

Notification Design Challenges for the Personal Web

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Abstract

Based on research conducted to improve the design and management of notifications in the Jazz collaborative development environment and a CASCON workshop on notifications, we describe a set of notification design challenges for the Personal Web.

1 Introduction

There has been recent Human-Computer Interaction and related research on the topic of managing interruptions [7]. Interrupting users with many non-critical events, for example, has been shown to lower productivity and cause stress and frustration [8]. In this paper we use the more neutral term “notification” to mean the same thing as a system delivered “interruption.” The two main components to interruption management that have been studied, albeit largely independently, are: (1) timing of interruption delivery based on user context [4]; and (2) presentation format of the interruption based on user context [1, 10]. In a pure timing-based model, notifications are queued up until it is a “good time” to interrupt the user, and all of the queued notifications are delivered at once. In a pure presentation-format based model, notifications are always delivered right away, but the way that the notification is presented, in particular the degree of intrusiveness is adjusted based on context.

A user’s context generally refers to what the user is doing at a given moment, and at its highest level reflects whether the user is busy or not. The two primary ways to determine context are: (1) Automatically (or system determined), where the system attempts to detect when users are interruptible or not [6, 12], and (2) Manually (or user determined), where users declare their preferences as to when they can be interrupted, and the system interrupts users accordingly. Context is more involved than simply the degree to which the user is busy doing an activity. Knowing when to interrupt should also depend on the importance of the interruption content, which is referred to as the interruption’s relevance or utility.

The Personal Web is the next instantiation of the *Smart Internet Research Initiative* [9]. The Personal Web focuses on the person *ME* as the center of gravity of Web integration. The objective of the *Personal Web* is to empower *ME*, as a common Internet user of generally limited technical skills, the autonomy and ease of control in assembling and aggregating integrate-able elements across the Web for a particular *sphere of context* of my concern. Making it simple for users to visualize and interact with the results of the user-sovereign Web integration would make *ME* productive and delight *ME*. Notification design optimized for the sphere of context of my concern is pivotal in enabling a simple user model, making *ME* productive by directing my attention to the most important and relevant information. For the Personal Web, it is important that notification delivery is adapted to factors such as device and location. In the Personal Web, it is not just about user’s current task but also the current sphere of context, which the user has manually defined and the system has ongoing implicit knowledge of.

This is ideal for providing information about the user's context.

The main contribution of our work is a set of notification design challenges for the Personal Web. In Section 2 that follows, we will preliminary results from our recent research and workshop on notifications. In Section 3, we will describe the notification design challenges for the Personal Web. We will conclude this paper with proposed next steps.

2 Research Conducted

We have recently done an effective notification design research on the Jazz collaborative development environment (CDE) [5]. The high-level goal of this research is to investigate better collaboration support through appropriate awareness of team members' activities in the Jazz Web UI environment. The research specifically aims to improve collaboration through interrupting users at context-appropriate times with relevant information in context-appropriate presentation formats.

We have also hosted a CASCON 2009 workshop on notifications, which was to explore the effective design of notifications in various collaborative / social environments, including but not limited to collaborative development environments and social networking sites.

In this section, we will briefly summarize the research conducted and their preliminary results.

2.1 Notifications in Jazz CDE

Jazz is an IBM initiative to help make software delivery teams more effective. It is a CDE designed to transform software delivery, making it more collaborative, productive and transparent for development teams using the agile development process. Instead of an integrated development environment (IDE) such as Eclipse which focuses on supporting an individual software developer, a CDE puts the team first with the assumption that team productivity will increase [2].

Agile development uses a less structured development process relative to more traditional software development, and thus has a greater need for awareness of team member activities. Agile encourages rapid peer-to-peer communication, relying much less on official top down communication channels, such as team meetings. Jazz supports informal communication and light-

weight awareness through a number of different

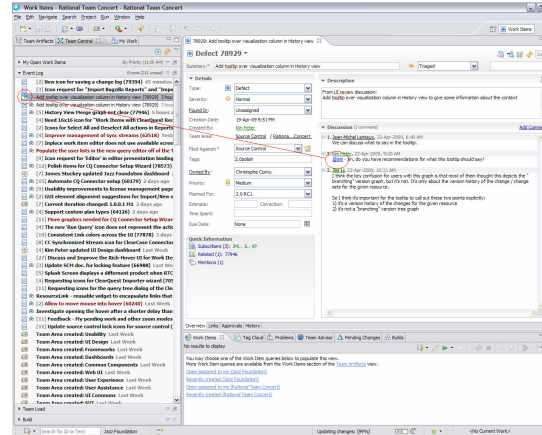


Figure 1: The Jazz CDE, showing the events list (left), linking to work item data (right).

mechanisms, which include notifications of events that are fired based on many user activities (such as completing a work item) as well as system activities (such as the outcome of a build).

We took a scenario based design approach [3] and conducted a focus group user study with eight representative Jazz users to validate the scenarios and generate design requirements. We conducted a three-session focus group study, each session lasting 1.5 hours, with eight representative participants, all IBMers who use Jazz.

Our high-level goal was to elicit requirements. The specific goal of the first session was to present and validate the As-Is scenario (which reflected our assumptions about the current problems with notifications in Jazz) and to document specific pain points experienced by our participants. After the first session we modified the To-Be scenario (which addressed those problems with specific design solutions) reflecting what we had learned. The goal of the second session was to validate the revised To-Be, and to prioritize the pain points elicited in the first session. From these two sessions we learned that our scenarios were valid, although some minor adjustments were required. Our participants told us that they are over exposed to notifications in the Jazz CDE, resulting in poor awareness of team activities. The pain points that emerged in the first session and that were ranked as most problematic in the second session were as follows:

1. Awareness of changes by others that affect my current work
2. Prioritizing all incoming communication related to my current work

3. Notifying others who are (may be) affected by changes in my work
4. Blocked communication path to others

Our main findings can be categorized into the following four themes:

- A) Individual needs come first, team needs second.
- B) Notification customization UI design presents unique opportunities and challenges.
- C) Notification UI should not block users: control must remain with the user.
- D) Don't want technology "watching you."

We then conducted brainstorming sessions within our research team to prioritize the requirements and explore design ideas, generated design sketches, and solicited input in the third focus group session. The key design goal that emerged was to create a central place to view and prioritize work items and high-priority events. Finally, we created a proof of concept working prototype for the Web version of Jazz CDE. The prototype supports many of the features and design elements described above.

2.2 CASCON Workshop

In CASCON 2009, we hosted a workshop on notifications. We spent the first 15 minutes for participant self-introduction, and we had 30 workshop attendees. Two 20-minute short panel presentations followed: we presented our Jazz CDE research; a product manager at Google presented their work on notifications for mobile applications. At the end of the presentations, there was a 30-minute panel questions and discussion. After a 15-minute break, we had four break-out groups and each group had 45 minutes to discuss and answer a broad range of questions and issues, including the following:

- What is the design space for the presentation styles of notifications?
- How should notification content (the message) be best matched to a presentation style?
- To what extent does the effectiveness of notifications (presentation styles and notification content) depend on the particular kind of environment or application?
- What is the state of the art in commercial environments and applications?
- What is the state of knowledge on notifications from the research literature?

Finally, we regrouped and had 30 minutes to wrap up the workshop, with each group presented a summary of their discussion.

We intend to write up a separate full workshop report, but here is a summary of the key findings:

- Participants told us that they are indeed being interrupted by too many forms of notifications, from email, RSS feeds and Facebook status updates to alarm clocks, microwave buzz and fire alarms.
- Participants concurred that good notification design would be a critical component for success in the Web and mobile applications space.
- Participants were divided on intrusiveness of notification presentation styles. Some prefer more intrusive presentation style, such as a pop up dialog box, while others prefer non-intrusive presentation style – regardless of notification content (the message).
- Participants were also divided on whether notifications should be viewed and controlled from a central place, e.g. a dedicated notification bar.
- Participants voiced concerns about looking at notification design purely from a software only perspective. A systems approach might be more appropriate, where notifications are delivered within the user's broader environment. For example, instead of a "You've got mail" notification showing in one's email program, the user's mobile phone vibrates; instead of a buzz via Instant Messaging (IM) chat window, the user's phone rings, interrupts the user, and when the user picks up the phone it tells the user that there's an urgent IM chat request from the spouse.
- Participants believed that it is important to design the system so that it knows when to override user's notification preference, for safety and other critical reasons. For example, even when users have set to be "Do not disturb" state with respect to notifications, the system must interrupt and alert users to a "fire alarm" equivalent notification.

3 Design Challenges

Much of current interruption management research has focused on how to reduce notifications (thus user interruptions), in the hope that it would

increase user's productivity. Since the Personal Web focuses on the person *ME* and is to empower *ME* and has implicit knowledge of the user's current sphere of context of my concern, we propose that we turn the research question around and ask how we could increase the useful notifications that would make *ME* smarter.

From our research to date, most interesting and unique design challenges for the Personal Web are the following:

#1 Individual needs come first, team needs second. Despite the intention behind a Jazz CDE to support and benefit a team, the team is not the first priority for users. Design should focus on benefits to the individual, with the expectation that improved notification and awareness for the individual will in turn lead to a productivity improvement for the team. Although the Personal Web is also a part of the larger social Web and *ME* being the center of the Personal Web, the design challenge is that notifications are only there to serve *ME*, not my social network or making *ME* look good or social among my friends. Research is also needed to investigate how users could use notifications as a navigation mechanism in the Personal Web.

#2 Don't want technology "watching you."

Jazz CDE users don't want to feel like they are being watched. Notifications can serve different purposes for different roles. Some developers choose not to follow team process (e.g., deliberately do not change the status of work items to "in progress") because this often generates many notifications that only help others to track their progress. For the Personal Web, the design challenge is not just about user privacy (which may or may not be a major concern in the future), but also complete control, transparency and traceability of my notifications.

#3 A systems approach is more appropriate.

CASCON workshop participants voiced concerns about looking at notification design purely from a software only perspective. A systems approach might be more appropriate, where notifications are delivered within the user's broader environment. For the Personal Web, the design challenge is that notification delivery should be adapted to factors such as device and location -- the user's current sphere of context of my concern and the user's current environment.

#4 To centralize notifications or not

CASCON workshop participants were also divided on whether notifications should be viewed

and controlled from a central place, e.g. a dedicated notification bar. For the Personal Web, the design challenge is whether a centralized notification view, or a distributed notification UI mechanism where it brings notifications closer to the user's sphere of context of my concern and the user's current environment works better.

4 Conclusions

Based on our recent research and preliminary findings, we have described a set of unique design challenges for the Personal Web. The Personal Web sharpens the focus on the broader interruption management research to a few unique issues. We believe good notification design would be a critical component for the success of the Personal Web. We will start investigate solutions to some of the design challenges.

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