Product Design-Oriented Cooperation Process Between The Designer, HW Developer And Sw Developer

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Abstract: Recently, the product design which used to be merely for product packaging has received much attention as an important factor that satisfies customer needs and provides competitive advantages to the company business and thus, it’s predictable that such significance increases as time goes by. However, the existing product development process requires to figure out customer needs first and create product design and then, forward it to HW and SW developers. This error-prone process results in unrealistic product design which can’t be further developed and also, difficulties in changing product design, consequently ending up with redevelopment from the early stage. Although each team considers each other, the lack of understanding in other field makes them not settle those problems. The cooperation between designer, HW developer and SW developer is essential from the product development process. Many corporations have made efforts to get designer, HW developer, SW developer involved in the product development process but failed due to lack of proper procedure or role definition. Therefore, this paper aims to suggest process in which the designer, HW developer and SW developer can cooperate with each other and work on product development, especially focusing on product design.

Index Terms: Cooperation process, Embedded design life cycle, Product design, Software process model.

1. INTRODUCTION

The product design which used to be merely for product packaging that features new technology has received much attention recently. According to [1], 70% of CEOs believed that the design issues are increasing competitive importance in upcoming future. And [2] created phrase, “design mindfulness” and highly praised benefits that come from committed, creative, energetic focus on great design. This cases show significance of product design and it’s so easily predictable that such significance increases as time goes by. In addition, the customers of recent days places great importance on new technology as well product design and thus, the design has become invaluable as it can satisfy and meet customer needs. Well-designed products can offer competitive benefit to increase its market share [3].

In the existing product development process, the marketing team has to figure out customer needs, create product design they want in advance and forward it to HW and SW developers. This error-prone process results in unrealistic product design which can’t be further developed and also, difficulties in changing product design, consequently ending up with redevelopment from the early stage. Although each team considers each other, the lack of understanding in other field makes them not get the point such as how their works can affect other area and how to carry on with. Therefore, the cooperation between designer, HW developer and SW developer is essential from the product development process. Many corporations have made efforts to get designer, HW developer and SW developer involved in the product development process but failed due to lack of proper procedure or role definition. Therefore, this paper aims to suggest process in which the designer, HW developer and SW developer can cooperate with each other and work on product development, especially focusing on product design. As the designer is required to take part in all process, the opinions from all stakeholders become acceptable while protecting value of product design which increasingly becomes significant.

2 COOPERATION PROCESS BETWEEN THE DESIGNER, HW DEVELOPER AND SW DEVELOPER

Cooperation Process for the product design suggested in this paper has defined process and roles for the product design which requires cooperation between designer, HW developer and SW developer prior to the existing embedded design life cycle. It consists of four steps as follows: definition of the product design strategy; elicitation of the product design requirements; cooperation between the designer, HW developer and SW developer; and product design review. If necessary, you’re allowed to move or advance to another step. If you’re done with all steps without any problem, the final design will be made. Then, cooperation process proposed in this study will be completed and the product will be developed depending on embedded design life cycle [4].

![Fig. 1. Overall product development procedure.](image)

2.1 Definition of the Product Design Strategy

In this step, the product design strategy is defined based on the product concept in which company seeks for and market survey conducted by the marketing department. This activity requires participation of insiders of company and designers. When releasing product, the company should choose concept and
design product. And the marketing department hands out questionnaires or conducts interview with customers who use the product to figure out customer needs in order to design product. Based on these two things, the design strategy for product which will be released this time can be defined.

2.2 Elicitation of the Product Design Requirements
In this step, based on the well-defined product design strategy, the scenarios are written and analyzed to come up with requirements for the product design. It requires participation of designers and customers. According to the defined design strategy, the scenarios are written and analyzed depending on customer needs to elicit the product design requirements. In this step, the designers take the lead but need to put more emphasis on customers to repetitively write scenarios and analyze them. Such repetitive works allow designers to find out customer needs and elicit product design requirements.

2.3 Cooperation between the Designer, HW Developer and SW Developer
In this step, the designer, HW developer and SW developer should cooperatively participate in and work together for the product design. Prior to this step, it’s led by the designer. But from this step, all stakeholders are required to participate in. Key designer, HW developer and SW developer should cooperate with each other to develop product effectively and discuss the product design. The detailed procedure is as follows.

1. Step 1: Redefinition of the Requirement
   Especially focusing on the product design requirements, the designer, HW developer and SW developer work out together to redefine requirements. In the previous steps, the insiders of company and customers have to participate in and work on to come up with the product design requirements, especially with the designers. Since the insiders of company, customers and designers do not develop the product by themselves in this case, there’re some problems in some requirements that need to be redefined due to difficulty to practically realize or abstract expression because these requirements were found in terms of the product design. Therefore, the designer, HW developer and SW developer should collaborate and redefine the product design requirements.

2. Step 2: Discussion of the Importance
   The designer, HW developer and SW developer cooperate with each other to prioritize the redefined product design requirements. In the majority of cases, all design requirements can’t be met due to various elements such as limited resources, conflicts between the requirements and release schedule and thus, it’s necessary to prioritize these requirements. Previously, the designer, HW developer and SW developer used to have their own priority in the requirements but this time, set priorities together and share them. By sharing same priorities in the requirements, it could prevent changes in the order of priority in the requirements before the product release and also, substantially reduce potential problems.

3. Step 3: Choosing the Requirements
   Considering various conditions of product which will be launched this time, the designer, HW developer and SW developer discuss and work on together, especially with the product design requirements in which the priorities are firmly set and also, choose the design requirements that need to be included in the product which will be released. As mentioned above, it’s not possible to include all design requirements into the product like the general requirement. Therefore, the designer, HW developer and SW developer should take various options such as time, cost, schedule and technology into account and consider their position in order to decide which design requirement should be included in the product to be released.

2.4 Product Design Review
   Based on aforementioned discussion, the final product design should be reviewed and discussed on this step with all stakeholders. This step requires participation of all stakeholders including the designer, HW developer, and SW developer. As all stakeholders take part in, they should review and discuss on the design of final product in their perspective. This process demands all stakeholder’s participation and repetitive works.

3 CONCLUSION
   This paper successfully suggested the product design-oriented cooperation process between the designer, HW developer and SW developer of which the designer takes part in all steps to protect the value of product design. It consists of four steps as follows: definition of the product design strategy; elicitation of the product design requirements; cooperation between the designer, HW developer and SW developer; and the product design review. In this process, the defined process and roles enable the designer, HW developer and SW developer to cooperate with each other, especially focusing on the product design and also, prevent redevelopment from the early step due to product design issue. In addition, the development of design elements that are important in the modern times will help to not only satisfy customers but also enhance competitiveness for the business. The plan for further study was complemented and improved with review and feedback from many experts. They will be applied to actual project to verify efficiency of this process which will be further complemented and improved.

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