# A Self-portrayal of GI Junior Fellow Agnes Koschmider: Developing Sociotechnical Systems with Special Focus on Quality

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**Abstract:** To date, it is not fully understood why people make errors in the design of business processes. Certainly, one reason is the boundedness of human cognitive abilities. Cognitive abilities are, for instance, restricted by the knowledge or memorability of process modelers. Due to this boundedness people make errors particularly in large and complex models while similar errors are not made in smaller and less complex models. My research focus lies in the investigation of tools and techniques that support users in the design of business process models in a way that improves productivity and efficiency (e.g., understanding and implementing the process model). This paper summarizes three research projects aiming at business process modeling support. The intention of my research is to contribute to the understanding of sociotechnical systems, which are an interplay between humans, information and communication technologies, and organizations. The first project facilitates support for process modeling with a recommendation system. Such a system has been developed in order to assist users twofold in purpose-oriented modeling of processes. The popularity of such a system increases when process models are recommended that can be rapidly understood. My second research project is the investigation of the empirical quality (i.e. structural and textual properties) of process models. To motivate users to reuse process model recommendations, process model reuse must be understood as a common practice and efficient tools and techniques must be provided, which I tackle in my third project.

**ACM CCS:** Applied Computing → *Business Process Management*

**Keywords:** Business Process Model, Recommender Systems, Modeling Support, Reuse, Empiricism

## 1 Introduction

Process modelers need to consider different aspects that are requested to be fulfilled by the business process model. Thus, the process of business process modeling requires significant cognitive capacity of the process modeler. An aggravating factor of business process modeling is also that more and more requirements must be considered (e.g., compliance issues) while the process modeler still should perform her expected task effectively and efficiently. A variety of methods devoted to the analysis of syntactical properties of business process models has been suggested (e.g., deadlock verification [7]) that diminish the task of inspecting the formal correctness of the model by the process modeler. An important issue, which has been neglected in the design of business process models, is to assist users in the creation of the process models. A shortcoming of today's modeling tools is that they usually do not support users in adopting new modeling techniques and the selection and creation of appropriate model content. Instead, most tools merely focus on providing a repository of graphical symbols and advanced visualization techniques to facilitate the understanding of the relationships between various process elements. I am particularly enthusiastic about developing and empirically validating techniques and tools that ease the design phase of business processes. Three exemplary projects are summarized in this paper.

## 2 Research Area: Business Process Models

A business process model can be reduced to a graph $G = (N, A)$ where $N$ is a set of nodes and $A$ is a set of arcs. Nodes are connected by directed arcs $A \subseteq NxN$, which define the control-flow of a business process model. Depending on the grammar of the modeling language different types of nodes are differentiated. Nodes describe tasks to be executed, states of the business process, and they can also be used as flow connectors to explicitly route the control-flow of the business process (e.g., AND describes a parallel task execution, XOR an exclusive OR representing choices between tasks). Flow connectors can also be modeled implicitly (e.g., see Petri nets). The function that is executed by a task related to a node is described by a label. The label can be expressed with different linguistic styles and syntactic cases. Process model elements can differ in graph aesthetics (e.g., shape, size), color and orientation. The latter allows creating a business process model that is read from left to right and thus the nodes are placed on horizontal layers or it can be read from top to bottom where nodes are placed on vertical layers. The process model should be modeled in a way that an orientation of the business process model is evolved by the user. The appropriateness of the layout of process model elements further depends on the graphical properties of arcs. Aesthetics of graphs are affected by the number of arc bends and arc crosses, the angles of arcs leaving a node, graph orthogonality and symmetry.

### 2.1 Process Model Quality based upon Modeling Support

To ensure proper and efficient modeling of business processes, it is important to adequately support users of process model editors. With minimal modeling support, the productivity of novice business process modelers is expected to be low during process modeling. Therefore, [3] introduces a recommender system supporting users at modeling time by providing a recommender component and search functionality for process model parts stored in a repository. A user profile makes it possible to suggest related process models although they do not conform exactly to the specified query. Based on the user profile, the system provides information that facilitates the decision for the (right) recommendation. Users can select recommendations that are ranked based on mandatory and optional criteria. The first mandatory criterion is a modified version of the term and document frequency measure, which was adapted for business process models. The second criterion is the reuse of process models (or process model parts), and the third is the number of operations (deletion and insertion) being performed for a specific process model. Imagine the user has modeled so far the process task "send shipment request for evaluation". Based upon the information in the node labels and the user's profile, appropriate tasks are suggested for completion of the business process model. The recommendation process also includes a content-based business process model analysis based upon the analysis of node labels [4].

### 2.2 Structural and Textual Business Process Model Transformation

Particular attention should be given to the structural and textual design of business process models. Appropriately designed process models facilitate the understanding by different users. Empirical studies showed that reducing the number of both edge crossings and bends improves the readability of the graph ([5]). Other aesthetics seem to be less effective on readability. Below, two business process models are shown. The business process model in Figure 1 is an initial process model to be structurally and texturally improved. Figure 2 shows the same business process model where the vocabulary of the labels and structural properties of process elements have been changed. Also the start and end element are highlighted. Which business process model helps the user better in performing her expected task (e.g., reading a process model and reusing existing process fragments)?

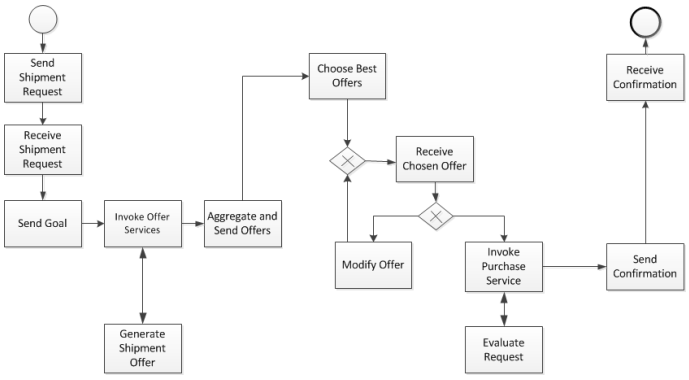


**Figure 1:** Initial business process

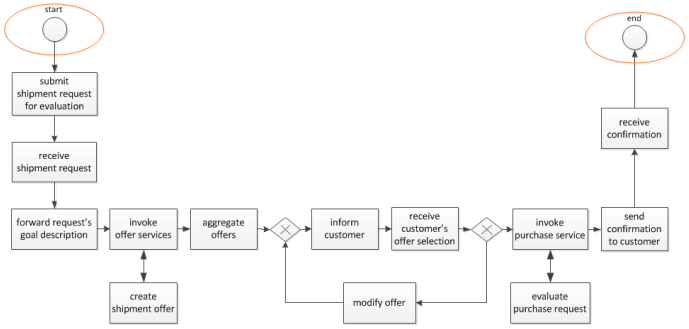


**Figure 2:** Business process after structural and textual transformation

Even if process modelers adhere to guidelines recommended for the labeling, the user (process model reader)

can still be handicapped due to a high information density. A high information density in a modeling workbench tempts the user in making errors ([6]). The restriction to a reduced number of elements (on one process model level) reduces information load. However, even few process elements can use labels containing many words and again readability suffers. The intention of this research project is to identify an appropriate information density for business process models based on textual and structural transformation. Also the correlation between understandability and the association of information (e.g., nouns belonging together such as "shipment request" are displayed in the same line) needs further research.

### 2.3 Process Model Quality based upon Reuse

Instead of modeling a process from scratch one may rather reuse (i.e. specify, produce, classify, retrieve and adopt) process fragments that have been designed by other users. Significant effort has been made in the past by research to promote business process model reuse. Business process model reuse means building up new business process models by assembling already designed ones. Plenty of benefits are assumed to result from business process model reuse (e.g., quality improvements and productivity gains [1]). However, the observation is that business process model reuse does not seem to be a common technique in the process of designing business process models [2, 8]. To provide reasons for the lack of enthusiasm for business process model reuse, a profound analysis of business process model reuse from different perspectives revealed problems, which might hamper a widespread use of business process model reuse. Business process model reuse should be a building block of a more comprehensive way of (reuse) modeling also geared towards capturing professional knowledge for reuse in conjunction with collaborative design approaches.

## 3 Discussion & Outlook

Different (modeling) backgrounds of process modelers have a direct impact on the number of modeling errors where less experienced process modelers tend to make more errors. Thus, support techniques are required that assist process modelers in modeling processes. This paper summarized three research projects aiming at business process modeling support. Furthermore, in a ubiquitous networking environment, it is a challenge to control her own privacy. To support the setting of individual privacy the Empirical Living Lab Method (EmLiL) has been developed together with the FZI Forschungszentrum Informatik in Karlsruhe. The subsequent stages of the method combine a realistic evaluation conducted at FZI Living Labs with empirical methods in order to detect specific privacy requirements. The method is currently being fully validated.

**Literature**


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