User Experience Milestones

Structuring the Development of Experience Products

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Abstract. The approach of User Experience (UX) can help to create a unique selling proposition in mature markets like the automobile industry by meeting motives of users and evoking positive emotions. Yet, the User Experience goal is not continuously implemented in existing product development processes. In this paper we discuss the question: How can a continuous focus on the user's experience with a new product and the demands of a heterogeneous and mostly technical development process be brought together. We suggest six continuous, consistent, evolutionary UX milestones for the development of successful experience products. These milestones embody the intended UX, accompany the developers and evolve from a rough UX orientation, to more and more detailed user stories, to physical prototypes, the final product and its UX evaluation. By defining six UX milestones as compulsory checkpoints we facilitate the anchorage of UX aspects in established development processes.

Keywords: Management of DUXU processes, Product development processes Emotional design, Storytelling, UX methods and tools.

1 Introduction

1.1 Motivation for User Experience (UX)

Companies in many industrial sectors, e.g. in the automotive industry, are facing great challenges due to competitive environments in mature markets [1]. In addition, crucial changes considering the requirements of customers and their behavior when using a product can be observed. While traditionally requirements were limited to pragmatic aspects like utility and usability these factors are not sufficient anymore when it comes to convincing the customer with unique selling propositions. The demands of customers are expanding [1].

Consequently new ways of creating differing products and meeting real customer needs have to be found. Under these circumstances the approach of User Experience (UX) widens the scope of product development in science and industry by including non-technical, emotional and psychological values [2]. Don Norman states: „It's not enough that we build products that function, that are understandable and usable, we also need to build products that bring joy and excitement, pleasure and fun, and yes, beauty to people's lives." [3].

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At the same time new technologies create great chances for providing more than just bare functionality [1]. Technological innovations can help to meet and exceed increasing customer demands. And products which consequently evoke positive emotions provide novel opportunities for convincing potential customers and satisfying existing ones.

1.2 Initial Situation

In reality there is often a gap between the potentials for User Experience due to technological advance on the one hand and the transformation of these potentials into actual products in real development processes on the other hand. The arousal of User Experience is very much dependent on intangible factors like subjective and affective characteristics of the user or the specific context of the product usage [2]. Nevertheless, possibilities for the emergence of positive experiences can be designed by keeping the user in focus throughout the whole development process [4] and creating products that satisfy and exceed real customer needs [5]. But analyzing real projects in automotive industry, we observed that the focus on the user and connected analysis results "get lost" on the way from research to development. Due to established practices the technological perspective predominates in product development. The impact of technological innovations and technical solutions on the customer benefit is often not constantly considered. The UX goal is not continuously implemented.

As an example from the automotive industry, e-mobility is such an innovative field that offers possibilities for generating new User Experiences. Electric cars create great chances for experiencing a new way of driving. But in many electric cars of the first generation the experience already fails when starting the car. As traditional sound feedback is missing and no consistent feedback is presented the driver is left alone with his concern: Is the car switched on? Instead of using the technological potential to fascinate the user, he gets frustrated.

1.3 Goal

We need to find a way to integrate the concept of User Experience into product development processes in order to exploit the potentials of technologies and implement experience ideas into products. Analyzing projects in automotive industry, we observed potentials in the following fields that we want to address with our approach:

Naming the Customer Benefit. Today User Experience is still often considered as a marketing aspect which is added after the actual product development. Hence technological potentials for increasing the customer benefit are neglected. The communicated experience is not consistent. We propose to define the intended UX in an early stage and determine it as a design goal itself.

Maintaining Initial Experience Ideas. Often no overarching story exists in a development process that represents the user's view on the product interaction. As a consequence, experience ideas gathered in early development phases are not present anymore during product implementation. Furthermore, separate experience ideas often lose their intended effect when being integrated into one product.

Creating Reproducible Experience Products. Fascinating products are already developed today. Yet, they are often based on random ideas and great performances of certain people involved. Creativity of engineers and designers will still be needed. But we aim at joining individual performances in a continuous development process - planning User Experiences more systematically.

In this paper we present UX milestones to structure the development of successful experience products. The approach is based on milestones which are a common tool in project management. Traditionally these milestones are predefined checkpoints where certain development objectives have to be achieved. We adapt this tool, defining six UX-related milestones that evolve from a strategic UX orientation to the final product and its experience evaluation by real users. We recommend that these UX milestones have to be fulfilled at defined points in the development process besides technical aspects before starting with the next development stage.

Furthermore, the milestones represent the user-product-interaction during the entire development process and help designers in creating a mental model of it. The idea of this approach is to connect different development steps to each other without losing the customer requirements. By this means we facilitate UX to become an integrated part of product development processes.

2 Background

Before the UX milestone approach is described in detail the reasons for the status quo and the consequential implications for our methodology are presented. Several specific characteristics and requirements of User Experience Design (UXD) on the one hand and existing product development processes on the other hand have to be considered when bringing the two perspectives together. Important factors were gathered from literature and the analysis of development processes in the automotive industry. The issues were supplemented with ideas of how to address these challenges with our concept.

2.1 User Experience Design (UXD)

Focus on New Aspects. UXD extends the view on product usage towards new aspects like emotions and excitement [2]. Therefore, not only the product on its own but the interaction with the user and the context as well as its evaluation by the user is strongly considered [1], [2]. In our approach the user's point of view on his encounter with the product is represented by the UX milestones. By handing on these representations from one development phase to another, the user remains in focus.

UX Requirements Harder to Define. Compared to technical requirements the various factors influencing UX are more difficult to specify. Hence engineers tend to neglect the user motives during technical implementation. We suggest presenting the UX goal in a coherent evolving story, simultaneously to the development of technical aspects.

Many Different Perspectives on UX. The existing UX definitions range from a marketing perspective to psychological needs fulfillment [2]. We want to provide a pragmatic approach for product development helping all disciplines involved to take a common user's perspective and design products accordingly.

No Consistent UX Process. There are a lot of methods supporting the creation of experience possibilities but no suggestions for an ongoing UX development process. With the UX milestones we present a step towards a continuous UX Design.

2.2 Product Development Processes

Focus on Technology. Today products like automobiles are mostly designed from a technological perspective. It is challenging to bring in the user's motives. Therefore they have to be connected to and translated into technical requirements.

Product and Process Complexity. Handling complexity is a main challenge in product development. Accordingly we have to be careful not to add even more complexity by introducing UX factors. Instead we present overarching user goals making it easier for product designers to focus on a common theme. By this means the complexity of the product received by the user should be reduced as well.

Many People Involved in Process. In big companies such as car manufacturers a huge amount of people from different disciplines (e.g. psychology, engineering, industrial design, informatics) is involved in product development. Each person has clearly defined competences and duties - focusing on his own perspective and his specific task rather than on the real user. With the UX milestones we want to connect the different development steps without losing the customer requirements.

Established Processes. Existing processes in automotive industry and other mature industrial sectors are mostly well established and optimized regarding traditional aspects like time, costs and technology. Therefore the recommended UX milestones are designed to be integrated into these existing development processes.

2.3 Integration of UXD into Product Development Processes

As a result of the diverse influencing factors the idea of UX is not yet continuously implemented in reality of product development. More specifically the real user and his motives as well as corresponding UX requirements are hardly represented in actual product development processes.

3 Approach

In order to enable a continuous, systematic creation of User Experiences and its integration into existing development processes we introduce User Experience milestones, marking the end of development phases on the way to successful experience products. The approach is based on the traditional project management tool of milestones. Therefore, the basics of this method are pointed out before our adaption to the field of UX is presented.

Milestones are a common instrument in project management. They are defined as key events, having a special significance within a process [6]. By means of milestones the overall process is structured [7]. Every project phase is completed with a pre-defined milestone [8], [9]. Two specific characteristics of milestones can be stated [8], [9], [10]. Firstly, they are used as an orientation and controlling tool. The milestones represent important intermediate results regarding aspects like costs, time and performance. These outputs can then be compared to the target planning which was done before the project start. Trend analysis can be used to predict the achievements of objectives. Secondly, milestones are designated decision points in a project where the course of action can be adjusted. Regarding product development e.g. promising ideas, concepts or generated solutions are selected to be developed further at the milestones while others are discarded. Summing up, milestones are scheduled points in projects where previously defined targets have to be reached. Due to many similar projects in reality milestones are often standardized and institutionalized [9].

In our approach we adapt the milestones to User Experience Design. Six UX milestones outline important steps towards systematically planned experience products. Three main characteristics and advantages of the methodology can be named:

Representing UX Progress. Similar to traditional aspects which were explained before also the progress of UX development is now reported. The UX milestones represent the user's perspective and user's goals throughout the project and have to be fulfilled at pre-defined points in the development process. Hereby we provide a possibility to continuously anchor the idea of UX in product development processes.

Evolving Milestones. By structuring the development process into six phases, each one finishing with a UX-related milestone, we help every designer understanding his defined position and role in the overall project without losing the initially intended UX focus. In every phase the previous milestone is evolved to the next level. As a result, every designer has the same background information and goal to work on. Each milestone can be used in the following steps as an inspiration as well as a reference for evaluating new solutions with respect to UX requirements.

Linking UX with Technical Aspects. To solve the conflict between User Experience Design and existing product development processes (see chapter 2) the UX milestones are linked to technical aspects. In this way the experience concepts can be embedded into traditional processes and implemented into actual products.

In the following each of the six consecutive UX milestones is presented in detail. The approach is illustrated with an automotive use case from our research project.

3.1 UX Framework

Description. Motives of potential customers and chances for User Experience are clustered in the first milestone: the UX framework. The framework symbolizes and visualizes opportunities for creating potential User Experiences with a product. Figure 1 shows an example for a framework in the field of electro-mobility, coming out of our project with the automotive industry. User motives are represented in the form of "I…"-sentences. In order to specify the framework, further explanations about the

product context or first ideas can be placed around the clustered UX chances. A framework is a rather strategic, abstract tool and can also have other formats like a mood board, brand image etc. In addition to established objectives like target costs, schedules, technologies or market segments the UX framework defines a rough orientation for further development phases in which it evolves into concrete experience concepts and their realization.

Important Aspects. The framework has to be based on the analysis of real users. Besides this, technology and market aspects have to be considered. Whereas traditionally product development is mostly problem-oriented, the UX framework concentrates on potentials in order to derive positive User Experiences.

Additional Elements. Customer profiles representing potential users have to be attached to the framework. This is an important aspect, as according to different user groups the UX chances can be interpreted differently.

Next Steps. Whereas in today's projects these initial chances are often not present anymore when it comes to technical implementation stages, we suggest to hand on the framework as an overarching goal throughout the whole development process. Ideas within the framework are used as a basis for the creation of experience stories (chapter 3.2).

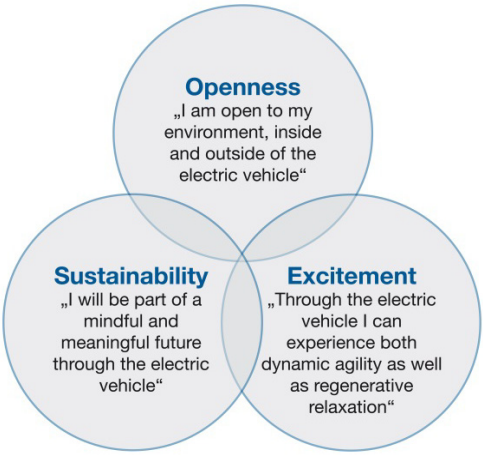

Fig. 1. UX Framework: Clustered chances of electric vehicles

3.2 UX Story

Description. At the second milestone a story describes a positive User Experience within the framework. Supporting the exploration and communication of new concept ideas the story is outlined in a rough story plot and contains exemplary characters [11], [12]. The story is basically a textual description supplemented with pictures. Figure 2 shows an extract from the story of the *Heartbeat*, an automobile interface developed by Löhmann et al. [13]. The concept addresses the chance for excitement by experiencing agility and relaxation, as it is described in the UX framework for

electro-mobility (figure 1). Instead of just naming the idea of an electric vehicle that provides a natural energy feedback a possible experience is written down in a story. In this way a story helps all people involved in the following process to have a common understanding of the intended product interaction. We suggest that compulsory experience stories for all concept ideas have to be developed and evaluated before the UX milestone. At this point promising concepts are chosen to be developed further.

Important aspects. The story visualizes the basic characteristics of the intended positive user-product-interaction but is yet not connected to a specific technology. Instead, focus is set on emotions and motives of the user.

Additional elements. A virtual integration concept specifies the product functions that are addressed with one experience story and explores the integration of different stories into a final product concept. As well, first technical parameters which are critical for the emergence of an intended experience are derived from the story (in case of the *Heartbeat*: e.g. interface reachable for driver and consistent energy feedback by pulsation).

Next Steps. Complementary to technical requirements the story is handed on during the development process. The matching of subsequent technical implementation with the story has to be guaranteed and checked at all times in order to meet users' motives and goals.

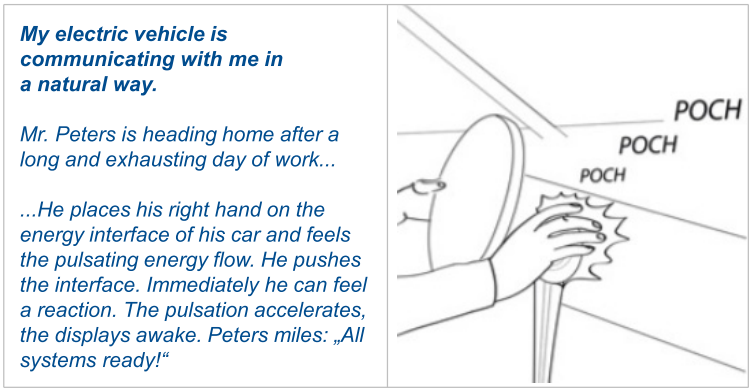

Fig. 2. UX Story: The idea of a natural energy interface in an electric vehicle

3.3 UX Storyboard

Description. The positive experience described in the story is specified at the next milestone: The UX storyboard describes the intended usage and experience step by step. Pictures illustrate the user-product-interaction. By that means important experience aspects are transparently documented for the ongoing process. An extract from the storyboard of the *Heartbeat* [13] is shown in figure 3. Actions of the exemplary character and reactions of the energy interface are presented. In order to provide a

precise experience goal, every detailed technical concept description has to be complemented with such a storyboard before starting with the implementation process.

Important Aspects. Whereas the story explains a rough experience idea, the storyboard depicts a detailed interaction process in a specific usage context. First experience mock-ups are used to evaluate and iteratively adapt the drafted storyboard before the milestone.

Additional Elements. The storyboard has to be translated into detailed technical requirements in order to be accepted by and applicable for developers. An advanced integration concept considers the interplay of different experience drafts as well as implementation aspects like usability and packaging. Storyboard, integration concept and technical requirements affect each other and have to be adapted accordingly.

Next Steps. The storyboard forms the basis for the subsequent implementation of the experience concept. Technical specification sheet and storyboard are passed on simultaneously until the end of the project.

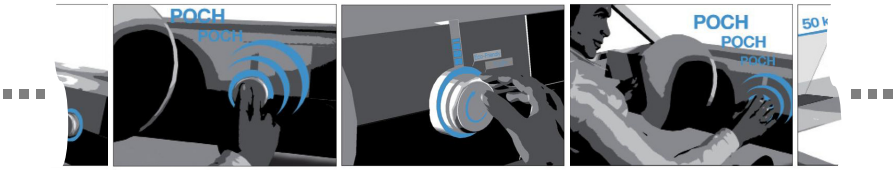

Fig. 3. UX Storyboard: Intended interaction with a natural energy interface in an el. vehicle

3.4 UX Components

Description. After having planned the User Experience possibilities, physical prototypes are developed in detail. In an iterative implementation process the prototypes are frequently evaluated by real users. At the end the UX components realize the intended experience and roughly define dimensions and design. In case of the *Heartbeat* the prototype provides multimodal feedback about the status of the car and the remaining range [13]. The visual energy scale and the haptic pulsation vary depending on the selected driving mode and the current speed of the car (see figure 4). After the previous analyzing and conceptual milestones, the UX components mark the first point in the development process where a physical representation of the experience concept has to be presented.

Important Aspects. Usually the implementation is executed based on the requirements list. But special attention has to be paid to not losing UX chances when solving technical problems. Hence, the technical realization not only has to meet technical requirements but also represent the content of the storyboard.

Additional Elements. All components have to be integrated into one product in the next step. Therefore, the prototypes are not developed separately. The integration concept connects the UX components with each other.

Next steps. The final prototypes are used as input for the serial development.

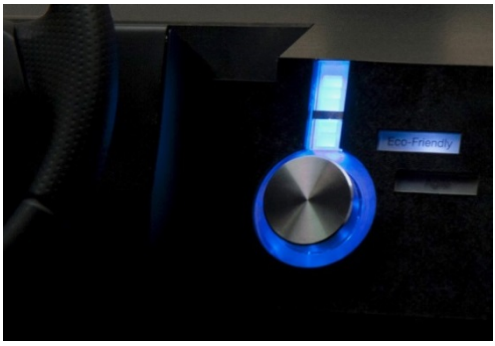

Fig. 4. UX Component: Prototype of a natural energy interface in an electric vehicle

3.5 UX Product

Description. Rather rarely a user-product-interaction is influenced by only one isolated component. Therefore, the UX product combines the UX components based on framework, story and storyboard. As the emergence of UX can be strongly dependent on realization aspects, aesthetic aspects and optimization of product details are important factors which have to be considered before this milestone. Focus is put on a homogeneous look and feel. Finally the product should embody the story behind it and facilitate a positive User Experience by itself without any further explanations. Figure 5 shows the *Heartbeat* integrated into the dashboard of a vehicle [13].

Fig. 5. UX Product: Natural energy interface integrated into the dashboard of an electric vehicle

Important Aspects. When the different components are combined in the final product it is very important to concentrate on the global User Experience. Even if each function creates a valid experience possibility a bad integration can ruin the overall product experience.

Additional Elements. Additionally the marketing concept is developed. Compared to traditional processes it is not only based on the product. Framework, story and storyboard can also serve as input for the communication of the intended User Experience.

Next Steps. The product is now used by the customer in the real world.

3.6 Proof of UX Concept

Description. Finally the matching of the intended User Experience (framework, story, storyboard) and the actual User Experience (user-product-interaction) can be evaluated with real customers in a real context. The proof of concept consists of structured experience reports, addressing the question: Do User Experiences emerge in real usage situations? Exemplary statements from users of the *Heartbeat* [13], confirming the arousal of an intended experience, are shown in figure 6.

Important Aspects. The traditional evaluation of technical characteristics and usability is enhanced by testing UX-related aspects like the fulfillment of users' motives.

Next Steps. The proof of concept can be used as starting point for product modifications or as input for following projects.

U21: "The car… becomes alive." *U15: "You can feel the car!"* *U05: "It feels like interacting with a living being."*

Fig.6. Proof of UX Concept: Experiences of users when interacting with the energy interface

4 Conclusion

The idea of User Experience provides great opportunities for creating fascinating products that meet the motives of real users. But in reality of product development the potentials for UX are often not exploited. Reasons for this can be found both in the special characteristics of UX Design as well as in the properties of traditional development processes.

We introduce UX milestones that represent the intended customer benefit throughout a product development project. As the first milestone the UX framework provides an overarching goal and a rough development direction. Within this framework stories describe possible experience concepts. These concepts are then specified in form of storyboards, describing an interaction step by step. The storyboards are transformed into physical prototypes before the components are integrated into a final product. Finally the occurrence of experiences with the product is tested in a realistic context.

The evolving milestones ensure a continuous focus on the initially intended User Experience during the development process. At these predefined points not only technical factors but also compulsory UX requirements have to be fulfilled in order to proceed with the project. A consequent experience goal is provided for all people involved in a development project and important decisions about the ongoing development process are influenced by the UX milestones. In this way possibilities for the emergence of positive User Experiences can be planned systematically.

Our approach was developed and evaluated during an interdisciplinary research project in the automotive industry. The feedback was very positive. Yet, the approach has to be specified and evaluated in real development projects and other branches. The concept of UX milestones is designed to be integrated into existing processes. It is adaptable to different development situations. But the specific points where the milestones should be included compared to existing aspects are to be defined in detail. In addition, the approach has to be supplemented with detailed development steps, appropriate methods for each stage and roles involved in the process.

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