

# Capturing Location in Process Models: Comparing Small Adaptations of Mainstream Notation

*Sundar Gopalakrishnan, Norwegian University of Science and Technology, Norway*

*John Krogstie, Norwegian University of Science and Technology, Norway*

*Guttorm Sindre, Norwegian University of Science and Technology, Norway*

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## ABSTRACT

*For mobile and multi-channel information systems it is often relevant to model where something is supposed to take place. Traditional business process modeling notations seldom capture location. Examining if there might be any gain in extending mainstream modeling notations with the capture of location is an interesting research topic. This paper addresses this question both through an analytical comparison of various notation alternatives and two experiments investigating different ways of visualizing location. The results of the experiments indicate that the notation using color for distinguishing different places have advantage over textual annotations, whereas no significant difference was found between the use color and pattern fills when it came to the subjects' performance solving the experimental tasks.*

*Keywords: Diagrams, Information Systems, Mobile Applications, Notations, Process Modeling*

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## INTRODUCTION

For mobile and multi-channel information systems it is often relevant to model where something is supposed to take place. Even if geographical location is included in some enterprise architecture frameworks (Zachman, 1987), business process modeling notations seldom capture location. In BPMN (Wohed, van der Aalst, Dumas, ter Hofstede, & Russell, 2006), UML activity diagrams (Dumas & ter

Hofstede, 2001) or similar process notations, so-called swim-lanes and pools may be used to indicate who (person/role/organizational unit) performs a certain task, but not where, as emphasized in Walderhaug, Stav, and Mikalsen (2008), the location and context of activities performed is of much higher importance in mobile information systems. For instance, whether a certain information processing task is to be performed in the office before going out on a power line repair job, in the car while driving, in the terrain while walking and searching for the exact site of damage, while climbing in the

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power must to fix the damage, while driving back from the site, or after having returned to the office – will have a large impact both on quality, efficiency, and job satisfaction, and is therefore an important process design decision. In turn, this decision will also have a lot of impact on what ICT tools have to be developed to support the work process, and what requirements that these tools have to satisfy. If the task were to be performed on foot in a dense forest, this would require different equipment and imply other usability challenges than for a desktop application. Another point is that ubiquitous information systems often have problems with information overload. As pointed out by Deiters, Löffeler, and Pfenningschmidt (2003) information should be delivered just-in-time based on the user's context rather than all at once, and clearly different types of information are relevant in different locations. Hence it is important to capture the various possible locations of the users at an early stage, to determine when the system can feasibly deliver various types of information.

Since diagrams often play an important part in early stage IS development, it is interesting to investigate the possibility of capturing the location and context of activities in process models. The work reported in this paper has focused on how to best achieve this in diagram notations which slightly adapt mainstream notations. UML activity diagrams have been used as an example in concrete investigations (e.g., experiments), but the notational remedies applied could equally well have been used in BPMN or other similar process notations. The research questions investigated are as follows:

- **General research question:** How can we show location in business process diagrams, using existing notations with simple adaptations?
- **Specific research question:** Which will be the better notation in terms of user performance and preference: distinguishing the location of activities by (a) annotations in separate nodes, (b) color, or (c) pattern-fills?

The choice to focus on small adaptations is due to the fact that there is a lot of investment embedded in existing notations, in terms of developers who have learnt to use them and tools available to support them. Suggesting a radically different notation would disregard this investment, and although the new notation might be theoretically optimal for mobile work processes, likelihood of industrial adoption would be smaller, especially where there exist well established, standard notations such as UML and BPMN with advanced tool support. While looking at more radically different notations might still be interesting for the longer term, and has been done in Gopalakrishnan and Sindre (2011b), it is considered beyond the scope of this paper.

The rest of the paper is structured as follows: The “Background and Related Work” section presents background material on mobile information systems and the need for representing additional aspects not covered in traditional modeling notations, including location. The section contains also related work on efforts to adapt modeling languages to include location. The “Research Method” section then discusses the procedures followed to arrive at the reported results, both for the analytical evaluation and experiments. The two following sections, “Analytical Evaluation” and “Experiment Results” present the results, whereupon “Discussion” tries to interpret the findings and discuss threats to validity. The “Conclusion” section concludes the paper, pointing to future work.

## BACKGROUND AND RELATED WORK

Mobile applications have the opportunity to take context into account. In Krogstie (2002) a categorization of context-dimensions is provided as follows:

- The spatio-temporal context describes aspects related to time and space. It contains attributes like time, location, direction, speed and track.

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