

Understanding the practical challenges of moving from closed to open source collaborative design

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Abstract

This inquiry examines how effective collaborative user experiences can be shaped in open source communities. It focuses on the changing design and development conditions of the prototype computer software application *LabanAssist* (Ebenreuter, 2008). These changes stem from, the project's prior development as a prototype application in a relatively closed collaborative environment. This environment had developed through a human-centred participatory design approach and changed into one that was dynamic and embraced open source collaborative design.

By changing the project's environment and activity of development, it is envisaged that a range of experts will have the potential to participate in the ongoing advancement of *LabanAssist*. The challenge, here, rests in designing a way in which an integrated view of the design situation and the associated activities required to continue the open development of the *LabanAssist* project, can be shared and communicated effectively across different design domains.

In this paper, literature concerning the nature of collaborative activities in open online communities is examined. This is done to better understand the challenges of communicating interdisciplinary ways of working and thinking that contribute to the holistic development of open design projects. To address these challenges, a number of interaction design guidelines for facilitating collaborative action are offered as a means to maintain the purpose and activity of open design projects.

The proposed guidelines offer a way of thinking about the manner in which interactive tools can be designed to assist with the identification of design elements in open design projects and to be able to visualise the relationships between various collaborators from different areas of expertise. An open design environment that has the potential to support collaborative action is shown through various interface designs of a conceptual tool that illustrates how a shared view of the form and significance of evolving ideas may be communicated over time.

Keywords

Open design; collaborative action; participation; guidelines; workflows; open source.

The environment and activity of design

Changing business models, methods of innovation and interaction fuelled by the capacity of the Internet to facilitate communication through emerging uses of technology have introduced alternative avenues in which design products and services can be developed. An example of this can be seen in the increasing number of open source development projects, which potentially involve any number of global participants who contribute to the collaborative development of a product's advancement online. In this

way, products are designed to adapt, not to a fixed need, but provide a place for action that expedites the needs and intentions of diverse users, in dynamic situations.

This research is built upon on the understanding that open collaborative design practices have the potential to enhance the exploration of unknown design potentialities and the creation of innovative outcomes (Harhoff et al., 2003). In this (Harhoff et al., 2003) view open design can be understood as a dynamic and complex process made up of diverse people, methods, perspectives, and values. This process is fundamentally different from the design of a product that offers a determinate solution to a particular need or desire. Instead, the unfixed or open nature of design potentialities that can take shape is therefore unknown. The notion of unfixed design potentialities is further enhanced by the dynamic direction of open design projects. These projects are essentially driven by end-user needs and intentions and provide the potential for innovative ideas and solutions to develop (Harhoff et al., 2003).

To support the development of innovative design outcomes, useful and informative resources that inform the practice of designing are needed to communicate the idea, purpose and function of open design projects. Communication of this information should be done in a way that bridges the gaps of understanding between individuals from different knowledge groups and varying levels of expertise. In open source software communities it is customary to offer up existing software systems for iterative development in terms of 'change requests' and desired 'product features'. This is done across a variety of online forums and discussion groups, in the form of 'to do lists' and 'bug reports' which do not offer potential collaborators of the project a global view of the design situation. Ubuntu Brainstorm (n.d.) provides an online forum to support the collaborative development of ideas to enhance its software platform. The environment in which the communication of shared ideas is made possible is problematic. The environment typically does not offer end-users the tools or the useful presentation of ideas in a manner that is either useable or helpful (Ashton, 2009).

The focus of this research concerns the changing design and development conditions of a prototype computer software application called *LabanAssist* (Ebenreuter, 2009). The *LabanAssist* project is a continuing work in progress that is seeking to make the knowledge garnered from its prior development, as a prototype application, into useful and informative resources. These resources can potentially be shared, understood and continued to be developed in an open design environment by a range of experts. It involves the clarification of countless interrelated dimensions of a project together with the variety of information, objects, events and practices relevant to the fields of user interface, interaction and software design. Since many issues can arise when conversations within their respective fields are discussed in terms that are seemingly diametrically opposed to one another, the challenge lies in designing a way in which a shared view of the *LabanAssist* project can be communicated effectively.

In the following sections I give context to this research. I discuss the challenges involved in building the necessary relations between different fields of knowing, doing and making with respect to the active involvement of potential participants of open design projects. I propose a number of interaction design guidelines for facilitating collaborative action in open design projects. Through a series of interface design concepts I illustrate the significance of these guidelines on the design of an interactive tool that seeks to support the dynamic structure and activities of collaborators from three different design domains.

I conclude the paper with further remarks concerning the future potential of this research.

Changing design and development conditions

In light of the changing environment and activity of design Keinonen (2009, p. 64) proposes two emerging fields of design practice: (1) 'immediate design' which focuses on various practices of use from a user-centred approach; and, (2) 'remote design' which is concerned with facilitating practices that lead to structural change. While the idea of distance is used to differentiate the two types of design practice, the development of objects and events that constitute the elements of the design situation, should be understood as part of an organized integrated system. Dewey (1938, p.72) expands upon this idea when he tells us that "we never experience nor form judgments about objects and events in isolation, but only in connection with a contextual whole". This is an important distinction because without the capacity to build the necessary relations between diverse fields of knowledge, the elements of the design situation and potential participants of a design project there is no significant foundation for the creation of form as a unified whole.

In terms of the initial development of the *LabanAssist* project, carefully developed task analysis schematics and design rationale (Ebenreuter, 2007), worked to assist the early conceptual development of a prototype tool that enables members of the dance community to document movement as Labanotation scores. In the same way that musicians can document scores of music as musical notes on a staff, dancers can document scores of movement using the vast symbolic vocabulary of Labanotation. Taking a fundamentally 'immediate design' approach to the creation of *LabanAssist*, the prototype application was co-created with and for students, and educators of the movement notation system called Labanotation. This work was undertaken, on location, at The Ohio State University's Dance department. As a result, the interaction design of the application's functionality is firmly grounded in the practical problems and user experience of documenting movement in a symbolic form.

The ability to build the necessary relationships between different fields of knowing, doing and working with potential participants of a project is critical to an open design project. Building these relationships are central to providing a variety of collaborators with the necessary tools and power to contribute constructively to a project throughout its iterative development. This idea is in keeping with Keinonen's notion of 'remote design'. Design that facilitates structural change, however, providing a common ground in which participants can identify opportunities for collaboration is essential to their active involvement in open design projects (Barcellini et al., 2008; D tienne, 2006; Ye & Fischer, 2007). I argue that the project for the ongoing development of *LabanAssist* requires a common ground or basis for understanding where, and how one can take action. This stems from the underlying rationale for design in which the project was initially developed. In support of this Ye and Fischer (2007) tell us that careful consideration should be given to specific design decisions in a way that encourages the potential for participation and collaboration.

Making the rationale for designing explicit is significant as it has the potential to provide an opportunity in which a strategy for assisting others to take collaborative action can be developed. One in which prior knowledge of the design situation can orient a

participant's understanding of a particular aspect of a project, in relation to the whole and better equip collaborative negotiations to develop concerning what is useful, usable and desirable to the design situation. This is a strategy for action that revolves around the development of ideas in relation to what could be done, as opposed to what must be done to carry the development of a project further. In this way a participant's perspective, experience, and judgment made during the process of designing is vital to the arguments and subsequent actions taken to shape the direction of a project. As a result, this way of thinking and working becomes central to the formation of the design process in open design projects.

The practical challenges for facilitating a variety of open design processes becomes apparent when the elements made available to participants for iterative development are not necessarily developed in complete isolation from one another. This is because various design elements, which require collaborative development, carry with them interdependencies that span across different fields of knowing and doing. These interdependencies and the complexity in which design problems can occur during the conceptual development of newly formed products or services, gives us insight. We begin to understand the benefit of social creativity practices that leverage the perspectives, expertise and fields of knowledge of a number of different individuals (Fischer, Giaccardi, Ye, Sutcliffe & Mehandjiev, 2004). In doing so, a shared understanding of a design situation and it's potential resolution can be shaped collaboratively by participants involved in the process of designing (Fischer et al., 2004). However, there remains a necessity for open design projects to establish a concrete connection between the elements and activity of design. This must be achieved across a number of domains, to provide a flexible structure in which open design projects can be successfully developed.

Navigating open and collaborative design environments

In order to effectively coordinate and navigate the potential contributions of participants in open design environments, an integrated understanding of the design situation is required. Literature that gives focus to the requirements for participation (Barcellini et al., 2008; Ye and Fischer, 2007) and a variety of issues concerning the collaborative development of tasks and activities in online communities (Détienne, 2006; Carroll, Neale, Isenhour, Rosson & McCrickard, 2003), offer a starting point in which a strategy for collaborative action can be developed. While Ye and Fischer (2007) seek to address end-user motivations in combination with effective tools and management support, the focus of this research is to enhance the design of interactive tools that facilitate collaborative action in open design projects. The ability to do so is based on the creation of an integrated understanding of the design situation, its elements and actions, across different design domains, rather than creating meaningful experiences that seek to encourage existing participants to further extend their collaborative commitment.

Drawing on the literature available (Antikainen et al., 2008; Fischer et al., 2004; Kensing & Blomberg, 1998; Divitini & Farshchian, 1999; Détienne, 2006; Carroll, et al., 2003; Ye and Fischer, 2007; Barcellini et al., 2008), I identify critical aspects concerning the participants of the design situation, the representation of design elements and their associated activities across different design domains as a way to enable the potential for collaborative action to take shape. In doing so, participants of open design projects may better understand: (1) Who their fellow collaborators are and what they know; (2) What design elements are being developed and by whom; (3) Where they can make a

contribution to the project's evolutionary development; (4) How the project's design activities are advancing the overall design situation; and, (5) Why particular courses of action have been taken and what future actions will be taken to support the project's development.

I propose a number of interaction design guidelines for facilitating collaborative action in open design projects:

1. *Provide cohesive structures of communication*

The fundamental structure and operation of open design environments should provide participants with a cohesive system of communication in which they can contribute.

- Visualise the progressive development of ideas and design decisions.
- Order and arrange the priority of elements.
- Give hierarchical form to collaborative discourse.
- Highlight the steps and stages of interactive processes.

2. *Establish an environment of activity*

A system of use should derive from a common understanding of the elements and activities of a design situation, across a variety of knowledge areas.

- Establish a collective tool set of design practices.
- Illustrate how participants' activities give shape to the design situation.
- Create independent structures of activity that progressively require collaborative development.
- Visualise individual and integrated workflows.

3. *Create situational relevancy*

The ongoing development and relevancy of elements that constitute the design situation should be understood as part of an organized integrated system.

- Give context to interconnected elements of the design situation.
- Connect collaborative conversations to design artefacts and the underlying rationale for their development.
- Build relationships between participants' expertise and activities.
- Assign interactive characteristics to the changing and unchanging elements of the design situation.

4. *Allow for potentiality*

The boundaries of a system should work to orient different ways of knowing, thinking and doing in a way that opens up the potential for a variety of concrete possibilities to develop.

- Enable the possibility for variety.
- Allow for the alternative arrangement and organization of design processes.
- Create an environment in which understanding and learning is possible.
- Provide the potential in which the mutual exchange of diverse perspectives can enhance and cultivate creativity.

Fundamental to forming a foundation for collaborative action is the interaction and interface design of a tool that supports specific user tasks in a way that successfully illustrates its utility. This is because the underlying methods of interaction, designed to facilitate various end-user tasks, directly informs the visual interface design and key elements of support tools (Armitage, 2003). The interaction design guidelines, listed above, provide a basis in which to consider the challenges of enabling collaborative action to take shape in open design environments. They offer a way of thinking about the manner in which these concerns are addressed through the design of an interactive tool.

Essential to the specific purpose of this research is the consideration, of the practical challenges of facilitating open design projects, and the design activities or tasks relevant to the processes and practices of three different design domains.

In this research the design domains and activities include:

- Interaction design
 1. Information architecture
 2. Wireframes
- User Interface design
 1. User interface design concepts
 2. User interface style guide
- Software design
 1. System architecture
 2. Application programming interface

The above design activities work to complement the existing knowledge collected through the human-centred participatory design approach taken to facilitate the early development of the *LabanAssist* project. These activities encompass diverse methods and techniques of design thinking and working that provide a starting point for the collaborative development of *LabanAssist* as a fully functioning software application in an open design environment. While these design areas are represented as distinct from one another, knowledge used to support the wide variety of design practices that exist today, are not mutually exclusive to any single domain of design. Instead, each domain draws on a variety of different disciplinary practices to assist in the collaborative development of new products or services and reflects the transdisciplinary nature of design (Margolin, 1996).

An approach towards facilitating collaborative action in open design projects

A holistic view of the design situation should communicate the evolving product idea, its overall purpose and function to assist the progressive development of open design projects. It is envisaged that by visually illustrating interactive processes and workflows, that constitute the activity of the design project, the user experience of participating in

open design communities will be enhanced. The ability for potential participants to gain an understanding of the basic structure and operation of open design projects should assist in establishing an integrated system of use in which they can contribute. This system of use, or way of working, should derive from a general and familiar understanding of the activities relevant to the design situation and the domains of design involved in a project's development. In this research, consistent workflows of connected activities form the basis of open design processes. These processes give shape to the design of a proposed interactive tool that seeks to facilitate collaborative action in open design projects.

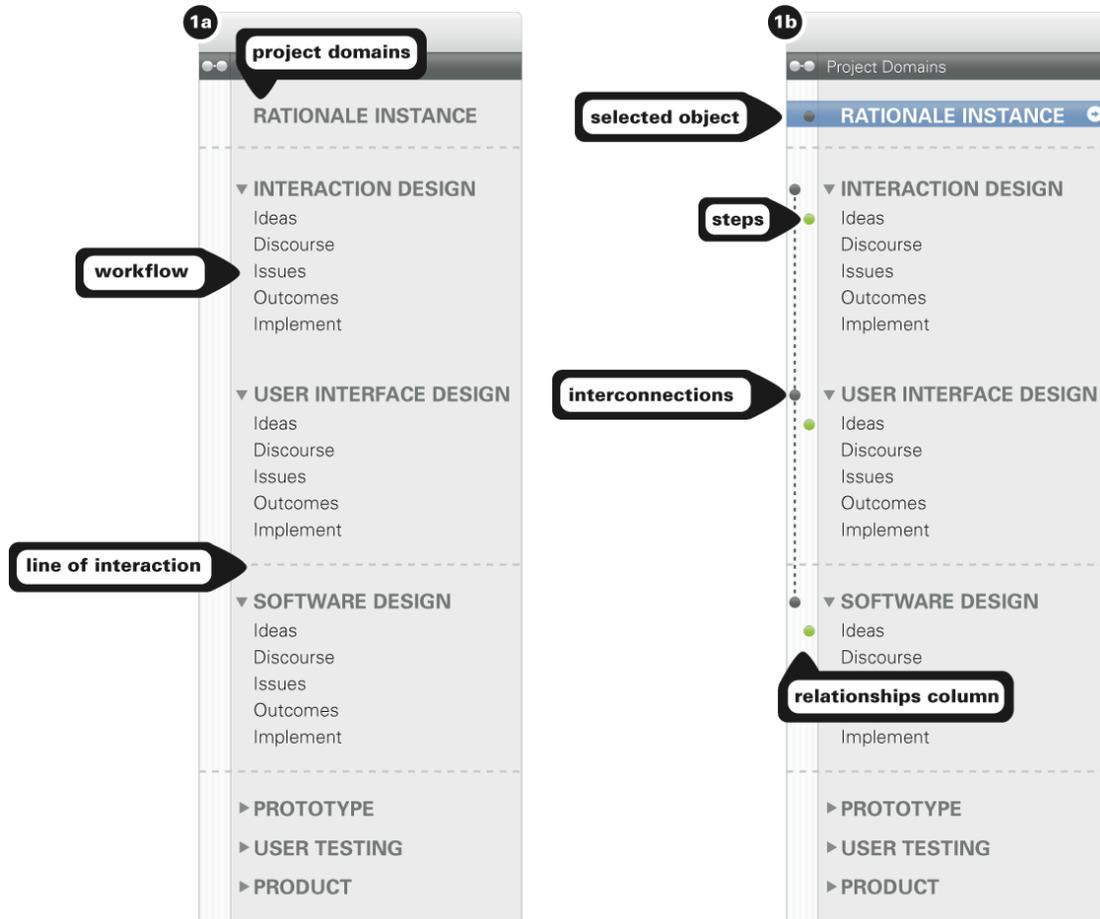


Fig 1. Workflow structure and relationships across different design domains

In Figure 1a the interface design of an interactive tool seeks to support the dynamic structure and activities of three different design domains. It illustrates a consistent workflow of connected activities that provide a foundation for the development of ideas as design outcomes and their subsequent implementation as fully functioning products or services. The basic workflow structure displayed in Figure 1a encompasses the ideas, discourse, issues, outcomes and implementation aspects of the design situation, specific to each project domain. Different project domains are made visually distinct in the design of the interface by various horizontal lines of interaction that are placed at the intersection of two closely related domains. In this way, the working relationships between project domains that focus directly on the user interface and interaction design

of a software application are highlighted for the work they do in close collaboration. This is because of the immediate impact each human-centred area of design has on one another. Software design, however, is treated differently in the design of the interface because of the technical and supportive role it offers the design of interaction, user interface design and prototype development of software applications. Distinct again from these project domains are the areas of prototype development, user testing and the final product, which hold direct implications for one another during their iterative development. It is envisaged that these areas will also involve end-user participation in both the evaluative stages of a product's early prototype development and the final product release.

The proposed visual distinctions made in the design of the interface are not made to imply that a clear-cut top down approach to designing should be followed. On the contrary, Figure 1b illustrates the interconnections between design elements and various project domains that can potentially exist. In this example (see Figure 1b) the selected object, which is a rationale instance, holds relevancy across three project domains. This is visually represented in the far left of the relationships column, by the positioning of a grey circular marker alongside each relevant domain of the design situation. The relationships are then visually established via a grey dashed line that identifies and unites them. In addition to this, the progressive steps in the design process that connect one activity to another, are represented in the far the right of the relationships column. The following steps of a project are suggested by a coloured circular marker, which is positioned at a lower level in the interface to that of the currently selected object. In Figure 1b the rationale instance is highlighted in blue to indicate that it is the currently selected object. The selected state of the rationale instance is also represented by a circular marker alongside it to suggest that a progressive relationship exists between the rationale instance and the development of ideas across different project domains. In doing so, the structure and stages of interactive processes are highlighted to provide a coherent structure to the communication of developing ideas.

Discovery and Recognition

As an approach to facilitating the inquiry into an open design project, rationale instances in Figure 2 offer potential collaborators of open design projects a way to learn about a particular aspect or object of the design situation, in relation to the whole (Ebenreuter, 2009). They work to provide situational relevancy in open design environments by giving context to the interconnected elements of the design situation. Rational instances achieve this by presenting interdisciplinary design knowledge concerning the development of components, relevant to the design situation, which can be integrated into a larger complex system over an extended period of time. Each rationale instance provides a descriptive account of a component for further ideation and development. They give focus to the relationship between: (1) the specific problems found in the practical user experience that the software application seeks to address; and, (2) the design artefacts created to overcome these issues. The first two points are then further supported with: (3) an explanation of how the function of the design outcome operates; and corresponds to both; (4) the visual attributes found in the interface design of the proposed artefact; and, (5) the interactive elements that the proposed artefact will communicate with, in relation to the system's overall software design.

The design rationale captured within each instance provides a frame of reference in which a variety of designers concerned with the interface, interactive and software

elements of a project can continue to shape the development of new products or services. By providing participants with additional knowledge and documentation surrounding each component for development it is envisaged that the potential for creative and innovative design directions can emerge in open collaborative design environments. This additional information is described and illustrated through a variety of documents that are particular to the way in which each domain of design thinks and works. For example the (1) problem; and, (2) design artefact as in Figure 2 hold particular significance to interaction design which contains user-centred design information and documents that are a part of a common set of practices and tools of communication, known to this domain. Alternatively, the (3) functional explanation; and, (5) interactive elements of a rationale instance are relevant to both interaction and software design. Information captured in the system architecture and information architecture documents provide not only a unique view of a component but one that is also applicable to the global view of a software system and its surrounding interactive elements. Again, this is information that is conveyed within a familiar set of terms and models that communicate this knowledge to individuals who have expertise in these domains. The (4) visual design concept; however, holds specific relevance to the user interface design of a system that is strongly connected to both user interface and interaction design. The method of wireframing, that interaction designers use to visualise general elements in user interfaces, are also significant to the (3) functional explanation of a rationale instance.

Providing potential collaborators of open design projects with various types of design knowledge and artefacts allows individuals, from single or multidisciplinary backgrounds, a specific and general view of the design situation. This is achieved in terms that are relevant to the design domains represented within each rationale instance. It is envisaged that this will help to establish a comprehensive environment of activity that will facilitate collaboration and make understanding and learning possible. By building relationships between participants' expertise and activities, it allows them to focus on independent aspects of a component's design that will progressively require collaborative development as the design process advances. The diverse nature of design knowledge captured within each rationale instance also works to provide a shared view of the design activities that illustrate individual and integrated workflows across a number of project domains.

The relationship between the component for development shown in Figure 2, and the associated design domains for which it holds relevance is also visually illustrated in the interface, on the far left of the relationship column. The fields of interaction, interface and software design are connected with a dashed line and consequent circular markers to indicate their interconnected relationship to one another. This is important as it highlights the different areas of consideration that need to be acknowledged in the resulting ideas and design outcomes that are suggested for integration into a prototype application.

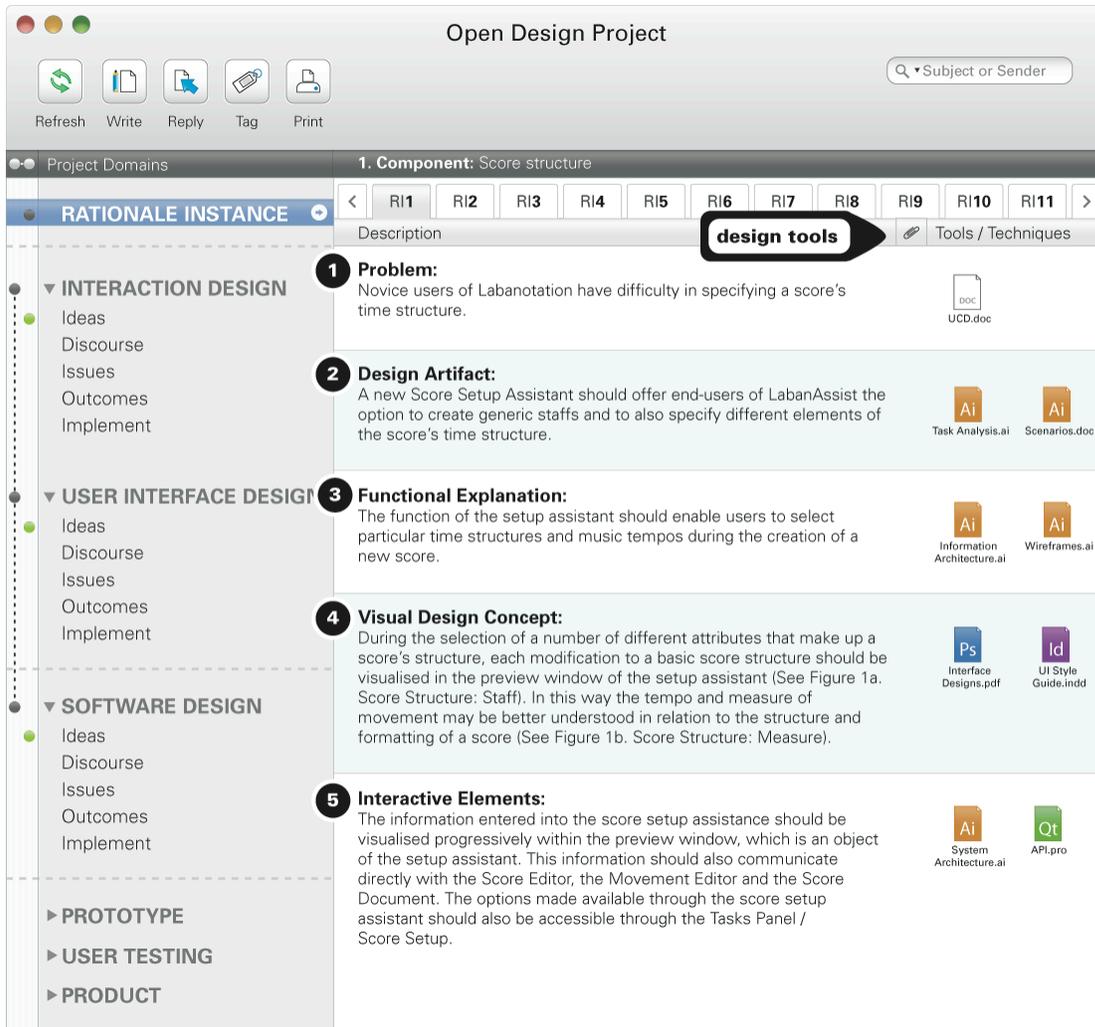


Fig. 2 Rationale Instance of the component: score structure

Negotiation and Evaluation

While rationale instances provide a potential starting point for the collaborative development of interactive products, design practices that manage the integration of a project's design elements are needed to ensure that the characteristics of newly developed directions remain consistent with the overall purpose and function of an open design product (Margaritis & Sgouros, 2008). The workflow structures illustrated in Figure 1a give shape to the collaborative development of numerous components that constitute the dynamic design situation. In this way the incremental design and development of each component, over a series of integrated design activities, works to refine the ideas and eventual outcomes suggested by participants to enhance a component's design. This is accomplished as the result of a gradual process of collaborative negotiation and evaluation.

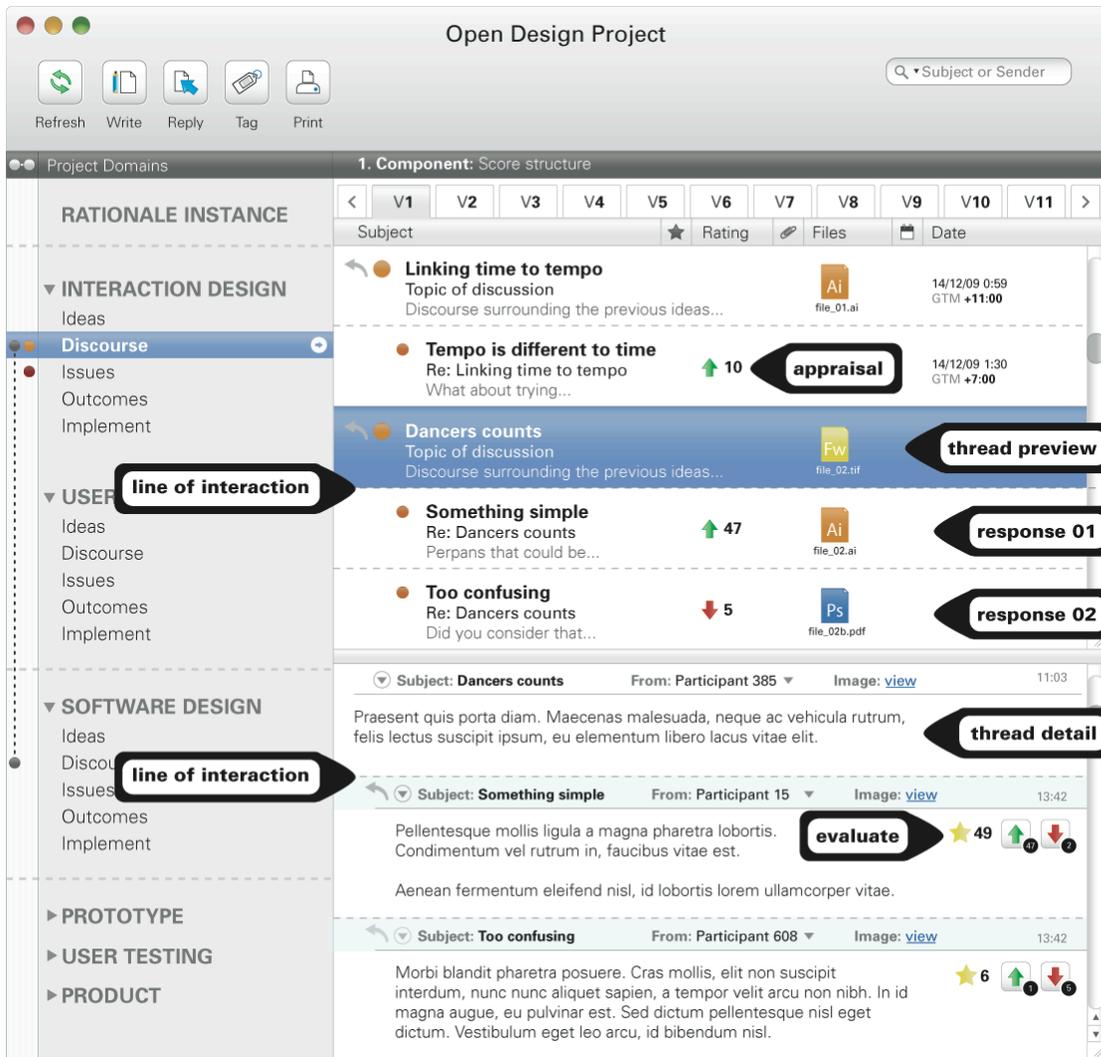


Fig 3. Threaded discourse

Threaded discussions, pictured in Figure 3 provide an avenue for collaborative activities and diverse dialogues to develop surrounding the ideas, a discourse (illustrated in Figure 3) of issues and outcomes of the component under development. A visual hierarchy of various subjects for discussion is given to each threaded discussion. This is done through the ordering and arrangement of their representation in the design of an interface by date of appearance or subsequent significance. The priority of each threaded discussion is determined as a result of collaborative appraisal and evaluation during which highly valued design suggestions are positioned at the top of the overview pane. The consequent responses to each thread are visually associated with the thread preview and thread detail by a line of interaction where each response is slightly offset to the right of the original subject of discussion. Individual thread previews and their associated responses work to connect collaborative conversations to design artefacts, whereas, the thread details provide an argument for a particular course of action to be taken. In addition to this, the ability to evaluate the value of each thread response is offered within the detailed view of a threaded discussion and the overall appraisal is illustrated in the thread preview.

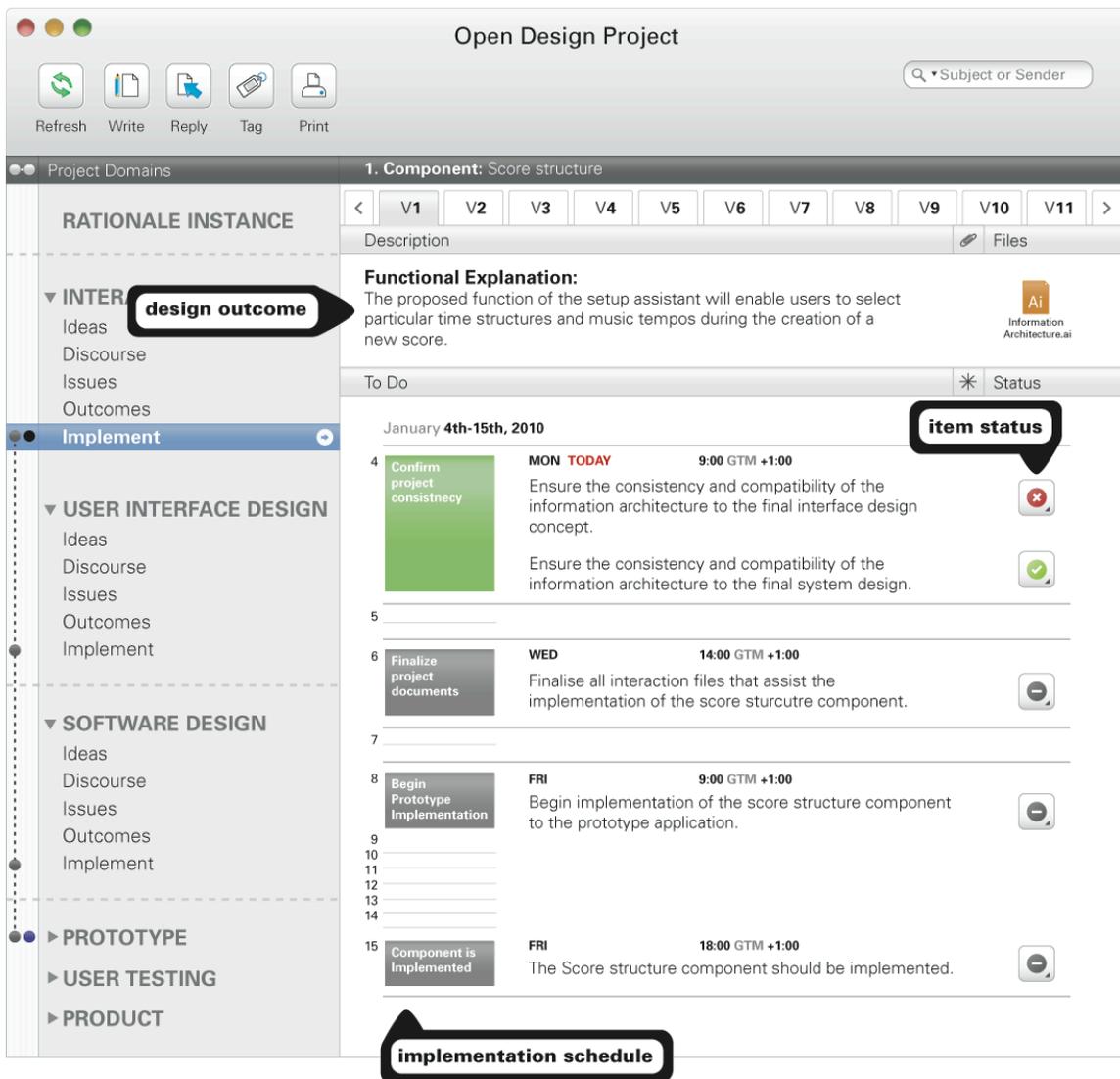


Fig 4. *Implementation to a prototype application*

The application of threaded discussions provides participants of open design projects with a concentrated focus of the design situation, across different activities. These activities are connected to the development of ideas, discourse and outcomes. The issues and implementation process (see Figure 4) of a product's components are fundamentally global in view. A designated site for the development of ideas enables the collaborative development of design components to develop in close relationship to the project domain in which different ideas are formed. Appraised ideas of certain merit are then refined and debated through discourse, for their ongoing value to the utility of proposed design outcome. The further evaluation and appraisal of continuing ideas are then viewed globally, as potential issues across all project domains, to assess if conflicts between the suggested design outcomes could arise. After the evaluation of a suggested component's fit to the overall design situation is corroborated, the potential design outcome is then re-examined within each project domain for its suitability to the purpose and function of the proposed product solution. Successful design outcomes are

then offered up for implementation to a prototype application. By visualizing the progressive and collaborative development of ideas and suggested outcomes in relation to the decisions that support their advancement, participants could gain an understanding of how their involvement and activity gives shape to the evolving design situation.

Figure 4, illustrates the implementation schedule for successful design outcomes that have been collaboratively developed and accepted for integration in to a prototype application. It provides participants with knowledge concerning each project domain's contribution to the resulting design component. Interactive icons are used to illustrate the current status of the project's development to assist with the identification of the changing and unchanging elements of the implementation process.

Discussion

This paper focuses on the practical challenges involved in changing the activity of designing from a relatively closed design environment to one that is open and collaborative. A greater understanding of the issues of facilitating collaborative action in online communities enabled the creation of a number of interaction design guidelines. These guidelines shaped the interface design of a conceptual interactive tool that seeks to enhance the user experience of participating in open design projects.

Visually mapping the 'what', 'how' and 'why' of the design process, as a progressive series of connected design activities, can assist to establish an integrated system of use and collaboration across different design domains. However, without the formal evaluation of the proposed guidelines in comparison to the features of other open source projects or an evaluation of the proposed interface designs of the conceptual tool, the key value that the guidelines provide, are as a foundation for designing. This foundation is to assist in the design of interactive tools that seek to facilitate collaborative action. For the specific purposes of this research the guidelines gave shape to an environment in which a design project that embraces open source development as a part of the design activity, could be established. In light of this, the proposed guidelines offer a starting point for designers to further develop and improve upon the manner in which they can assist the design of collaborative action.

A visual representation of an open design project has been illustrated through a number of interface designs, which offers an example of the potential in which a variety of collaborators could better, identify and participate in interactive processes and workflows that constitute the overall design project. Furthermore, the circumstances for developing the design project are underpinned by various techniques and methods that work to supply participants involved in the development of open design projects with a collective tool set and shared vision for it's active formation.

As a continuing work in progress, it is envisaged that the proposed interaction design guidelines will be further developed and refined to address systems of notification that highlight the social status of participants and illustrate the changing elements of the design situation. Moreover, the aim of this research has been to contribute to a growing body of knowledge in design research that seeks to better facilitate open source collaborative action.

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