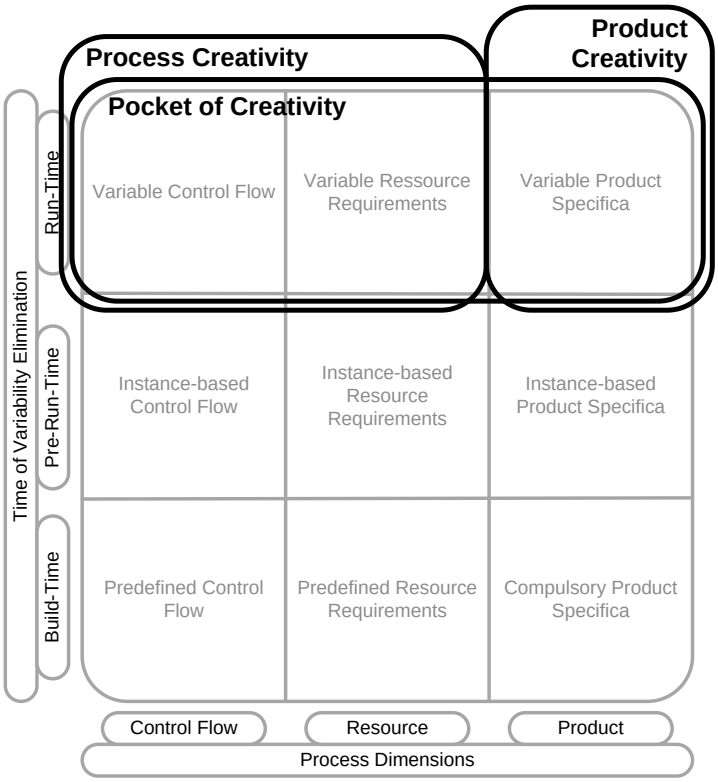

Figure 2: Characteristics of pockets of creativity

Obviously, there are varying levels of both process creativity and product creativity. However, the identification of those tasks/processes that do not involve any process or product creativity at all, may allow organizations to automate these tasks without having to fear killing any creativity.

As the above described empirical research has shown, in many cases process and product creativity occur conjointly. Yet, the data suggests that product creativity can be seen as the primary reason for process creativity. This is particularly the case within industries such as the creative industries. However, it may also be possible that, in other industries such as banking or insurance, the output is predetermined (for example due to legal requirements and other compliance issues) but the process of how to achieve that output may be creative. Notably, it is arguable whether such processes may in fact be framed as being creative as they do not necessarily generate products that are characterized by both novelty and appropriateness.

3.4 Example Case

We use an exemplary creativity-intensive process from the film industry, the so-called post-production process, in order to exemplify the concept of pockets of creativity and its applicability. This retrospective analysis is a first step towards the evaluation of the proposed concept. Within the process of post-production there are several technical and creative elements. One highly creative element is the so-called Offline-Editing. Offline Editing is the stage within the process where different pieces of footage are put together by an editor so as to tell the film's story. Offline Editing is a complex process that comprises of both well-structured and highly creative tasks. Table 3 provides an overview of product-based, process-based, and resource based constraints that apply for the pocket of creativity of Offline-Editing.

Constraint	Example Case
Product constraints	The different output formats are known as well as the length of the sequences. This is prerequisite to continue the process and meet client requirements (e. g. the length of a TV commercial).
Control flow constraints	The process is highly creative and requires flexibility. Whereas the actual structure of the offline editing cannot be explicated in advance, the pocket of creativity involves well-structured sub-processes such as technical and creative reviews which have to be executed in a predefined order.
Resource constraints	Various constraints regarding time, budget, human resources, and equipment apply to this pocket of creativity. However, certain aspects are not known in advance. For example, the process may require the involvement of additional personal with certain expertise in offline-editing.

Table 3: Exemplary constraints

The offline edit is creative in nature: Only certain aspects of the outcome of the process are defined. The final product looks different each and every time the process is conducted. The final product is highly subjective as different people have differing understandings of aesthetics and creative quality (Firestien 1993). However, certain aspects of the product, such as format and length, may be known in advance. By explicating these characteristics of the creative product, it becomes possible to plan for subsequent process steps. For example, the format impacts on the equipment that is required to further proceed with the post-production process. The process-flow is not pre-determined. For example, the number of iterations through the creative tasks of offline-editing (rough cut) and offline editing (fine cut) are not known, or there may be need for communication in order to receive additional footage that can be used within offline editing. Even though there are resource-based constraints, such as time and budget, it is hard to predict what resources will actually be needed to carry out the task. For example, depending on client feedback it may be necessary to involve people with additional expertise in post-production into the process. Figure 3 depicts the pocket of creativity. Not that Figure 3 only presents a simplified, small part of the overall post-production process. The pocket of creativity comprises of two creative tasks and a well-structured sub-process.

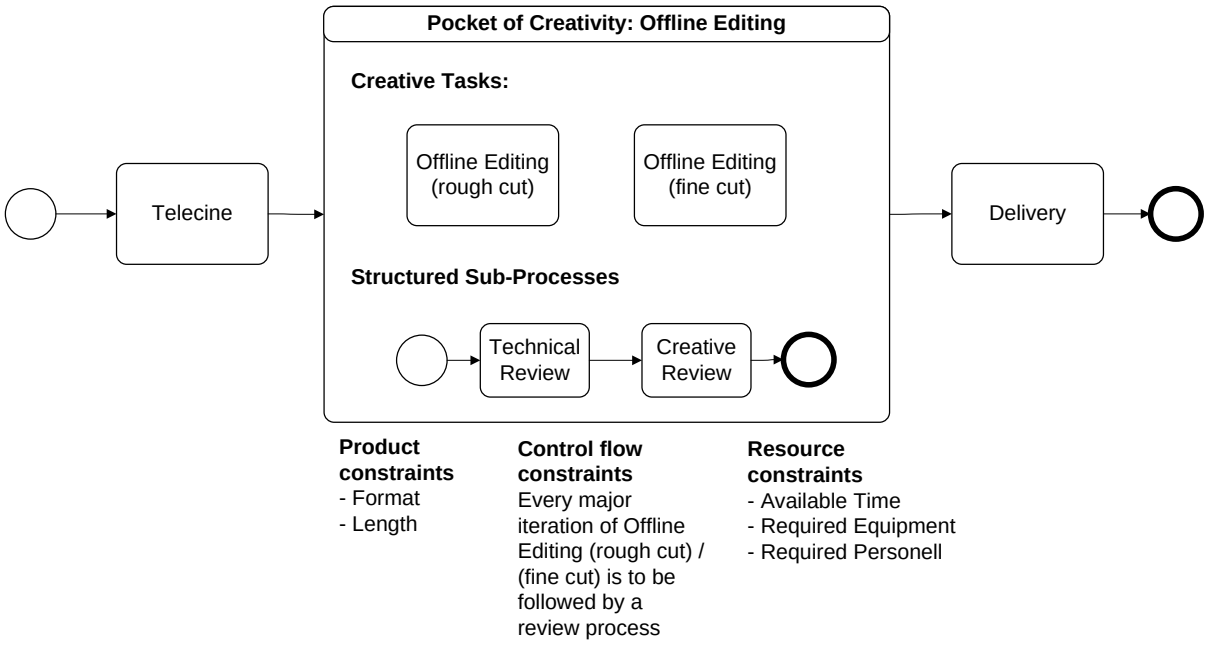

Figure 3: Exemplary pocket of creativity

Summarizing, by expatiating this pocket of creativity the process designer ensures that this creative section of the process can be supported and can also be integrated into the overall process. However, by determining what part is indeed a creative task that is not further broken down in terms of process flow, the designer avoids straight-jacketing of a creative process which might prevent creativity.

4 RELATED WORK

As has been indicated, it is not the case that there have not been attempts in order to support flexible business processes. In the following we provide an overview of the work of fellow colleagues who addressed the phenomenon of variability in business processes. In order to do so, we proceed from the more rigid approaches to the more flexible ones. Obviously, particularly the latter ones may be considered by organizations that seek to support creativity-intensive business processes.

Research on *workflow evolution* addresses the question of what to do when static workflows have to be adapted due to changes of the underlying business process (Casati & Ceri & Pernici & Pozzi 1996). The challenge is twofold: On the one hand, the process of modifying the existing workflow model has to be managed in order not to necessitate a complete reconstruction. On the other hand, running workflow instances must be adjusted according to the new workflow description. Existent techniques for workflow evolution provide support for occasional changes of business processes, which are generally structured and stable (Seidel & Adams & Ter Hofstede & Rosemann 2007). However, when general process blueprints are absent, there is no evolution to be managed.

Approaches towards *exception handling* have been discussed in order to handle such events that are not accounted for in the original process model, often referred to as exceptions. Allowing for all possible, and known, exceptions within the workflow model can quickly lead to workflow models that are hard to read and maintain. To tackle this problem, Russel et al. (2006) suggest the application of exception handling systems which separate the handling of exceptions from the main process model. Yet, an exception handler has to explicitly know about the exceptions it may handle. In consequence, such systems are incapable of dealing with flexible or even more so creative processes.

In order to allow for a higher degree of flexibility, Sadiq et al. (2005) introduce the concept of *pockets of flexibility*. They propose an approach to workflow modeling that enables the specification of loosely defined process sections within highly structured workflow models. These sections comprise a set of

workflow fragments and constraints, which restrict the control flows that are allowed between the fragments. For pockets of flexibility, prior to execution, the control flow is specified for every workflow instance (Sadiq & Sadiq & Orlowska 2001). This approach allows workflow processes to be tailored to individual instances in a so-called late instantiation fashion. But still, right before execution there has to be an explicit workflow model that describes process coordination. Thus, this approach is too rigid to handle creativity-intensive processes.

Note that all of the above mentioned approaches require the process designer to model the process flow in detail – at build-time for all workflow instances or right prior run-time to facilitate individual processes routing for every workflow occurrence. In response to this, over the last few years a new paradigm has emerged. The so-called *case handling* paradigm seeks to overcome the limitations of rigidity inherent in workflow systems by applying a data-driven approach. Van der Aalst et al. (2005) argue that most workflow systems do not reflect the way work is conducted in most non-manufacturing environments. For this reason, they propose to focuses on the whole case rather than the a single work item related to a task and to follow a data-centric approach rather than merely considering process-flow (v.d.Aalst & Berens 2001). The core features of the case handling paradigm are: provide all information available to avoid context-tunneling, decide on the activities to be executed on the basis of the information available rather than the activities executed before, separate the distribution of work from its authorization, extend the classical 'execution' role by additional types such as 'skip' and 'redo', and allow workers to view and modify process data outside the corresponding activities. The wide range of concepts that may be applied for specifying a case, ranging from explicitly describing the process flow to implicitly defining its structure by merely setting out post conditions related to data objects, may qualify the case handling paradigm – at least in some scenarios – for its application in creativity-intensive processes.

Groupware systems constitute a genre of IT systems that take away the focus from supporting business process coordination but promote cooperation between people. Consequently, these systems are capable of handling variability in business processes, as they do not rely on predefined process structure but foster interaction between people – a primary source of creativity (Gurteen 1998). Thus, van der Aalst et al. (2005) propose the application of groupware systems to support primarily unstructured processes.

5 CONCLUSION

In this paper we introduced an analytical framework that characterizes so-called pockets of creativity in business processes. The analytic framework we presented has been developed based on argument that rests in the examination of existent literature as well as on an empirical study on creativity-intensive processes. We suggested to distinguish between process-creativity and product-creativity and introduced three types of constraints: product constraints, control-flow constraints, and resource constraints. Those parts of a creativity-intensive process that are non-creative can be modeled and automated with conventional process modeling techniques and workflow systems. Those sections that have varying degrees of creativity however, are different: Whereas some parts may have enough structure and constraints to be supported by declarative approaches such as case handling, other parts do not have any structure at all. Here, groupware and knowledge-intensive applications can be means to facilitate creativity and enhance process performance.

It is hoped that process managers can apply these criteria in order to identify pockets of creativity in business processes so as to shed light on the relationships between well-structured and creative parts of business processes. It is further hoped that the explication of these relationships will enable to enhance process efficiency by optimizing and automating the well-structured non-creative tasks while not straight-jacketing the creative parts and, thus, compromising creativity.

This study has some limitations. Most notably, the three key observations that led to the notion of product creativity and process creativity as well as to the formulation of the three types of constraints are based on empirical studies with only three organizations from one particular industry. Thus, future

research must consider creativity-intensive processes from other domains. Future research will also focus on the exploration of strategies and IT systems that can be used in order to support such creativity-intensive processes, so as to ultimately enhance organizational efficiency and effectiveness. Moreover, one may question the practicality of the proposed approach as creativity must often deal with rigid structures and inflexibility. A response to this assertion may be the conduct of further studies in which the proposed approach is further applied and evaluated. Other aspects that have not been comprehensively covered in the present paper are the study's impact on the business process lifecycle as well as the actual modeling notations/grammars that can be used to model the proposed constraints. In summary, it is hoped that the proposed approach can inform the development of a more comprehensive methodology.

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