

UX in the Wild: on Experience Blend & Embedded Media Design

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ABSTRACT

The internet is becoming a tightly interwoven part of our everyday lives. There is a growing market for web services which augment the daily life of users through products with an internet connection. We call these real world extensions of the web *embedded media*. In the last couple of years we explored embedded media design through student projects with real world clients. We learned that the UX difficulty of embedded media design is to mix, enforce and augment existing user experiences. We've tried to capture this challenge in the intuitive notion of *experience blend*. In this paper we use examples from our project work to introduce this notion of experience blend.

Keywords

Ambient Intelligence, Embedded Media, Experience Blend, Internet of Things, User Experience.

INTRODUCTION

Since its invention, the internet has been in a constant state of tempestuous growth and transformation. Web use is becoming an integral and mundane part of the life of many people. This seems to be the long-term trend which transcends other well-known developments on the internet like: web 2.0, social media, cloud computing and the mobile web. The web is evolving from an information space to a communication platform and to an infrastructure which supports users in many of their daily tasks [20, 25]. The internet is weaving itself into our daily lives; it has changed from something 'out there' to visit when you like, to something 'right here' at your disposal when you need it. Or, as the Rathenau Institute puts it in their book Check In / Check Out: "We no longer surf on the net, we live in the net" [8].

The changing role of the internet for users is also a game changer for UX professionals. The hardware which we use to access the internet is diversifying. Apart from the 'screens': mobile phones, tablets, picture frames and navigation devices, a range of more specific 'smart products' such as Nazbatag, the Nike + hardware and Disney's Clickables have reached the market [15]. These products differ from normal products (and from websites)

in the sense that they do not offer a stand-alone user experience. Rather, they try to extend the web experience into real life or vice versa. Because of their intermediary role between the real world and the web, we call these products: *embedded media*. Embedded media enable brands to engage users for a longer time, more intimately and across more contexts than a standalone web experience can ever do.

In our experience, designing embedded media is quite different from product design, web design, and service design. However, there is little guidance for UX professionals who meet the challenge. Although the emergence of embedded media is not entirely unexpected - at least the growth of the number of smart and connected products on the market are predicted by long term technology visions like ubiquitous computing, ambient intelligence and the internet of things- most research programs in this area have focused on the technology or on investigating sensible future use cases rather than on UX guidelines [22]. In this void, we introduce the concept of *experience blend*. If embedded media acts as an intermediary between real life and web experiences, we believe the relation between the designed and the existing experiences should be the central question for UX. The notion of experience blend helps to make this relation explicit and to organize best practices.

The paper is organized as follows. First, we discuss our integrative and iterative design approach, which we advocate for embedded media design and which students used in all of the projects which we discuss in the paper. After that we discuss concrete examples of student projects, and use them to illustrate the concepts of embedded media and experience blend. We end the paper with some general conclusions.

METHODOLOGY

Introduction

In the past couple of years we have explored the design of embedded media through student projects with companies in the Netherlands like Philips Design (household products), People of the Labyrinths (fashion), Siza (healthcare) and Muse (advertisement) as client. In this section we explain the *integrative innovation* approach we used in these projects. Three cornerstones of this approach are *balancing innovation forces* through *iterative concept development* and a *prototyping approach* for design.

To conceptualize the links between innovation, integration and prototyping we extended the prototyping model of Stephanie Houde & Charles Hill.

In their seminal paper “What Do Prototypes Prototype” [9], Houde & Hill make a distinction between four types of prototypes: role prototypes, implementation prototypes, look and feel prototypes and integration prototypes (Figure 1).

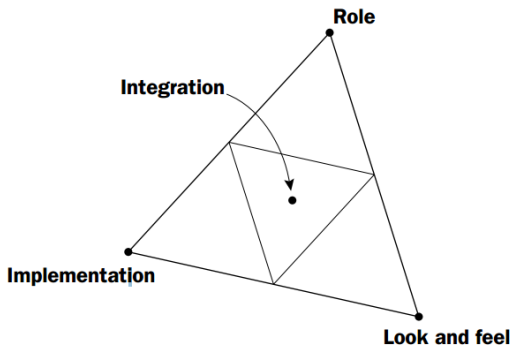


Figure 1: The prototyping model of Houde & Hill

Each of these prototypes is a tangible and temporary answer to a design question. Role prototypes answer the question what changes in the life of the user because of the new product. Look and feel prototypes address the sensory experience of the product. Implementation prototypes address the question how the product will actually work. Finally, integration prototypes answer multiple of these design questions at the same time.

Balancing innovation forces.

Rather than just prototyping concerns, the three corners of the Houde & Hill model are generic concerns in innovative design projects [e.g. 10, 18, 24]. We looked at Houde & Hill more as a metaphor than as a prescription; we extended it to include three relevant *contexts* for design and three *innovation forces* (Figure 2). Each context and innovation force corresponds with one of the corners of the original Houde & Hill model.

The first innovation force we identified is called *user pull*. With user pull, we refer to a concern with the user and the utility of the product in the *context of use*. Role prototypes are the embodiment of these concerns. Enough concern with users, and the capacity to involve them into the design, leads to useful and usable products [14]. But users should not be the only source of knowledge in a project: they can be unimaginative, may have little knowledge of new developments and they may not always be good at expressing their latent needs. As a result, if user pull is too dominant the resulting products may not be innovative and lack appeal. Think of rehabilitation product as a category with a heavy emphasis on user pull.

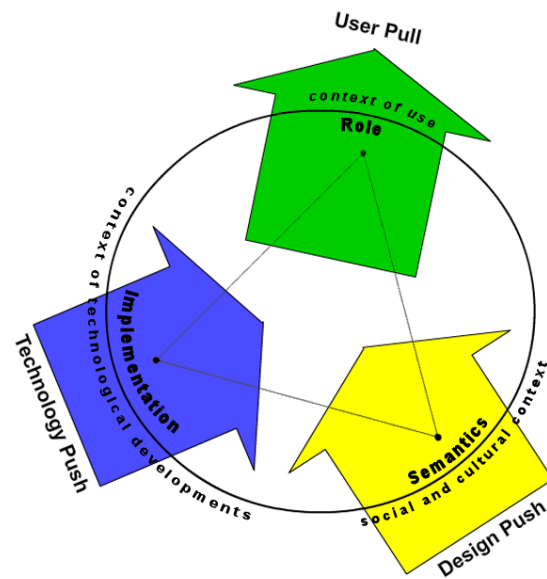


Figure 2: An extension of the Houde & Hill model which depicts integrative innovation.

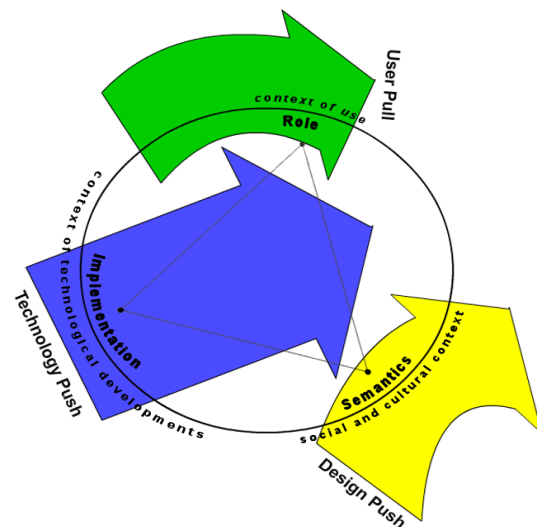


Figure 3: Non-integrative innovation. One of the three forces is too dominant: other aspects of the design are forced to follow its path.

A second innovation force is *design push*. With design push we refer to sensitivity with the social and cultural context and ability to translate this into design solutions. Clear examples of design push can be found in critical design which aims to expose undercurrents in society [3, 7], but, possibly more down to earth, in the ability to translate brand values into a design [1]. We prefer the term *semantic prototype* over ‘look and feel’ prototype, because a successful sensory experience expresses meaning, which is more than a ‘pretty picture’. Design push is an essential innovation force, but if it is too dominant, over-artistic non-solutions may be the result [3, 7]. The last force is

technology push which is the ability to identify new *technological developments* and to appropriate them for the product. As such, implementation prototypes just as often serve as a proof of principle rather than foreshadowing the final implementation in a realistic way. Technology push is a strong innovation force, but when it becomes too dominant it results in unusable expert-only systems (Figure 3).

Iterative Concept Development: “Build to design” and “1:10:100”

Prototyping is recommended in user centered design projects as a means of verifying and validating design ideas [21]. However, prototypes can also be used in a much more informal and open ended way. For example designers can use prototypes as part of idea generation (also called ‘thinking’) to explore multiple solutions for a design problem and they can be ‘conversation starters’ to be able to have a discussion about a potential solution with stakeholders. A ‘prototyping attitude’ is an enabler for innovative design projects [13]. Product design firm IDEO expresses this spirit of constant prototyping with their slogan “Build to Design”.

To enforce frequent prototyping in our embedded media design projects, we work with the “1:10:100 method”. The 1:10:100 method is particularly useful for open ended projects, projects which are opportunity rather than problem oriented [11], or when the client does not have an idea of the preferable solution directions. Embedded media has these characteristics. The idea behind the 1:10:100 method is to do the complete design project - including: briefing, research, requirement engineering, ideation, prototyping, user testing and presentation - multiple times with growing time investment and fidelity [4, 11, 25]. The first concept iteration is done in 1 day, the second in 10 days and the third in 100 days (see Figure 4). In each concept iteration a new concept is developed and presented to the client (and other stakeholders). Each concept is a new answer to the original design brief, and the first two concepts are ‘thrown away’, but there is a buildup of knowledge about the problem and its possible solutions during the project because the research and exploration of the design space ‘sticks’ with the designers.

In practice the ‘1’ and the ‘10’ are period’s discovery with quick and dirty design as discovery method. The first day (the 1) is a hectic day in which an egg timer forces the design team to go through all the design activities with incomplete knowledge, running on assumptions and using low-fidelity prototypes. Often this day has surprising results and releases a lot of energy within the design team and with the client. During the ‘10’ phase of the project, the team takes more time to do the project more thoroughly, make data rather than assumptions drive the design and to run the process in a way that fits the problem. In the ‘100’ the team runs the project like a normal project. The ‘100’ is

often set up in an iterative way, but these are detailed design iterations more rather than concept iterations.

A particular strength of the 1:10:100 method is the way in which the interim presentations allow the design team and the client to shape the project, so we pay a lot of attention to these evaluations. At the ‘1’ and ‘10’, the design teams present a solution to the client as if it is final - knowing that it is not. The discussions at these presentations are solution oriented. Our experience is that presenting a solution makes it easier to discuss the nuts and bolts of the problem which a client tries to address as well [4]. The discussions at the interim presentation lead to a thorough review and a different framing of the problem for the next iteration (effectively implementing Schön’s reflective cycle) [4, 11, 23]. To maintain the integrative approach through out the design project, at least one role, implementation and semantic prototype needs to be presented at each interim presentation (depicted as a triangle Figure 4). This means that the conversation at the interim addresses the three innovation forces each time. In other words: each iteration, the designers and the client get deeper insights into the design problem and its possible solutions, the context of use, the enabling technology and social cultural context. In all, a natural situation is created where client and the design team can learn from early mistakes while maintaining face and a sense of control over the project.

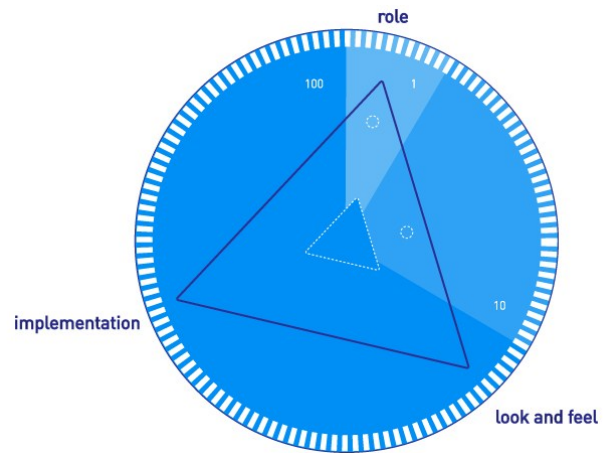


Figure 4: Graphical depiction of the 1:10:100 method as we use it to design embedded media

In summary: integrative innovation combines a *prototyping approach*, conceptualized with the Houde & Hill model to enforce an equal focus on and *balancing* of the three *innovation forces* in the design project and a radical *iterative concept development approach*, in order to organize solution oriented, reflective conversation within the design team.

Student Design Projects

The method described above, is followed in all student design projects which we discuss in the remainder of this

paper. In this section we provide a brief overview of the skills and training of the students which we have. Most¹ student designers were 2nd and 3rd year professional bachelor's students majoring in 'Communication and Multimedia Design (CMD)' or 'Technical Informatics (TI)'. CMD students following a communication design program are focusing on web and multimedia design for interactive media. TI students follow a program focusing on software engineering and embedded systems programming. Most teams had a balanced mix of students with a technical informatics and communication design background and both 2nd and 3rd year students. Occasionally, a design team consisting of communication design students only, had to be formed. Apart from the design methodology described above, students received introductory courses on multi modal interaction design and artificial intelligence. Moreover technical informatics students were trained to design and prototype embedded systems using the Microsoft .NET Micro Framework [19] microcontrollers as primary prototyping platform and they were introduced to technology trends related to embedded media. Communication design students were trained in interaction design and societal trends related to embedded media.

EXPERIENCE BLEND

Introduction

A user who is visiting a website can devote his full attention to the web experience on offer; this is a luxury which is hard to come by outside of the web. In designing embedded media experiences it is important to think about how the experience you are designing relates to other experiences. The central idea we will discuss in this section is *experience blend*. With experience blend we refer to the idea of creating new user experiences which manage to blend in with existing user experiences in a seamless way. In this section we first discuss the use of *experience stacks* to achieve experience blend. Next we show how experience blend can be achieved by *contextualizing the experience*. Finally, we discuss the importance of *experience anchors* to connect touch points in long term experiences.

Blend In: Experience Stacks

To discuss the idea of experience stacks, we use the example of the 'cuddly tree' of one of our projects. The *Cuddly Tree* was designed in response to the challenge to come up with an intelligent souvenir for the theme park 'Efteling' which could be used inside the park and at home. The idea was the souvenir could play an active role to anticipate an Efteling visit or to recollect the Efteling-experience. The three solutions the students came up with during the project were as follows. For the first iteration of the 1:10:100 method, the '1', the students came up with a

game on a mobile device which could guide visitors from site to site in the theme park and allow them to improve their score by visiting all sites. With a latex 'skins' the device could be made to look like a fairytale figure. The '10' concept was a watch with a, speech operated, holographic fairy figure who would allow you to find friends in the park and to meet with them. The '100' concept was the 'Cuddly Tree', a small fluffy tree which could tell fairytale stories to young children. It played the main part of a frame story: the tree had lost all its stories and the children were to visit all sites in the Efteling to collect them. After visiting all sites the Cuddly Tree would be full of stories again.



Figure 5: The cuddly tree encourages children to scout around and collect stories in the Efteling.

The difficulty of designing for the Efteling is that the theme park is an open ended, free roaming park experience which is rich of its own storytelling. While the storytelling of the Efteling offers a lot of inspiration and opportunities for game and interactive story concepts, they easily take over the overall Efteling experience in an undesirable way. Games, with their storyline and goalsetting can be dominant immersive experiences; even if the theme park attractions play a role in the game. The fun of the attractions can disappear in the story and scoring schemes, which the game sets out for the user. In a way the game experience acts as predator and the existing experiences as its prey. The "Cuddly Three" concept shows that it is possible to design experiences for these types of contexts that do manage to blend in. The frame story of the tree, which has lost all its stories, does provide a game touch to the Efteling experience but it does not hurt the individual stories that the Efteling attractions carry. If we generalize this conclusion we can say that stacking experiences in a single context of use does not have to be bad, but the existing experience and the new experience need have a clear and non-competitive relation to each other.

A way to think about stacking experiences is to think of them as behavioral *script hierarchies*. A behavioral scripts is an expected sequence of behaviors for a given situation [16]. In a supermarket such a sequence holds: entering,

¹ We describe the dominant population here; some students of other programs do have access to our embedded media courses.

taking a shopping basket, picking groceries, paying and so on. Scripts can be said to encapsulate each other: each element of this list, in turn encapsulates its own set of subscripts. Describing a designed experience as a script, and the way it encapsulates or is encapsulated by existing scripts, helps to avoid experience interference. The designer can avoid user experience interference by respecting the boundaries set by the script. It is also possible to encapsulate existing experiences in new ones. In that case the boundaries of the scripts belonging to the existing experiences need to be respected as well, to prevent that the outer experience suffocates the inner experiences by imposing too much meaning on them. This makes all the difference between the first 'game concept' of this Efteling project and the final 'Cuddly Three'. The frame story of the 'Cuddly Three' concept, respects the boundaries of the existing experiences in the Efteling, while the game does not.

Blend In: Contextualized Experience

Many experiences for the web are designed with immersive interaction [26] as dominant interaction aesthetic. The idea is that these web experiences form a world on their own in which users can immerse themselves completely with all their attention. The difficulty with immersive experiences is that they do not blend in the real (and social) world very well. As an example: just think of disturbing a gaming roommate. Therefore *calm technology* may be a better starting point to achieve experience blend. The idea of calm technology was put forward by Mark Weiser & Tim Brown in 1996 [26]. Interfaces which are designed to be calm, aim to stay in the background unless they are needed by the user. This can be achieved by clever information design. A clock on the wall, for example, is always there if you need to know the time, but it will not draw your attention otherwise. In addition to Weiser and Brown [26], Eggen & Van Mensvoort have proposed guidelines for the design of calm technology [6]. Although the guidelines and examples these authors give are inspiring, for the purpose of this paper we will focus on the interplay between content and context. We will use the intelligent kitchen concepts which students created for care organization Siza to illustrate this blended engagement approach.

Siza provides living and care for mentally and physically disabled people. Siza was looking for solutions that allowed their clients to execute daily tasks more independently. The project focused on supporting the cooking process for clients with wide ranging mental abilities. Following our 1:10:100 method student designers delivered three concepts. In the '1' they came up with an intelligent cutting plate which could assist in the planning of the cooking activities. For example, the plate could tell you when to put which vegetables in the pan. In the '10' they came up with an all-purpose cooking assistant: a virtual character would assist the user in all phases of the cooking process. The '100' concept consisted of a cooking app on a tablet, which would guide the client in the cooking

process supported by distributed feedback on other cooking utensils such as the cooking plate, pots and pans, spoon and whisker (figure 6).



Figure 6: A interactive kitchen gives cooking instructions through embedded, distributed feedback devices cooking utensils. A yellow color is used to highlight the relevant materials in the kitchen

An interesting design choice in this last concept is the way which feedback about the status of the cooking process is embedded in the kitchen environment, thus using the context of the message as a carrier for its content. This is in line with a calm technology guideline provided by Eggen & Van Mensvoort. They discuss the role of context in design and observe that messages ask for full attention, while subtle changes in the context do not. Eggen & Van Mensvoort give the example of the Ambient Umbrella who's handle lights up when bad weather is predicted, reminding the user to use it [1]. Eggen & Van Mensvoort urge designers to follow this example and put 'messages' in the context with their guideline: *context = content*. Like the ambient umbrella, the location of the feedback in the Siza example makes sure the user can understand it while the 'messages' of the pans can be kept simple. In many successful embedded media concepts, the *context* is made to *carry the experience*. For designers of immersive experiences, who are used to set their own contexts, making use of an existing context can be somewhat alienating, but it is a necessary skill to make sure new experiences can blend (in).

Blend Out: Bridging Several Contexts of Use

In his book Smart Things [15], Mike Kuniavsky describes smart products as the iPhone or Nazbatag as *service avatars*. Kuniavsky claims that it is often best to focus on the user experience of the service, and to see smart products as a means to deliver this service, rather than to focus on the user experience of the smart products themselves. Bridging multiple use contexts is an important selling point for solutions which we consider good

examples of embedded media. We will show this point with a project that we did around Burgers Zoo.

In this project students got the challenge to create an experience which improved the free roaming experience of the zoo and at the same time would help the zoo to spread visitors more evenly around the park. In the '1' the students created a virtual frog which could guide users throughout the zoo. In the user research of the '1' students interviewed regular zoo visitors, to find out that they often returned for a single 'favorite' animal. Students concluded there was an opportunity for the zoo to provide more information about *individual animals* (rather than species as a whole). The information could be fairly trivial, such as how well the animal had eaten that day. The students used this opportunity as a starting point for their subsequent iterations. In the '10', students proposed to create a safari experience using augmented reality binoculars, providing information about the individual animals. During the safari users could collect virtual treasures with information which could be used on the website of the zoo. In the '100', students proposed to replace the binoculars (too much an individual experience) with a compass and they downplayed the safari metaphor, creating more space for the original, social, zoo experience. Also in this concept, keeping track of the individual animals which users spotted that day played an important role, although these interfaces have not been designed in detail.



Figure 7: A dedicated 'smart compass' can point users around Burgers Zoo and provide information about individual animals.

Although the concepts of Burgers Zoo and the Cuddly Tree concept, which we discussed earlier in the paper, are fairly simple examples of experiences that stretch out across multiple contexts of use, they do show the opportunities. Embedded media designers need to be able to create experiences that blend in into existing contexts but also blend out and build bridges to new contexts. Somehow these experiences need to be connected, and this connection may be complex. Sometimes users will need to build a mental model across a range of experiences. When the embedded media experience revolves around a smart

souvenir such as with the Cuddly Tree, the product is the connection [12], but in other cases, such as the burgers zoo example it can be a real challenge to connect the disparate markers.

CONCLUSIONS

Within this paper we have discussed the idea of embedded media, products that connect web experiences to real world experiences. We have shown how our design approach (integrative innovation) supports us in designing these embedded media. Also we highlighted some of the lessons we have drawn from these projects.

The design of embedded media is heavily influenced by the existing context of use you are designing for. Designers who are trained to design immersive experiences such as games and websites, can set their own context and can count on the full attention of the user. This is not desirable for embedded media. Therefore we offered the idea of *experience blend* as a thinking direction that embedded media designers can add to their toolbox.

The central question behind the idea of *experience blend* is how to design the user experience in such a way that it will blend in seamlessly with, and enhances existing experiences. We have shown that thinking of experiences as encapsulating one and another (experience stacks), helps to see the boundaries of the experience you are designing. We also have also shown how to design contextualized experiences which are carried by their context of use. Unfortunately 'blending in' is not enough as many stand-alone products are becoming part of a larger set of experiences. This brings opportunities, but comes with the challenge of building bridges between contexts of use, which take the user along.

Although the notion of experience blend, needs to be fleshed out further, it offers a counterbalance to the dominant aesthetic of immersive interaction. But, the opposition between these two ideas may be misleading, as well. The settings of many of the projects we ran are somewhat malleable. It may be easier to impose 'new rules' or a 'new story' in a theme park, than it is in the car, a shop or a public park. At the same time, we believe that these contexts could be enriched with embedded media too. That is, if we manage to design the new user experience in such a way that it blends well.

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