Common & Particular Needs: A Challenge to Participatory Design

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Abstract
A design story about the design of a visualization for controllers who monitor IBM's controls process, provides the backdrop for reflections on the success of a participatory design process. The story illustrates that while the design process appears to lead to a successful general technical solution, the solution fairs less well when viewed from the perspectives of: support for evolving work practices, or support for the particular and contextual tasks of individuals. This leads us to reframe our participatory design process as the design and socialization of end-user programming tools.

Keywords
Participatory design, end-user programming

ACM Classification Keywords
H5.2. User interfaces: User-Centered Design.

Introduction
After many years practicing participatory design, we have observed two challenges for our practice.

- While the common needs of a group of participants in a participatory design process can be met by a general custom solution that emerges from the design process, individual participants typically have specific situated needs that cannot be addressed by the general solution.

- Because work practices continually evolve, the shared requirements of a group of participants also evolve beyond the completion of the original custom design. Over time the original custom design no-longer meets the 'evolved' needs of the users.

We illustrate these challenges with one specific participatory design process. In this instance, we were co-designing a visualization for IBM controllers to enable them to monitor IBM's control process [1]. IBM's controllers are responsible for defining and managing the control process, which identifies controls that will be used to verify the company's operations and financial reporting. A control is a documented and verifiable test, which is run on a specified periodic basis. An example control for 'Accounts Receivable' is that adjustments should be checked to ensure that management has approved (by signature) all adjustments that are not financial in nature. In global businesses, the same business process may occur in many different countries, and so the same control may be tested in many different countries. Part of the urgency for such a solution was the regulatory need for a reporting solution to address the Sarbanes-Oxley legislation Section 404 that, amongst other things, requires that management file annual reports on internal controls, and demonstrate an ability to monitor control compliance.

Our Design Practice

Our design practice is a variant of participatory design, so end-users are full members of the design team. The central activity of this team is creating and reflecting on artifacts: sketches, visual and technical prototypes, storyboards, etc. This activity can be thought of as a learning conversation between the design team members. The conversation is about the design space, and the artifacts produced are conversational props that serve to ground the design conversations in the concrete; and thus facilitate the conversation between the members of a multi-disciplinary design team. These conversations lead to a better understanding of the design space, which in turn enables better crafting of custom applications.

A second characteristic of our design practice is that we build end-to-end solutions that get deployed in real-world contexts. Thus the final product of the design process is a custom application that is deployed to our end-user participants.

An Illustrative Design Story: Designing a Compliance Visualization

Our story starts when we met with the IBM controllers to discuss working together to create a visualization for their Risk and Compliance data. Prior to the meeting we had been working on the design of visualizations for risk and compliance data that would allow executives to see the current status of their organizations compliance, and based on what they saw, take necessary actions. Figure 1 illustrates our design process, with the first meeting with the controllers shown as a filed circle.

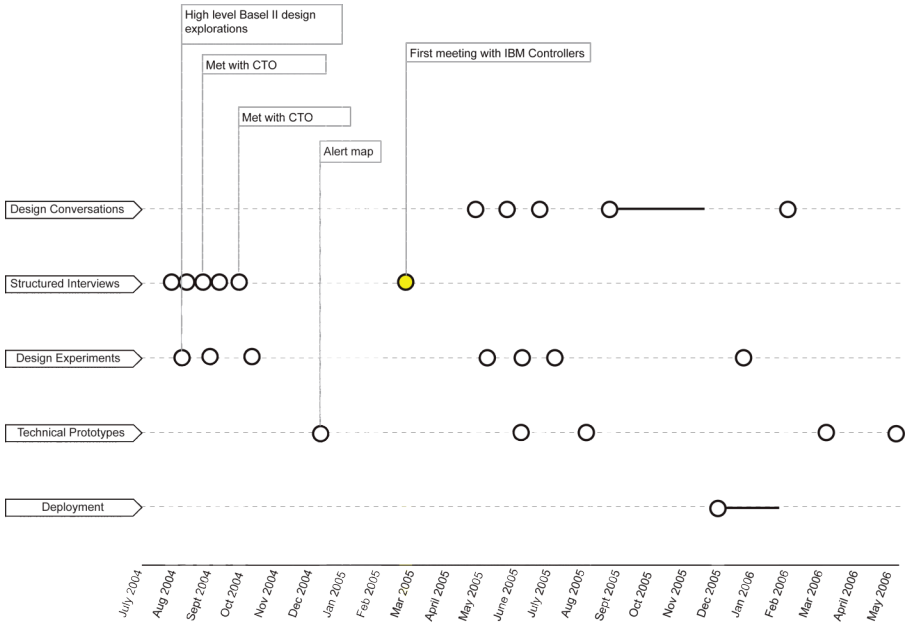

Figure 1. A representation of our design process.

At the first meeting with controllers, we showed them many examples of risk and compliance visualizations, and described our design process. They in turn told us about their compliance process; they were using a home-grown database for their compliance process, but needed to be able to generate reports more frequently and monitor their controls more closely than that database allowed. We offered to build a visualization for them if they provided their data and expertise in the domain of compliance. They agreed.

The Design Team

We formed a design team that consisted of: three Executives, one person responsible for process support and two people responsible for technology support from the controllers staff. Two designers and one software engineer from the visualization research team.

Design Conversations

We had many design conversations over the ensuing months in which we learned more details about their compliance solution. In particular we learned how many controls had identified (in the order of 1000's), and how they had been categorized according to business processes and the country in which they were tested. The database used to store the controls data also reflected this categorization, as did the organizational structure of the controllers themselves. Besides the individuals who have responsibility for the individual controls, the control staff (*i.e.* all the controllers across the whole organization) are organized hierarchically, where individuals have responsibility for managing all the controls for a business process, or a country. The controllers are personally responsible for overseeing the testing, and certifying the accuracy and efficiency of the control processes they are responsible for.

We used sketches as conversational props [2] throughout our meetings with the controllers. As we explored the design space using design sketches we started to discover more about the needs of these executive controllers. Of particular note is their need to be able to see the status of individual controls within a category (business process or country). We offered

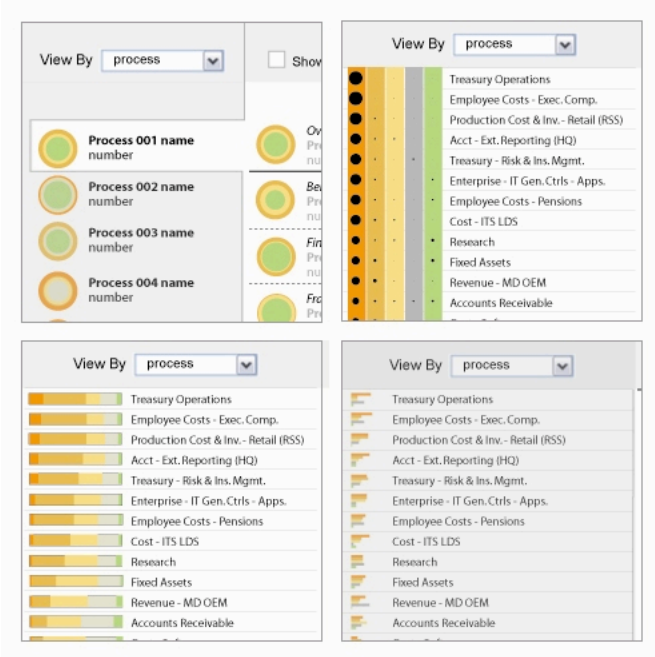

Figure 2. Design sketches for different representations of the status of control categories.

sketches (as shown in figure 2) that portrayed the overall status of the business process; however the controllers said that seeing for example, that a business process had defects in 5% of its controls did not help as they needed to know whether that meant 2 controls had problems, or 30 controls. They wanted to be able to see the status of individual controls.

We used informal annotated scenarios to capture these design conversations, as shown in Figure 3, where the large yellow rectangle contains the captured comments. These comments were visible to everyone present as they were made by directly annotating the sketch that was being projected. This allowed participants to comment on, and suggest changes to, the annotations being made. Participants also had paper copies that they could annotate by hand.

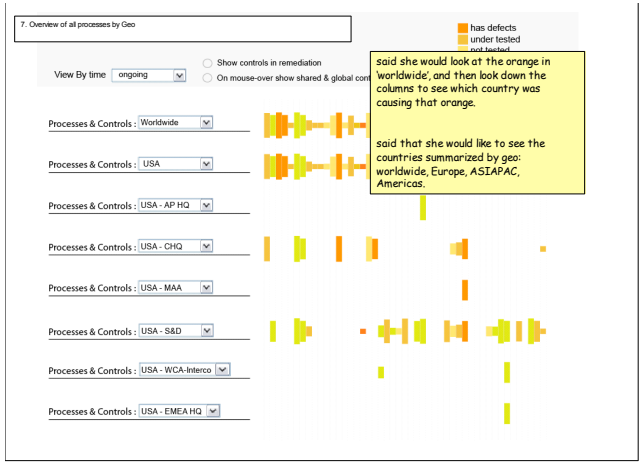

Figure 3. An annotated scenario, used to capture design conversations.

After a series of such conversations, we started to implement some of the design sketches. These technical prototypes allowed us to experiment with interaction techniques and also allowed the whole team to 'see' what the visualization would look like against the real data. In addition, it gave us the opportunity to explore some of the technical issues such as performance, dynamic updating and connecting the visualization to their backend database.

We deployed the working prototype to the IBM controllers for two months. The deployment was advertised on the controller's web site. About twenty controllers participated in the trial; these were mostly business process owners. We collected comments from the deployment in a wiki. A link to the wiki was placed directly on the visualization. We also conducted three semi-structured interviews with groups of business process owners. Seven people in total took part in these interviews. Finally we had further conversations reflecting on the deployment and final design with the executive controllers who were design participants.

Reflections on the Design

In participatory design, feedback from a deployment should not be considered as objective data, as the users are also designers and thus have a 'stake' in the deployed design. Rather, in this design process deployment provided further opportunity for design conversations between designers and users. In addition, because not everyone who used the deployed visualization had participated in design process, the interview process was a way to bring more stakeholders into the design conversations. As more stakeholders are bought into the design conversations, new issues arose. For example, some of the controllers we interviewed were concerned about whether the visualization made the intermediate details of their work process more transparent to the executives, and thus more likely to be micro-managed. These new issues need to be addressed as part of the design process and resolved within the design conversations.

Common Needs

There was much agreement between controllers about what they needed to be able to see in order to monitor the controls. Being able to see at a glance the status of their controls was commonly felt to be useful. There were also common suggestions for changes; e.g. maximizing the number of controls visible on one screen by not showing controls that had no defects.

Particular Needs

Stakeholders did not always agree however about what they needed to see. For example, process owners wanted to see the controls organized by process, whereas country owners wanted to see the controls organized primarily by country. All stakeholders wanted to be able to get a view of 'their controls', i.e. just those controls they were responsible for. Another example of a situated need was an organization that used brands, as an additional category for controls. They had decided to treat each brand as a separate business process, but this meant that they could not get a view of their controls organized by country.

We realized that when people with different roles were agreeing, this indicated a common feature that we needed to support; however, where people with the same role were disagreeing, this suggested the need for customization. Furthermore, we realized that in certain circumstances the need stated is so specific to that particular user, that even greater levels of support for customization are required than simply allowing users to select from predefined views, or selecting specific items to show from a view. For example, one owner told us that he kept separate spreadsheets that contained information specific to his schedule for testing the controls for the process he was responsible for. He might like to be able to annotate the visualization with such information, and possibly share those annotations with others.

Evolving Needs

Through the months of the project, controllers would continue to make requests for new features. This is not atypical, because part of the participatory process is that everyone involved is learning more about the process the technology aims to support. Not surprisingly, this leads to insights into new ways of thinking about and enhancing their work process. For example, once they had a visualization of the current state of the controls, the desire to be able to look at historical trends across controls arose. Similarly, thoughts about how to differentiate between defective

controls in terms of their risk to the company were not part of our early design conversations, but did get articulated later in the process. Not surprisingly, once articulated, everyone was interested in being able to see the financial impact of a control having a defect.

The continual evolution of work practices raises another issue for our participatory design process. When can we as designers consider our job done? We have had problems ending design partnerships, as the participants come to rely on us to continually redesign the solution to meet their new requirements.

Conclusions

Participatory design is an effective technique for bringing users concerns directly into the design process. However, as this design story illustrates, users have particular needs, as well as more common requirements. Additionally, requirements are not fixed, but continually evolve as work practices evolve. Understandably as new requirements emerge participants want to continue the participatory design process and incorporate these requirements into a solution. While the continual need to support emerging requirements and situated needs guarantees work for the design team; it means that end-user participants are dependant on developers to continually maintain and specialize the deployed solution.

We propose changes to our design practice as a response to this dilemma. Rather than focus our design on a single solution, we see our job as designing a highly customizable (even programmable) solution that end-users can change to meet their particular needs. The task of the design team is to jointly discover what is common to the work process, and what needs to be customized. Then the design is the identification of the domain-specific abstractions, and potential customizations. The design process could become a programming apprenticeship for the participants where the end-user participants become peripheral members of a programming community comprising a range of expertise levels. Given suitable tools, several of the participants may become facile in creating customized solutions that can be shared with their colleagues. Exactly how we realize this change to our design practice remains to be seen, but we will draw on research [3, 4] that has started to explore this kind of design practice.

Acknowledgements

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References

[1] R.K.E. Bellamy, T. Erickson, B. Fuller, W.A. Kellogg, R. Rosenbaum, J.C. Thomas and T. Vetting Wolf. *Seeing is Believing: Designing Visualizations for Managing Risk and Compliance*. IBM Systems Journal, 46, 2, 2007.

[2] T. Brinck , L. M. Gomez, *A collaborative medium for the support of conversational props*, Proceedings of the 1992 ACM conference on Computer-supported cooperative work, p.171-178, November 01-04, 1992, Toronto, Ontario, Canada.

[3] G. Fischer, J. Grudin, R. McCall, J. Ostwald, D. Redmiles, B. Reeves, F. Shipman. *Seeding, Evolutionary Growth, and Reseeding: The Incremental Development of Collaborative Design Environments.* In G.M. Olson, T.W. Malone and J.B. Smith (Eds.) Coordination Theory and Collaboration Technology, Lawrence Erlbaum, 2001, 447-472.

[4] T. Schümmer, S. Lukosch, R. Slagter. *Empowering End-Users: A Pattern-Centered Groupware Design Process*. In Groupware: Design, Implementation, and Use, 11th International Workshop, CRIWG 2005, LNCS 3706, Springer-Verlag, pp. 73-88, 2005.