

# A Participatory Framework for Evaluation Design

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## Abstract

Users and the information systems designed to support their needs and behaviors are becoming increasingly complex. Evaluators are tasked with designing evaluation methods that address the evaluation challenges of systems conceived through newer design principles, while also identifying issues and user perceptions in an efficient and effective manner. We argue that user involvement through structured *formative evaluation design* can fill the conceptual and procedural gaps between system design and system evaluation. This poster proposes a participatory framework for designing evaluation methods that can help designers and evaluators develop holistic approaches to design and evaluation by bringing greater detail, structure, and clarity to evaluation design. To determine the feasibility of this participatory evaluation design framework, we will integrate the system evaluation and evaluation design process into the system design process of information displays that support team situation awareness during trauma resuscitation.

*Keywords:* evaluation design, evaluation, participatory design, trauma resuscitation

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## Introduction

System design practice has progressed through several changes in perspectives on the role of the user, group work, and expanding contexts of use (Bannon, 1991; Bødker, 2006; Harrison et al., 2007). However, system evaluation is still grounded in traditional approaches (e.g., usability testing and heuristic evaluation) that were intended for implementation with users or experts individually in lab settings (Greenberg & Buxton, 2008). At the same time, systems are becoming increasingly dynamic and complex, requiring evaluation methods (i.e., questions, techniques, and instruments) that can adapt to the context in which they are used (Chilana et al., 2010). Evaluators may miss important issues if evaluation methods are not properly calibrated to the users, system characteristics, and design context. Moreover, without proper formative evaluation throughout system development, designers and evaluators risk wasting valuable resources and time with users.

Several challenges make it difficult to design contextually appropriate methods: (1) integrating system design, system evaluation, and evaluation design into one process; (2) coping with complex contexts; (3) reaching mutual understanding with users; (4) designing relevant evaluation methods; and (5) eliciting feedback and tacit knowledge from users (Kusunoki & Sarcevic, 2012). Current methods do not provide evaluators with guidelines for selecting or adjusting evaluation methods to ensure that both design and evaluation are grounded in the same theoretical foundations. A conceptual disconnect can also form if design and evaluation are treated as separate activities or even phases in the system development process. The goal of our research is to fill the conceptual and procedural gaps between design and evaluation by presenting an overarching framework that guides researchers in taking a holistic approach to system development through structured *formative evaluation design*. A participatory evaluation design framework can provide evaluators with more details about how to involve users in refining evaluation methods. It can also provide guidelines for how to implement targeted and streamlined evaluation and evaluation design activities during iterative system development.

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Acknowledgements: We thank Drs. Andrea Forte, Michael Muller, Delia Neuman, and Susan Wiedenbeck for their valuable feedback.

Kusunoki, D.S., & Sarcevic, A. (2013). A participatory evaluation design framework. *iConference 2013 Proceedings* (pp. 860-864). doi:10.9776/13439

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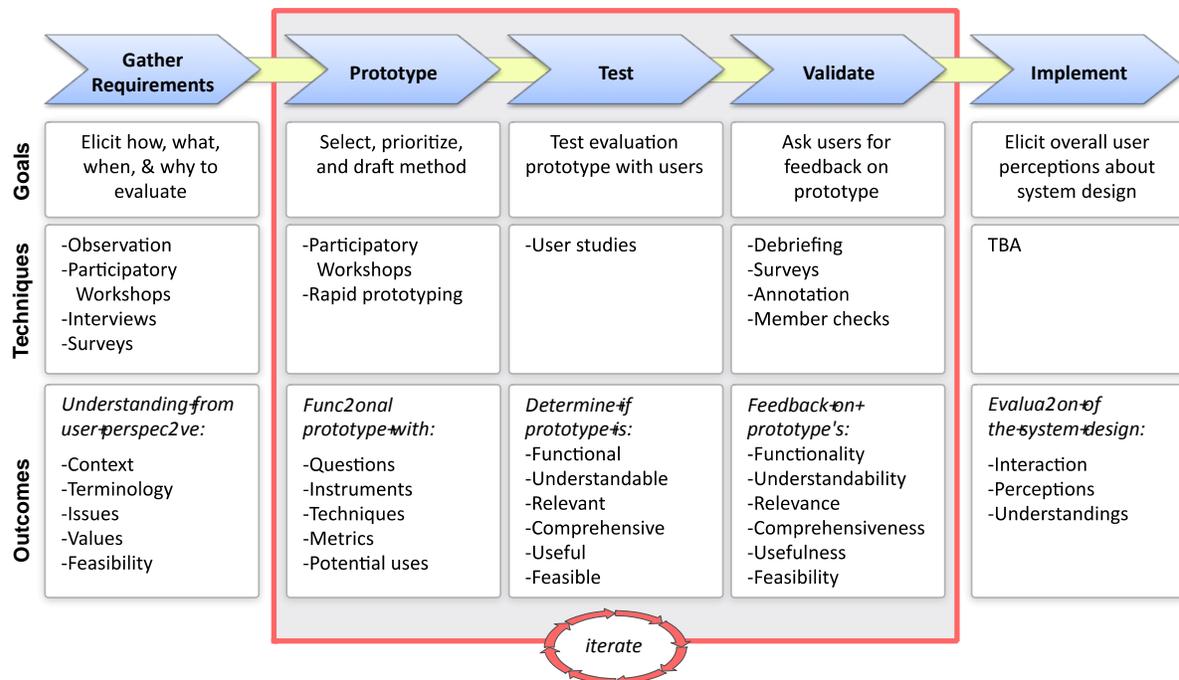


Figure 1. A participatory evaluation design framework.

## A Participatory Evaluation Design Framework

To fill the conceptual gap, evaluators and designers need to merge their practices of *understanding*, *designing*, and *evaluating*. First, their practices of *understanding* user behaviors, perceptions, and contexts should provide a strong foundation for their practices of *designing systems* that support users in a particular context. Then, their practices of *designing evaluation* methods should align with their practices of designing systems. Finally, they must determine whether their *understanding* is properly reflected in their *evaluation designs* and the resulting *system design*.

Through the use of what we call a *participatory evaluation design framework* (Figure 1), evaluators can work with users to collaboratively determine what will be evaluated, why it should be evaluated, and how it will be evaluated. Participatory design can help evaluators develop methods that match user-generated evaluation design requirements. Evaluators can include users in the evaluation design process by collaboratively determining the usefulness, understandability, and appropriateness of the methods. Users help evaluators isolate and prioritize issues that must be addressed through the system design, which is especially useful in complex contexts. We emphasize user involvement without placing extra burden on users by carefully integrating system evaluation and evaluation design activities into the system design process to fill the conceptual and procedural gaps as described in the following sections.

### Gather Requirements

While gathering system design requirements through techniques such as observations, participatory workshops, interviews, and surveys, evaluators can identify what users value and feel should be evaluated about the system for it to support their needs (Figure 1, gather requirements). The goal would also be to elicit the user perspective on topics such as values, issues, metrics for success, and feasibility of project. Time spent upfront on understanding users' context, behaviors, perceptions, and specialized terminology will reduce time spent adjusting methods later.

### Prototype

When the system prototype is being designed through rapid prototyping and participatory workshops based on the requirements gathered, evaluation methods could also be designed (Figure 1,

prototype). The goal would be to: 1) select and prioritize issues and values; 2) prototype methods that would elicit feedback; 3) decide which metrics will be used to determine the system's success; and 4) identify potential uses of the evaluation results (Greene, 1987). Designers and evaluators would be responsible for maintaining the conceptual and technical integrity of the methods (Ayers, 1987; Garaway, 1995; Greenberg & Buxton, 2008; Greene, 1987).

### Test

The methods are tested through user studies when conducting formative evaluation of the system design (Figure 1, test). Based on their experiences during prototype testing, evaluators determine from their perspective whether the evaluation prototype is functional, understandable, relevant, comprehensive, useful, and feasible to implement (Fowler, 1995; Groves et al., 2009). Evaluators then supplement their understanding with feedback from users through validation.

### Validate

Users are asked to provide feedback about the functionality, understandability, relevance, comprehensiveness, usefulness, and feasibility of the evaluation prototype (Figure 1, validate). This can be accomplished through techniques such as debriefing, surveys, annotating instruments, and member checks (Fowler, 1995; Groves et al., 2009). Validation should follow testing immediately to ensure that the users' perspectives are not affected by time delay. Member checks can be performed at a later time when initial findings are developed from evaluation testing and validation (Greene, 1987; Guba, 1981).

Based on user feedback about the evaluation method, evaluators may decide to iterate the prototype, test, and validate steps of the evaluation design process. Once all major user issues and concerns have been addressed through iterative evaluation, evaluators can elicit overall user perceptions about the system design and the evaluation design process. After concluding system development, rigorous summative evaluation will determine the technological performance of the system. Evaluators should periodically check that users are still satisfied because needs and technologies change rapidly over time.

## Specific Aims

We have three specific aims that we plan to accomplish through implementing this participatory evaluation design framework:

**Aim 1:** Fill the conceptual and procedural gaps between system design and evaluation.

**Aim 2:** Design a framework for evaluators to systematically develop evaluation methods.

**Aim 3:** Develop better questions, techniques, and instruments for eliciting users' concerns, perceptions, understanding, and feedback on evaluation design.

In the following section, we discuss how we will implement this framework to structure the system development process of information displays that facilitate teamwork in the trauma resuscitation domain.

## Future Application in the Trauma Resuscitation Domain

To determine the feasibility of this participatory evaluation design framework, we will integrate the system evaluation and evaluation design process into the system design process of information displays that support team situation awareness during trauma resuscitation. Trauma resuscitation is a highly complex, dynamic, and safety-critical medical domain. Healthcare providers from different disciplines, such as anesthesiology, nursing, and emergency medicine, form impromptu teams to perform life saving treatments on patients in critical conditions following the Advanced Trauma Life Support (ATLS) protocol (American College of Surgeons, 2008). Each trauma resuscitation is unique—different combinations of factors dynamically interact and contribute to the mechanism of the patient's injury, symptoms, and reactions to treatments. Teams must rapidly collect and sift through extensive amounts of information from various sources to examine, diagnose, and treat patients (Sarcevic, 2008). Despite the urgent, high-risk, and complicated nature of the trauma resuscitation process, there are no information technologies present in the trauma room that aggregate and display contextual information to support team situation awareness and decision-making.

## Additional Challenges in Trauma Resuscitation

A number of additional issues may arise during system design and evaluation due to nature of trauma resuscitation (Kusunoki & Sarcevic, 2012). Team members have various training backgrounds and levels of experience, and consequently may have conflicting ideas about what the design should support. Each team role also requires different pieces of information in different formats at different times. Teams are formed spontaneously and may not know each other or know each other's work styles. Participant access is limited because healthcare practitioners are busy and working long, odd hours. Planning observations or user studies for live trauma resuscitations is unfeasible because they are infrequent and unpredictable. Privacy and security restrictions also make it difficult to receive clearance to view or record live trauma resuscitations. Moreover, testing unfinished systems in this environment is unsafe. Considering these challenges, system development needs to be flexible, efficient, and rigorous.

## Meeting the Challenges

Techniques within the participatory evaluation design framework can be adapted to meet the challenges of the trauma resuscitation domain. Conducting simulations to test the system alleviates some issues with infrequency, privacy, and safety. Simulations also allow researchers to observe and videotape for detailed review. Recruiting participants from their appropriate disciplines to fill each role and randomizing user studies can reproduce the dynamic formation of diverse teams. Working with users early on will help ensure that the system design and evaluation methods are appropriate, ultimately saving everyone time by preventing costly repairs.

## Conclusion

Regardless of the methods developed, overarching cohesion should exist among the principles and methodologies that support system design and evaluation. A participatory evaluation design framework can help designers and evaluators develop holistic approaches to system development. Designers and evaluators may potentially benefit from a structured framework for streamlining evaluation and evaluation design activities during system design. Future application in the trauma resuscitation domain will allow us to determine the feasibility and adaptability of this framework.

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