

Role-based integration of behavioral and structural modeling

1st TAB Talk: Tarek Skouti

Introduction

Behavior models capture which tasks and activities of a system must be performed in what sequence. Process models are the most popular of behavior models. There are various process modeling languages such as BPMN, UML Activity Diagrams, Event-Driven Process Chains. Out of these process modeling languages, **BPMN** has become the de-facto industry standard for process modeling and is used by business analysts and software developers alike to communicate software requirements [1].

However, behavior models are not the only models used to describe a system. **Structural models** like the UML class diagram are closer to the system implementation but do not explicitly reflect the entities' behavior. Therefore, a combination of these models is needed to define the requirements of a system. The combination of both models is not a trivial task. The models are inherently different. Behavioral models are designed to provide a dynamic view of the system, and structural models to provide a static view [2]. A better *integrated behavioral and structural modeling* is needed that provides a solution to modern modeling challenges like the inclusion of new technologies [3], context-aware systems [4], the rise of knowledge workers [5], and at the same time reduce the long term complexity of evolving systems [6].

The dissertation project's overall objective is to design and develop a solution that *integrates behavioral and structural modeling*. The realization of integration requires a common concept in behavioral and structural modeling. The RoSI RTG increased the understanding and proved the variety of application scenarios for roles is almost limitless. Therefore, **roles** as the common concept is the approach taken. The work of RoSI alumnus Hendrik Schön [7] on roles in structural modeling provided the groundwork for a role-based integration of behavioral and structural modeling. The next step is integrating roles to behavior models, which will be the TAB Talk's main topic.

Research Method

A popular research method in information systems research, "**design science research**," was chosen to develop a solution [8]. Figure 1 shows the research method, which provides multiple entry points for research. The problem was identified in depth. The

objectives of a solution have been researched. Different approaches were developed [4, 5, 9]. For that reason, a design and development centered approach was taken. Eventually, new objectives for a solution might be derived during the evaluation or communication phase, but additional field research provides little advances. Roles are not entirely new to process models or behavior models in general. Various role-oriented process modeling languages like Role-Activity Diagram and Role-Interaction Network had been proposed in the past. However, these languages only use a narrow view of roles, and neither of these languages is generally accepted [9].

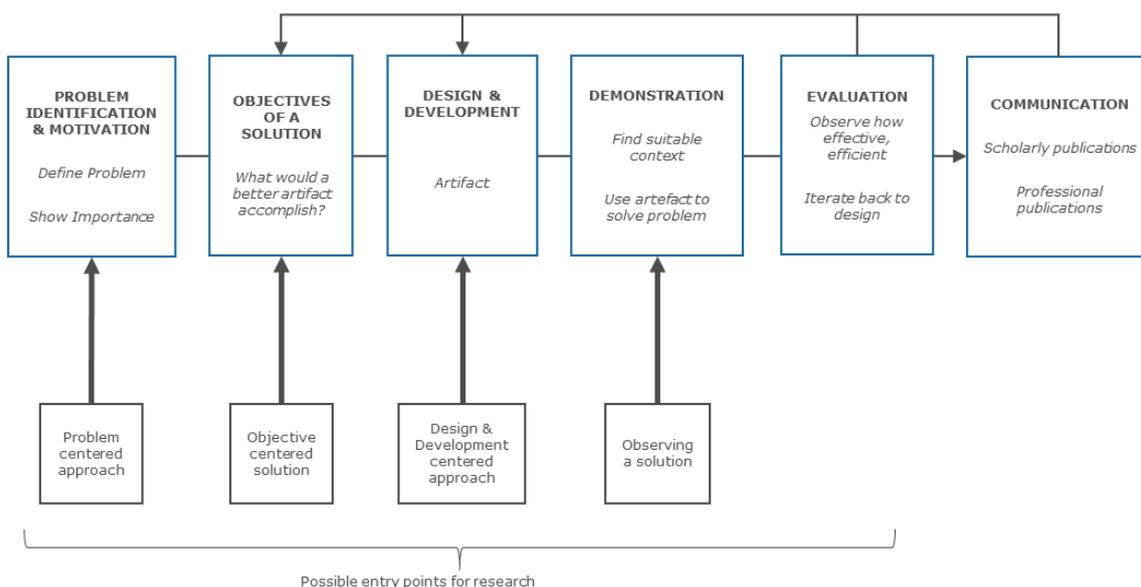


Figure 1: Design Science Research Method (Peppers et al. 2003 p. 96)

A Role-based BPMN extension

The development of yet another business process modeling language does not add value, so a closer look was taken at the standard for process modeling BPMN2.0. BPMN also includes roles, but a narrow view of roles [10]. Figure 2 shows some key elements of BPMN. Roles are named swimlanes in the specification, and instead of a Role standing for a swimlane, it can also be a department, a system, a position etc. [11]. However, BPMN provides an *extension mechanism by addition*. While the extension mechanism is not provided with guidelines for developing an extension, it does provide some restriction as to the elements Event, Gateways, and Sequence flow must not be altered. The

resulting **BPMN extension** diagram should keep the feel of a BPMN diagram. The extension mechanism allows a broader introduction of roles to BPMN.

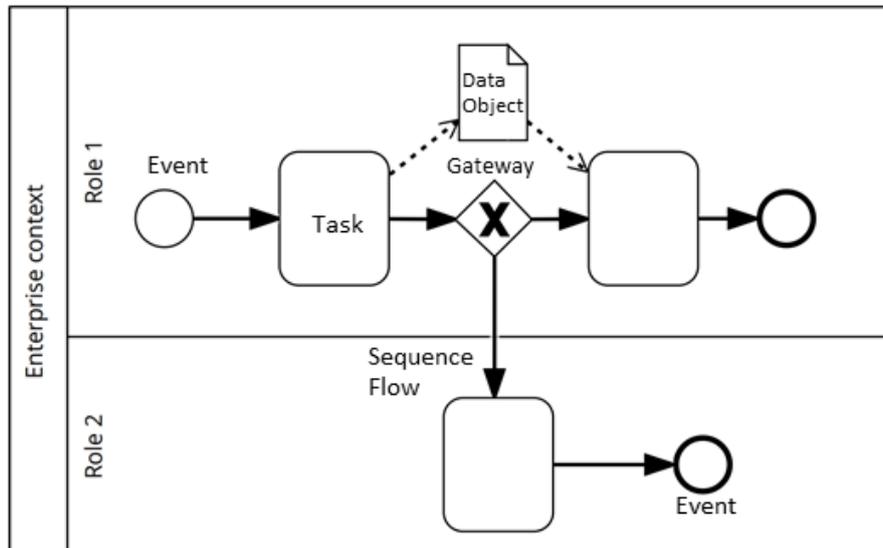


Figure 2: BPMN Core elements

A Role-based-BPMN extension **RBPMN** was proposed in [12]. It is based on previous ideas of role-based process modeling languages [5, 10], works within RoSI, and as an answer to open process modeling challenges. There are three key aspects of RBPMN. The first aspect is active and passive roles. An active role enhances a swimlane's meaning to include **deep roles** while remaining true to the BPMN specification. Passive roles target a sometimes-overlooked part: Process participants without a currently

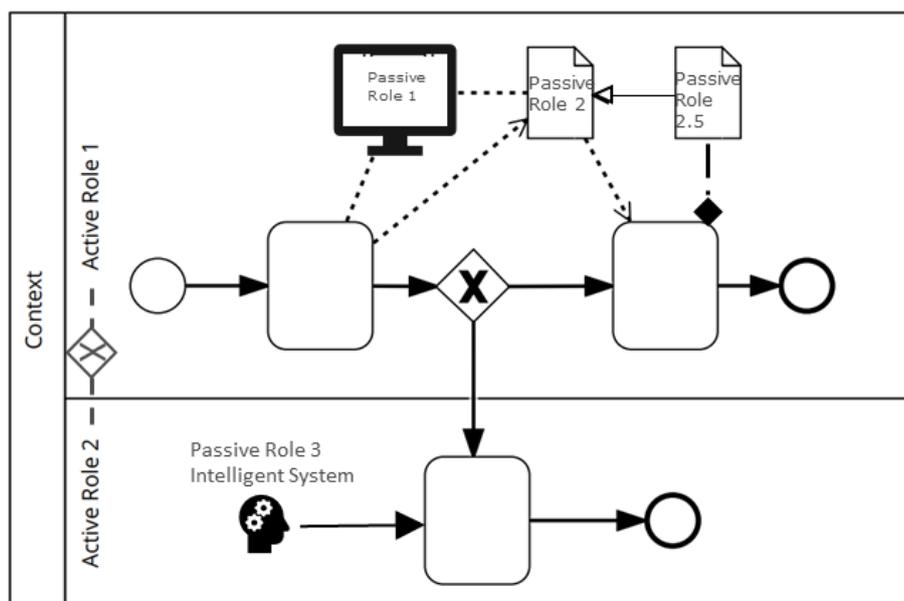


Figure 3: RBPMN Elements selection

expressible process activity of their own, necessary for completing the process. Data objects in BPMN cannot express the variety of data and the variety of devices providing the data. The passive role allows more expressiveness. The second aspect is capturing the **variety of performers** in a process. Roles are an ideal solution to the modeling challenge "variety of performers". The third aspect is the **context**. Context-dependency and modeling of the static or dynamic context are key for RBPMN. In the forthcoming paper [12], RBPMN is described in more detail.

Conclusion

A solution can be excellent in theory but only shows its true drawbacks if rigorously demonstrated and evaluated. A first demonstration of the RBPMN language can be found in its introduction paper [12]. An upcoming **case study** on industry processes from the financial industry will provide more insight into the expressiveness of RBPMN and shine a light on unexpected open questions. RBPMN was already evaluated on BPMN extension conformance and role feature inclusion. RBPMN is a BPMN standardized extension, which means it can be seamlessly integrated into BPMN modeling tools. Most role features of the model level are realized in RBPMN. The next steps are evaluating RBPMN and working towards the role-based structural and behavioral modeling integration approach.

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