

## Process Innovation as Creative Problem-Solving: An Experimental Study of Textual Descriptions and Diagrams (extended abstract)

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**Abstract:** Supporting business and systems analysts with process models in idea generation tasks has been a longstanding topic of interest. In the study we summarize in this extended abstract, we examined how process models support process re-design tasks where analysts attempt to generate ideas about novel ways in which organizational processes can be executed. Through an experiment we compared how two types of models about organizational processes – textual and diagrammatical – assist novice analysts in developing innovative solutions to process redesign tasks. The results from our study indicate that diagrams are superior to textual process descriptions regarding the appropriateness of process redesign ideas and tend to produce ideas with higher originality and impact, while the sheer amount of ideas does not vary significantly. Process diagrams also change the focus of the redesign ideas - ideas related to information systems improvements increase, while ideas related to data flow enhancements in a process decrease. The work summarized in this extended abstract has been published in [FR16].

**Keywords:** Process Innovation, Business Process Models, Business Process Reengineering, Creative Problem-Solving, Diagrams

### 1 Introduction

The complexity of contemporary information systems draws much attention to how their analysis and design can be supported by appropriate methods and tools. Much of this attention has traditionally focused on techniques that support the modeling of requirements of information systems in terms of data or processes [Pa02]. We examine process models and study how individuals use domain understanding developed through the use of process models in developing new, improved models for how these business processes could be enacted. This is an important area of study. Nowadays analysts often rely on process models to document and analyze current organizational operations, to help business personnel understand the work domain and identify improvement opportunities related to the business processes and involved information systems [De01]. The exercise of improving technical or organizational processes typically involves the development of so-called “as-is” process models that capture the current organizational reality, which are then provided to analysts in hope that they would stimulate creative ideas about how the current processes can be changed to yield the desired business

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outcomes. The question that unfolds, however, is whether process models are actually assisting analysts in finding innovative new solutions for “to-be” processes, or whether they limit them to narrow current ways of thinking. For example, process modeling has been argued to focus mainly on the shortcomings of an existing solution, with the consequence that model-based process innovation concentrates on overcoming existing problems rather than achieving inspirational new goals [Ro06]. Other studies, however, suggest that good process models are an important determinant to process improvement success [Ko09].

## 2 Research Model

Figure 1 shows the research model that framed our experimental study: We were interested in the influence of the type of process representation on the creativity and type of the process-redesign solutions. Based on findings in the literature on how individual characteristics relate to creative problem-solving processes, the model also acknowledges the relevance of the individual as a creative person by using creative competence [Cr05] and creative attitude as control variables.

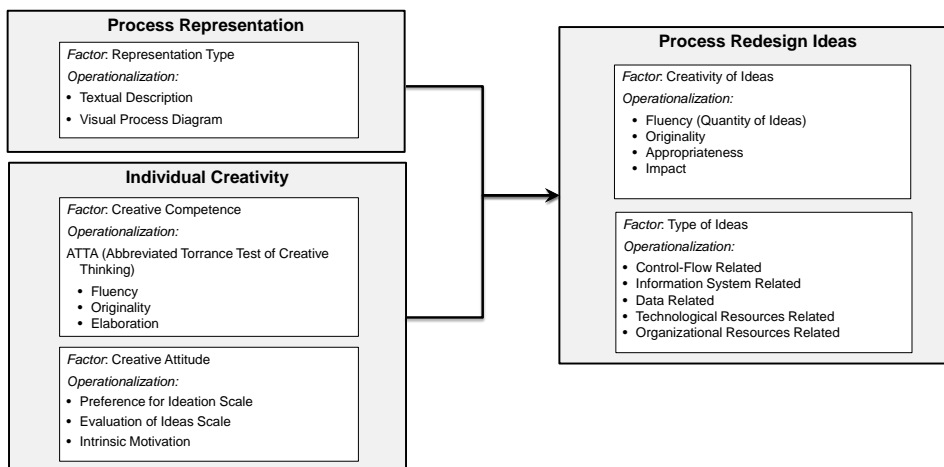


Figure 1. Research Model (adapted from [FR16]).

## 3 Design

We conducted an experiment to investigate the impact of type of process representation (textual versus diagrammatic) on creative redesign while controlling for other factors. We asked participants to analyze and redesign a business process for a pizza-delivery service business process in three different improvement tasks [Ob13]. We employed two

categories of dependent variables. First, we measured the solutions' creativity in terms of fluency (number of ideas), appropriateness, and originality, as is common in the creativity literature, and in terms of their impact [Pi12]. We added the impact dimension in order to relate creative problem-solving solutions back to the original business objective of changing a process (thus to differentiate process redesign solutions that are truly relevant to the business from other creative solutions). Second, we used a measure we developed for the type of solutions in terms of the locus of change, that is, as affecting the control flow, information systems, or the organizational, technological, or the data component of a business process. Three research assistants coded the creativity of process redesign ideas. The answer "Webcam in the kitchen with livestream. Pizzas get name cards and can be observed while baking." was for instance rated high, the answer "Tell them to set an alarm clock." was rated low in originality for the task "The pizza-delivery service wants to improve its processes, so that customers know at all times when their pizza will arrive. How can the process be changed to implement this improvement?" Additionally we measured creative competence with a standardized instrument, the Abbreviated Torrance Test for Adults [GT02].

For the experiment, we recruited 120 university students from a business school as proxies for future end-users of process representations who have at least some knowledge about business domains and business-process management.

## 4 Results

To identify differences between the main experimental groups, we performed analysis of covariance for repeated measures tests, with the treatment (text or diagram) as the independent variable for each dependent variable (fluency, appropriateness, originality, and impact of a future process; number of control flow-/ information system-/ data-/ technological resources-related ideas) in all three creativity tasks. We used creative competence as a covariate.

In summary, we found three major results: First, the "diagram" group generated ideas that were more appropriate than those of the "text" group. They also produced ideas of greater originality and impact, although these results were not significant at the  $p=0.05$  level. Most of the results were in line with our expectations, but the number of ideas produced was similar between the two groups. The findings confirm a commonly held notion that diagrammatic process models are a useful aid to process analysts in designing future processes. While these results demonstrate that diagrammatic models do not make analysts more creative per se or lead to a higher number of ideas, the redesign solutions offered appear to be beneficial in terms of dimensions like appropriateness and type of idea. Our findings do not support the argument that process models evoke fixation and hinder the generation of creative, appropriate ideas.

Second, the individual creative competence factor affected the number of ideas produced, confirming the widely held assumption that participants with higher creativity

produce more ideas.

Third, participants in the diagram group produced more ideas related to information systems and fewer ideas related to data than the text group did. Diagram users also produced more control flow ideas but fewer organizational resource ideas, but neither difference was significant. In sum, the type of process representation influenced some but not all types of process-redesign ideas. One useful interpretation of our findings is that managers can, at least to some extent, guide the development of future processes by selecting a process representation format that is more or less conducive to producing changes to the control flow, data, resource, or technology components of a business process.

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