PRODUCT DEVELOPMENT IN A SMALL IT FIRM: AN INTERACTION DESIGN PERSPECTIVE

GLORIA GOMEZ
OCEANBROWSER LTD.
GLORIA@OCEANBROWSER.COM

RODNEY TAMBLYN
OCEANBROWSER LTD.
RODNEY@OCEANBROWSER.COM

ABSTRACT

This experience report describes how an interaction design (ID) perspective has led research in product development of a web application for online study called OB3 in a small information technology (IT) firm. From day one, the development team has implemented what the ID research outcomes specify would work.

Before implementation commenced, the company's CEO (second author) told the designer (first author): *We can develop anything; a list of 25 features from image annotation, authoring and searching comes to mind. But, we have little time to spare, few human and financial resources. We cannot afford to develop the application more than once, or to do it wrong. We need to identify what will work before any programming is undertaken*.

ID has been useful for identifying innovative and suitable feature requirements to shape our product. Its flexible user-centred methods enable the application of a diverse instrument set for organising user participation and gathering data throughout the iterative design process, to understand issues around studying online, and in turn, inform the product implementation.

ID is helping to define our niche market and a path of business growth. Supported by an initial literature review, this paper starts making the particularities of our case transparent to others, and aspects that can be interesting as research.

SOME BACKGROUND: OUR COMPANY

OceanBrowser LTD. is a New Zealand based online learning company. The founder (author 2) established the business in 2004 after exiting a 10-year IT role within a university. Initially the company served as a vehicle to provide consulting services back to clients within the same university.

Based on demand from initial clients, a cross-platform desktop application, OB1 (and a later release, OB2), was developed to support distributing course materials via DVD. Its features include digital rights management, offline access, with internet forums and online voice conferencing services. The product appeal included its ability to deliver rich distance courses to students with poor internet connectivity.

In 2008 the early planning of OB3 began, drawing on feedback from clients, and from a one-day seminar event the company ran at a client university. Through these activities we identified the new product needed to be web-based, allow content to be managed by our clients without mediation of a technologist, and be a sustainable and viable commercial proposition. In 2009 we developed a rapid prototype and tested concepts with a few individual clients.

A next generation product, OB3 is a web application for online study. Its features radically simplify the process of gathering, organising and presenting and collaborating around online content. It is aimed initially at our existing niche market of graduate medical education, building from an existing client-base in Australia and NZ.

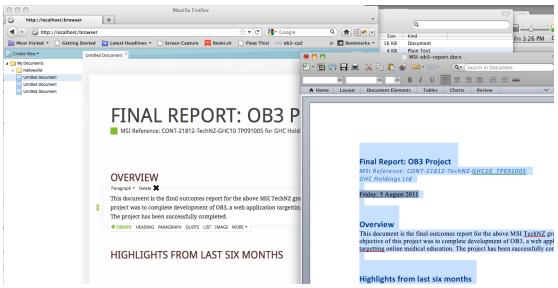

Figure 1: Users can copy and paste content from office documents directly into OB3. Formatting is retained and the content can be edited and enhanced in the browser (zoom in 300% for details).

Research and development (R & D) of OB3 began in 2010, and in September 2011 we completed the first of three scheduled betas counting down to commercial launch in Q1 2012. During this period the team has grown to from one to five equivalent full time staff. Over the last year the product has won a regional research and innovation award, and generated low 6 figure advanced sales within our target market, building of demos of preview versions.

THE ID METHODOLOGY AND METHODS

Our IT firm has started a path to growth with a larger customer base. As new products hold answers to most organisations biggest problems (Crawford & Di Benedetto, 2000), ID was used to explore the development of a next generation product, with features that make users more autonomous and less dependant on technologists during online study, and transform us from services to product-focused company. The R & D of OB3 is informed by an ID methodology that involves "… the study and exploration of how people relate to other people through the mediating influence of products..." (Buchanan, 2005, pp. 12-13).

ID's methods and instruments are diverse and adaptable (see http://www.ixda.org/conference). The Bridging Design Prototype (BDP) method which was originally developed by author 1 to work in preschool settings, has been further evolved to investigate a product experience in postgraduate medical education community (our niche market). Studies and explorations have led to the implementation of suitable features, and how these should behave, for a product aiming to facilitate lecturers, students, and/or administrative staff to efficiently manage and author the processes of:

- Gathering information of complex medical concepts, found in different places such as discussion forums, PDF and scanned documents, websites, videos, PowerPoints, Podcasts, Flash movies, etc.; (Figure 1)
- Editing and integrating knowledge (or information) gathered into media-rich documents; (Figure 2)
- Publishing integrated documents online as course materials and/or essay assignments; for
- Sharing and discussing them within a distributed learning network

The BDP method is comprised of six principles informed by several user-centred design philosophies (Keates & Clarkson, 2003, Norman, 1999 & 2002, Schuman, 1993) and one learning theory (Ausubel, 1968). It enables the investigation of product experiences in difficult-to-access and technologically disinclined user communities (Gomez, 2009). The students and lecturers (all medical professionals) and administrative staff of our client universities can be distributed globally, have limited computer skills, and little or no time to learn new skills. Some lecturers may be younger or more computer literate than some students and vice versa.

Described in context in the next section, the above principles are being applied to an iterative design cycle that produces low and high fidelity prototypes. The BDP method facilitates the gradual identification and implementation of product's features (or "a system image") that all the members of a user community can understand and quickly adopt, with little or no training, into their activities because its features are found easy to learn or operate, which implies, they can perform their work more efficiently.

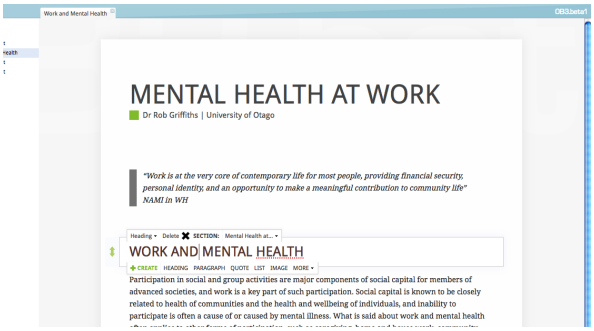

Figure 2 - Editing document content (zoom in 300% for details).

A BDP is a functional prototype comprised of features familiar to users; together with novel features the researcher chooses to incorporate after careful analysis of relevant data, gathered with appropriate methods. It capitalises on user community' prior knowledge (embodied in techniques, theories, instruments) and recognises their context realities. These characteristics can bring users (customers) into the development process early; first as commentators of low fidelity prototypes (mock-ups), early demos, alpha versions, and later as users of high fidelity prototypes (beta and released versions). Customers who have chosen to incorporate BDPs into their work further facilitate the research team to perform observations.

ORGANISING PARTICIPATION

The first BDP principle organises user participation for data gathering. *First principle;* the iterative prototyping cycle is informed by Norman's (1999) seven-step iterative approach of his Human-Centered Product Development process. This process advocates adopting a multi-team perspective to technology development and reserving software programming until after a good

understanding of users' needs has been achieved. Low and high fidelity BDPs are developed based on a team assessment of key expert comments and literature review outcomes made by the designer. The interaction design role, represented by the designer and the CEO, leads discussions on the issues identified that should be solved, while the team together selects features that should be implemented before programming starts.

To manage the product's R & D across multiple years, OB3 features are being implemented over progressive series of betas covering: authoring workflow, multimodal discussions and personal annotations, content management and study summary documentation. By multimodal we mean using audio and/or video recordings plus text to insert comments.

For product validation and avoiding the implementation of the wrong features, BDPs in progress and completed are shared with customers as early as possible to learn their viewpoints on the delivery of online medical education. The prototyping of each beta is performed in stages and diverse instruments are used to access the prior knowledge of the user community.

Literature reviews on relevant topics (e.g. elearning and networked learning, distributed cognition, visual design, and knowledge representation) can offer theoretical explanations to formulated design assumptions, and an opportunity to transform theories into practice. For instance Kirsch (see 2005, p. 147) claims, "the way visual cues are structured and the way interaction is designed can make an important difference in the ease and effectiveness of cognition and metacognition" during online learning. The visual design of an e-newspaper was used to illustrate his theoretical analysis. Our web application can be an opportunity to research Kirsch's claims. In OB3, the document template has visual cues (e.g. headings, callouts, italics) to support writing and reading activities while the interactions enable quick resource insertion with drag-and-drop or cut-and-paste actions (Figures 1 to 3).

Discussion lists, blogs, tweets can also provide another way to gain understanding of the users' context, current perspectives and its relation to the design assumptions. Informal conversations, with existing and potential costumers and colleagues, at professional meetings or conferences, seminars organised by client universities or our company, demos and exhibitions can provide an chance to see how the design assumptions are received, understood, confirmed, transformed or rejected. While user testing is reserved to evaluate software performance of completed betas. With permission, some conversations are recorded for the sole purpose of product development. The data obtained in testing will be published as we have signed consents forms.

SHAPING THE PRODUCT

The other five BDP principles shape the product, establish HOW activities (also called tasks or behaviours) should be performed and supported. *Second principle;* by using the seven-steps for transforming complex tasks into simple ones (Norman, 2002) we are able to develop an understanding of the complexities around authoring and sharing documents to study online. Studies reported on principles for scaffolding instruction of complex topics (Reiser, 2004) inspired ways to simplify online study tasks. For instance:

- Development of a unique interface for students and lecturers. OB3 de-emphasises administration features. Administrative tasks should be supported first by technologies for elearning, to free up time that can be better invested in educational activities and engagement with the learners (see Heinrich et al, 2009, p. 478).

- Relevant interactions for writing a document are scaffolded by the system through feature design. E.g. typing or inserting text, uploading photos or videos via smart phones or ipads, document or folder creation, and making an audio-commentary. Irrelevant interactions are supported through feature automation. Activities such as document saving, style formatting, recognition and creation of hyperlinks to websites, and referencing have been automated to improve work efficiency and document quality. Mehlhorn and colleagues (c2006, p. 5) concluded that an elearning technology could be quickly adopted if this is "…easy to operate for the faculty member… The learning curve … is minimum, and most can be taught how to use [it]."

Third principle; the concepts of countering exclusion and accessibility (Keates and Clarkson 2003) enable the design of interaction modes that lower adoption barrier and broaden age-groups participation in OB3: lecturers, students, and administrative staff , up to age 60+, whose computer literacy can be limited to using basic features of MS Word, email software, and an internet browsing.

OB3 features enable users to author, publish, and share self-developed content at a time suitable to them, even a day or few hours before course or assignment delivery. A conclusion in a study on elearning with Moodle says, "… [technologies should] foster user self-confidence so they see [it as] easy to use… Adults more than young people fear the unknown and are prone to… prejudice against new technology that often has no basis in reality. If users have difficulty using a system, they might believe that [it] is too difficult to use and the benefits they will gain are not worth the effort" (Arteaga & Duarte, 2010, p.8).

Fourth principle; for a designer to develop a product inclusive of user groups such as the ones we must address, the following principle must be applied: A designer's mental model for a product's system image must equal the users' mental model, so users can easily learn to operate it (Norman, 1999). The fifth principle provides one way to accomplish the fourth principle. *Fifth principle;* the system image of OB3 features are

being developed taking into account the prior knowledge (or existing mental models) the user community possess for writing, browsing, and emailing technologies. The learner must have prior knowledge and the learning must be prepared with familiar languages are two of the three conditions for Ausubel's (see 1968) theory for meaningful learning.

Multiple approaches have been employed to get customer participation and input during BDPs prototyping. *Sixth principle;* by doing so, the user community has become a design participant (Schuman 1993) in the product development process. This facilitates the designer and CEO to build close relationships and when possible perform observations.

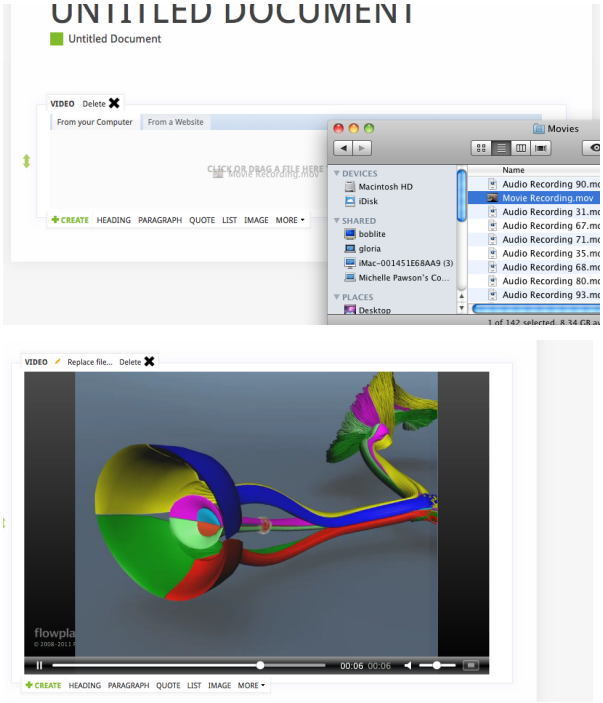

Figure 3 - Drag and Drop file (here a video) from desktop to OB3 (zoom in 300% for details).

PRODUCT TESTING

The authoring workflow features were completed in OB3 beta 1. These were the outcome of a 5-stage prototyping iterative cycle. A pre-launch test was performed in natural settings to evaluate if people who know how to write documents with basic features of MS Word and browse the Internet could use this version. The test showed five lecturers including two over 60 and two students could create media-rich essay documents containing text, images, videos, and links to document files in less than 50 minutes. This data is being currently analysed, however, 35 performance issues (bugs) were identified and recently resolved. These include: four users had difficulty uploading or determining if a file upload succeeded or failed, two suggested using other style for template headings, avoid uppercase (Figure 1) while another requested using APA style. One suggested adding a scientific formulae option, and the majority adding a saving message and undo feature. One user, self-identified as technophobe, said, "it did not hurt" after completing the testing.

Launched in September 2011, beta 2 (incorporating changes) has been released to a small number of existing and potential customers for further testing in natural settings, who we are loosely monitoring. Lately, the CEO has been guiding via Skype an Australia-based customer in the process of migrating course content to OB3. Their interactions have been video and audio recorded to further inform product development. Now we have a BDP with which to engage existing and potential customers with the aid of a high fidelity BDP.

COMPETIVE, USEFUL, DESIRABLE,

OB3 belongs to "the product improvements category" of visual learning environment (VLE) or hybrid systems for the market of online education and professional development. Its competitive advantage is in the HOW: its design characteristics favour cognitive workflow (Kirsch, 2005) and use of familiar interactions in the creation of what Ellaway and Masters (2008) identify as typical features of medical VLEs: 1) syllabus, course outlines, essays (Figures 1 and 2) which could be organised into portfolios; 2) links to course notes and web pages, 3) upload media and images (Figure 3); 4) search for materials, and 4) discussion forums.

Through the ID approach we have identified and are implementing a product offering users sufficient added value to be a compelling proposition. According to Crawford and Di Benedetto (see 2000, p.7), studies show that a cause of failure in organisations is "there was a need but the new product did not meet the need." Desirability of online educational products in medical education can only be motivated by explicitly showing the value this user community will gain, which is around effective study coupled with ease of use. Our customers are medical institutions wanting to create high quality online medical education offerings, our users are medical academics, clinicians, and students, who are time starved, and need to study (or teach) online for professional or career advancement reasons.

Alpha and beta versions of OB3 have been used to validate and test key concepts with our target audience in an increasingly complete application model. Most encouragingly, we have been successful in generating sales during the development process and prior to a production-ready release. By placing Design at the centre of product development (Buchanan, 2001), knowledge has been brought from different disciplines and integrated for the creation of features that enhance the desirability, usability, usefulness of our product.

CONCLUSIONS

In this paper, we have introduced Interaction Design and the Bridging Design Prototype method as useful perspectives to inform the feature development of a next generation product for online medical education in the context of a small IT company.

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