Supporting Scenario-Based Product Design:
the First Proposal for a Scenario Generation Support Tool

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Abstract
Using concrete stories about product or technology use, or 'scenarios', is a promising design approach. Nevertheless, design practices face uncertainties especially in the activities of identifying, creating and selecting scenarios. Based on a workshop series at a design company, specific problem areas in its scenario practice have been identified. Support is required in: (1) documentation of design information and creation of scenarios from the information, (2) identification and selection of the scenarios for specific purposes, (3) concept evaluation using scenarios and (4) communication of scenarios to stakeholders. This paper proposes a functionality of the scenario generation support tool that addresses the requirements.

1 INTRODUCTION

With a more competitive market and more selective buyers, consumer products will most likely thrive by shifting the design focus to users. Despite their different personal characteristics, all users want the best value for their money. In nowadays market this is often simply translated as one product having as many functions that fulfil the diverse goals of the users. Nevertheless, one generic solution might not be the answer because a product needs to perform well in diverse situations that the users may experience. For design teams, this means they have to deal with immense and not uncommonly contradicting design information. Furthermore, the various use aspects demand multi-disciplinary design teams, which often presents a challenge in team-building and communication. In facing these challenges, design teams are eager to receive support.

Using concrete stories about product or technology use, or in our term 'scenarios', seems to have all the potentials to address the above mentioned challenges. The concreteness of scenarios helps to glue together relevant information pieces and make them more meaningful. By enforcing the use of natural language and making assumptions explicit, communication internal within the design team as well as external with users and stakeholders can be improved. This approach of applying scenarios in a design process is known as 'scenario-based design' (SBD).

Originating from the software engineering discipline, SBD aims to tackle technical problems especially in the activities of balancing reflections and actions, encouraging active participation of stakeholders and building reusable design knowledge [1]. Currently, SBD is also increasingly being applied in a full spectrum of product use. Software engineering however has underlying differences compared with consumer product development. In comparison with tangible products, software applications concern a more limited set of interactions and use situations. A web-based application for project management, for example, has a closed set of

interactions (utilizing mouse and keyboard) and context of use (i.e. office or corporate setting). On the other hand, tangible consumer products often have diverse means to interact with and more varied use settings, demanding a more elaborate use of scenarios. Therefore, initiatives to refine scenario use in the design of user-friendly consumer products are growing, and we refer this to as 'scenario-based product design' (SBPD). Despite these new initiatives, it has been observed in e.g. [2, 3] that the use of scenarios in product design is actually not new. These works confirm the benefits of scenarios in product design process to improve communication and afford early exploration and evaluation of design ideas.

Despite the potentials, design practice is often discouraged by the uncertainties involved in applying scenario-based approaches. Building scenarios indeed can be a waste of time if the purpose and the future use of the scenarios are not well-defined. To remedy this, a design team needs to know in advance what the gain is from using scenarios before even starting to create them. The design team will need a more solid framework of scenario use to be able to measure the efficacy of a scenario-based approach. Unfortunately, available SBPD approaches remain mainly heuristic and loosely defined. To better reflect this situation, we define SBPD in our research context as *a common denominator for techniques that apply scenarios to bring actors, products, environments and their interactions into harmony*.

There seems to be a gap between 'theoretical SBPD' and the 'real battlefield' of product designers. Despite the promising benefits of using scenarios, designers often face doubts whether they have identified, created and communicated scenarios in an optimal way. SBPD in practice needs a more practical guidance. Motivated by this need, we propose to guide scenario generation as a form of support that is likely applicable for the practice of small to medium-sized design companies. Small to medium-sized design companies are chosen because they provide a pragmatic test bed to apply and evaluate our proposed scenario use framework. This type of companies is characterized by the close-knit design

teams, short-term deliveries and dynamic project execution. The designers will be able to quickly measure whether a framework for scenario use would address the practical challenges they face or if it would only obstruct the design process. A realistic challenge therefore lies that the new supported scenario-based approach has to be more reliable, time-saving and gratifying to the designers than the currently used design approach. A research question can be formulated to capture this underlying requirement: *how to create a framework for scenario use that makes design practice more effective and efficient?*

This paper presents our approach to answer the research question. Scenario uses within design activities have been studied which resulted in a generic classification of scenario types [4]. Further on, collaborations with product designers are a significant part of this research, to learn about practical design challenges that can be addressed by using scenarios. Based on our results so far, we propose a scenario generation support tool that acts as a framework for using and building scenarios. A support tool is flexible enough for the differing design practices, meaning that designers are free to choose to use it or not. On the other hand, by utilizing such a tool, a better practice can be shaped and consistently sustained. The support tool is expected to help product designers structure their design knowledge, confirm their rationales and communicate their design ideas.

2 APPROACH

This research aims at supporting design practice by means of a scenario generation support tool. Study on existing frameworks and tools to apply scenarios has revealed that most of them focus on only specific areas in the design process such as requirements capture and verification, e.g. [5, 6]. Another framework, the Design Information Framework (DIF) [7], addresses scenario use in a more holistic approach. However, it is also exhaustive and might not be immediately suitable for the differing practices in small to medium-sized design companies. The findings from our study motivated us to conduct a broader study on scenario uses in design-related domains. An overview of scenario uses in a form of scenario classification has been developed to summarize the results of this study [4]. The scenario classification has been further used as a common reference with designers to discuss their design practice and identify challenges where scenarios can potentially bring in solutions.

In relevance with the aimed practical value of this research, two workshops have been conducted with designers at a Dutch medium-sized design company. From here on, it will be referred as 'the company' and the designers working there as 'the designers'. The company specializes in products for human care, medical cure and user comforts. Their approach focuses on users since users' acceptance is essential for these types of products. The designers already apply scenarios to a certain extent in their design process. With this favourable background, the workshops have evoked the designers' valuable opinions about their motivations for using scenarios and the challenges they face in their current scenario practice. These findings cannot be generalized to all design practices in other organizations. Therefore, additional contacts with other design companies are currently planned to verify if the company's practice is relevant to other design practices. Nevertheless, preliminary requirements for the support tool can already be drawn and will be used to direct future workshop sessions.

Based on the findings so far, we could suggest a hypothesis that sustaining scenario uses throughout a design project is more useful than sporadically using scenarios only when needed. To realize a sustainable scenario use in a design practice, a good foundation in identifying, creating and selecting the scenarios is needed. Therefore, we propose a support tool to guide scenario generation from empirical design information. To make sure that the support tool will be usable in practice, designers are involved actively throughout this research as the potential end-users of the tool.

3 RESULTS

Each of the two workshops conducted at the company was attended by a moderator and two designers. The participating designers have all had some experience using scenarios. They are willing to discuss their current practice and the limitations they meet in applying a scenario-based approach. Their motivation comes down from the curiosity to know SBPD beyond their practice and to possibly improve it. A part of the workshop objectives was to get insight in their design practice and to discuss support forms that are potentially applicable. Additionally, we also aimed to verify the scenario use classification from the designers' practical point of view. To create a concrete discussion during the workshops, a fictional case study of designing a bicycle luggage carrier was used to represent a design project.

This following subsection elaborates our workshop findings at the company: the designers' reasons for using scenarios, how they currently conduct their scenario-based approach and challenges inherent in their practice. Based on these, a set of requirements are formulated and functionality of a scenario generation support tool is proposed.

3.1 Scenarios in Design Practice

The conducted workshops have indicated the loose ends of a scenario-based practice particular to the company. In general, the motivation for using scenarios at the company is to maintain information about users and the product use situations in its life cycle. For the company, the complete product life cycle may include, but not limited to, production, delivery, shopping, usage and disposal or recycle. Each product life stage is taken into account during the design process. Taking inspiration from empirical data, the designers focus on extreme and critical situations which may present risks throughout their product life cycle. The largest and most important part of the critical situations concerns the use of the product. Henceforth, this paper will only refer to 'critical use situations' as situations that potentially lead to failing outcomes during product use.

Within the company, time and resource pressure is inherent in any project. Consequently, the critical use situations are expressed only in brief scenarios and assessed using an objective scale measure. These brief scenarios represent fragments of complete and coherent scenarios. Design activities are aimed to actualize the product's performance measures in all critical use situations. Therefore, the list of critical use situations is heavily used by the designers to verify their design (or design changes) in quick iterations.

As the results from the workshops, three main problem areas within the company's practice have been identified. Additionally, the scenario use classification has been verified being shown that the designers were able to relate their own scenario practice to the classification. The following subsections will elaborate the identified problem areas in more details.

Documenting design knowledge

The current practice: Before a project is started, the designers build intensive contact with their clients to get the business requirements right. Once the project is defined and throughout the process, the designers compile their design information from contacts with potential end-users, observations on competitor products and close investigations of established standards (e.g. safety or ergonomics). Especially at the beginning of the design process, the design information tends to explode because the significance of the information pieces cannot yet be determined. As a result, the designers take in all the information so that they do not miss anything that may contribute to their decisions later on.

The challenges: Within the development of a complex product, this early phase will pose challenges in selecting the information relevant to the design case beforehand. Considering the amount of information, there could be a lot of efforts saved if the most relevant information are identified early and gathered first. Furthermore, the task to document all the gathered information might take an enormous effort and time. While it is getting more streamlined later on, the beginning of a process is usually associated with ad-hoc documenting activities. Designers within a team would therefore benefit from a more structured manner to collaboratively document their findings; this can be regarded as an investment for future easy access to their design knowledge.

Identifying and prioritizing critical use situations

The current practice: Based on the registered information from the previous step, the designers pay special attention to critical use situations that may lead to failures during product use. While mostly based on observations and interviews with potential end-users, the list of critical use situations could also receive contributions from the clients, specific requirements from established standards (e.g. ISO, NEN, Arbowet) and possibly designers' own imagination of plausible failures during product use. The last type of contribution however, still needs to be verified with end-users and other stakeholders.

As mentioned earlier, the designers express these situations in brief scenarios on top of a framework for risk analysis. The framework provides a more structured approach to assess the magnitude of each critical use situation based on its severity and frequency. Subsequently, it also helps the designers to prioritize the most critical aspects to address with their design.

The challenges: The framework used at the company is a formal risk analysis tool. It does deliver objective analysis on the use situations of a product. However, the formality of the tool could potentially be a hindrance to designers' creativity. While the analysis is supposed to be performed up front, what often happens is that the list of critical use situations still grows during and after design activities. Unfortunately, the risk analysis is an activity very different from the design creative process. The designers prefer to postpone this activity to when they have time apart from designing, which results in the analysis and documentation often lags behind the execution. Furthermore, the current way of registering critical use situations sacrifices coherence for time-efficiency which could present a risk. When some elements of the critical use situations are left out to be assumed, the assessment of the risk severity could become less reliable.

Quick evaluation on design concept

The current practice: Idea generation in design is intuitive and rarely performed in a structured manner.

Nevertheless, rationality should not be compromised: any design concept must lead to at least a sufficient performance in all use situations. Within the company, the designers use the list of (critical) use situations to quickly assess their design ideas in order to not overlook any use aspect. They also take an initiative to perform the quick evaluation together with their peers to retain objectivity.

The challenges: When designing a complex product, the list of critical use situations could grow considerably. Running through the list for evaluation then becomes extremely challenging due to the large number of interconnectivity among the different situations. For example, a modification to improve the performance in a use situation A might lead into a worse performance in use situation B. Designers cannot simultaneously remember all the present risks while they are designing. Furthermore, there could be uncertainties concerning which use aspects will be affected when a change is made. Despite being reliable, evaluating a concept by running it through the critical use situations can be mentally exhausting.

3.2 Scenario Generation Support Tool

Scenario building is an extension to design inquiries, which focuses to make further use of the inquiry results for communication and evaluation purposes. To make sure that designers have a good foundation in their further use of scenarios, the proposed support needs to guide: (1) the initial documentation of necessary scenario elements and the scenario storylines creation, (2) the identification and selection of scenarios for specific purposes, (3) the evaluation of design concepts using scenarios and (4) the communication of scenarios to other stakeholders. The following subsections propose the functionality of the scenario generation support tool. To illustrate the tool, several scenarios are presented to depict a comparison between the commonly occurring design practice and the plausible future practice using the tool. The scenarios are based on a fictive design case of (re)designing a bicycle luggage transporter.

Repository of design information and generated scenarios

A design team prepares a project by researching existing products or competitors, technologies that may be useful, and most importantly potential users of their products. A simple inquiry can already gather a lot of information which can be a challenge to organize. With several designers in a team, an extra challenge is to make sure that every team member has the same level of knowledge to move forward as a team.

To be able to create useful scenarios, designers need to first of all gather scenario elements. The elements of a scenario comprise, but not limited to, a user (and his/her characteristics), tools or products, a goal concerning the product use, physical setting (where the scenario takes place), non-physical setting (e.g. time pressure, nervousness), user actions and possible events that could happen. Leaving out too much detail of the scenario elements could present a risk of misunderstanding. Therefore, a proposed functionality of the tool is to put up the types of information explicitly so that designers can easily notice which information is still missing. These information pieces can then be used conveniently as building blocks for scenarios which are more meaningful and memorable.

Current practice scenarios:

Please imagine the following situation…
Alice and Bob are designers at the company. After a kick-off meeting with a client yesterday, their manager assigns them tasks within the project of designing a new breed of bicycle luggage transporter. Alice is going to visit an

exhibition of bicycle latest technology -which coincidentally takes place in a good time- to find out the market situation. While Bob is going to observe/interview buyers at one reputable bicycle store in town, and hopefully he finds some users who have suitable profiles to participate later on in their research…

"How can we share our findings quickly?"

After a long day, Alice and Bob come back with a lot of information; they have taken along notes, photos, brochures, etc. Both Alice and Bob are wondering how they can organize this information neatly and share it quickly with their team members. They try to ask the team for a quick meeting, but it's difficult to get everyone together especially at this moment when everyone is busy doing field studies. Preparing a document could be a good idea to share the info with the team, but it takes time especially with the different media of information that has been collected. Alice and Bob just want to "drop" their findings into a common place that everyone can refer. This way, everyone can access the information him/herself when he/she has time.

Future practice scenarios:

Imagine a different situation…

Alice returns from her field visit to a bicycle fair in Amsterdam. She is a bit exhausted after the trip and making contacts with bike manufacturers at the fair. She's satisfied though with what she has learned of the latest bicycle-related designs and technologies. During the fair, she had a chance to remark the current state of bicycle luggage transporters. She took many photos that highlight their main features so she could show and discuss them with the team. She also took some brochures to get references/contacts of the companies…

Alice shares her reviews on latest bike products

Now that Alice's back in the office, she wants to store all information she has just learned quickly and call it a day. Alice uploads the photos she shot to the company's server where everyone with a login can access. But she's not done yet; she wants to give out her reviews and opinions now that they are still fresh in her memory. She opens her internet browser and runs an application called "Scenario Central". She finds the photos she just uploaded, gives them short descriptions and annotates some parts of the photos (Figure 1).

Bob records user profiles and disagrees with Alice

Bob comes back from surveying the bicycle stores a bit later after Alice left for home. He checks the application "Scenario Central" to get a glimpse of what Alice has put there. Aha! Bob reads Alice's positive review about product 'panniers' that she found at the fair. Coincidentally, today Bob met a user who has been using the product for some time and is not satisfied with it. Bob immediately put his findings as a reply to Alice's review (Figure 2). He then continues with registering the information about users he met during the observation. On the same work area, Bob adds 3 user profiles he has had interesting conversation with. Each of them has experiences and strong opinions about the existing products. "This kind of users will be valuable information source in this project", Bob thinks. Bob connects each user profile with product(s) they have used so far, along with the comments these users have made (which are on Bob's notes). Bob knows he still needs to give a more thorough and structured review about these users and products, but for now this is sufficient just so that he remembers the key details.
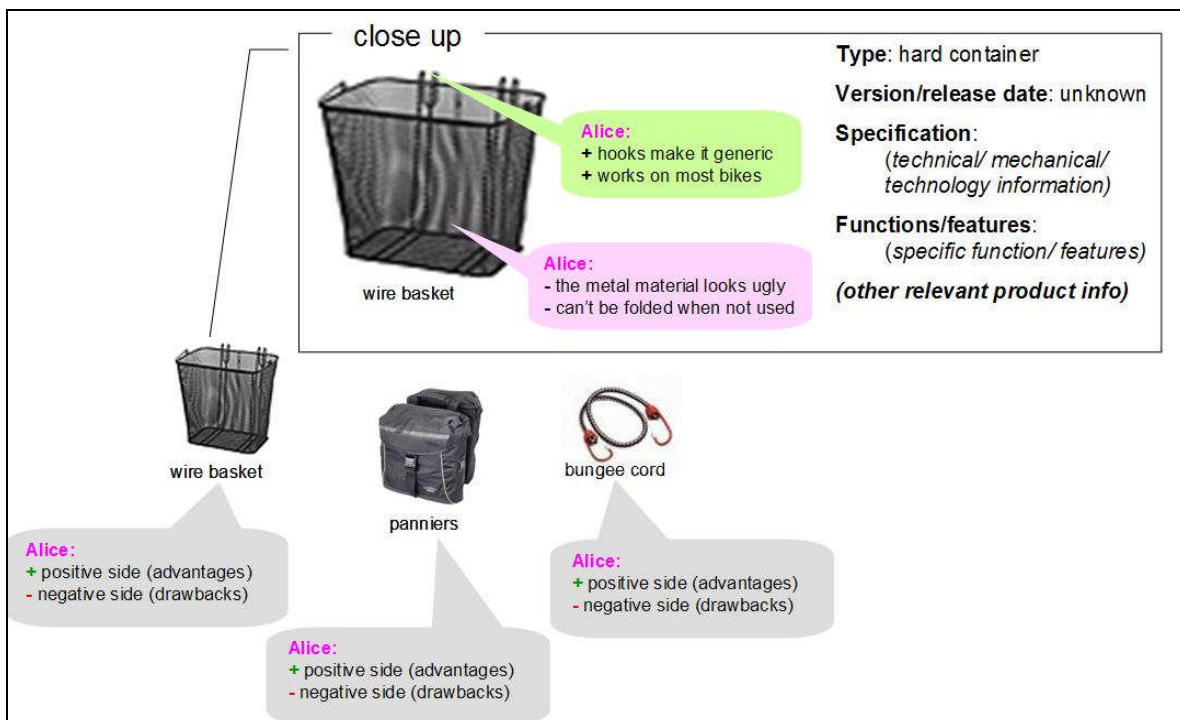

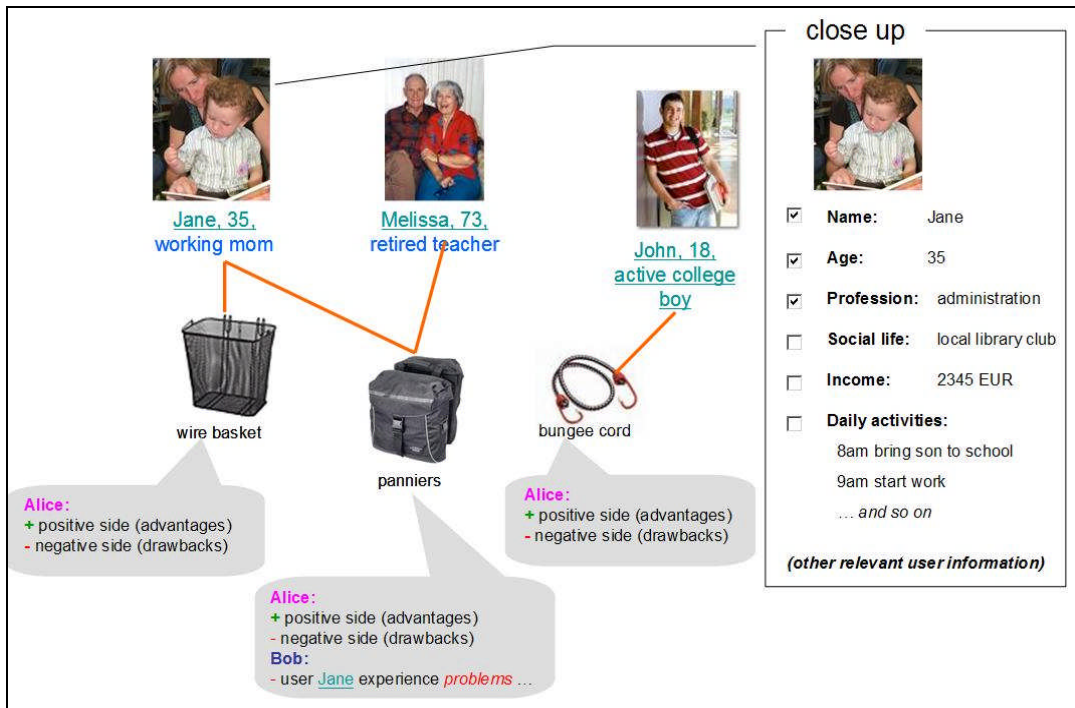Figure 1: An overview of existing products with designers' comments and annotations.

Figure 2: An overview of users and products they use.

Bob composes scenarios of user Jane

The following day, Bob has had a chance to interview user Jane. He specifically notices the diverse goals and situations Jane has concerning transporting "something" on her bicycle. Bob asks Jane to describe her normal day involving her bike and bike accessories. Additionally, he also prompts Jane with some events (e.g. reckless driver) and asks Jane's reactions in the case of such events.

Now, Bob understands Jane's situations better. He creates 2 scenarios based on his interview with Jane. Bob also indicates Jane's emotions as she performs actions in the scenarios. Installing the toddler-seat is no fun for Jane thus a grim face next to it. (Figure 3) The existing scenario elements can be used later on as inspiration for other scenarios. For example, the team might imagine a scenario of Jane in a different setting e.g. a bumpy road. Or with the goal to 'transport groceries', how does user Melissa or user John do it using their products.
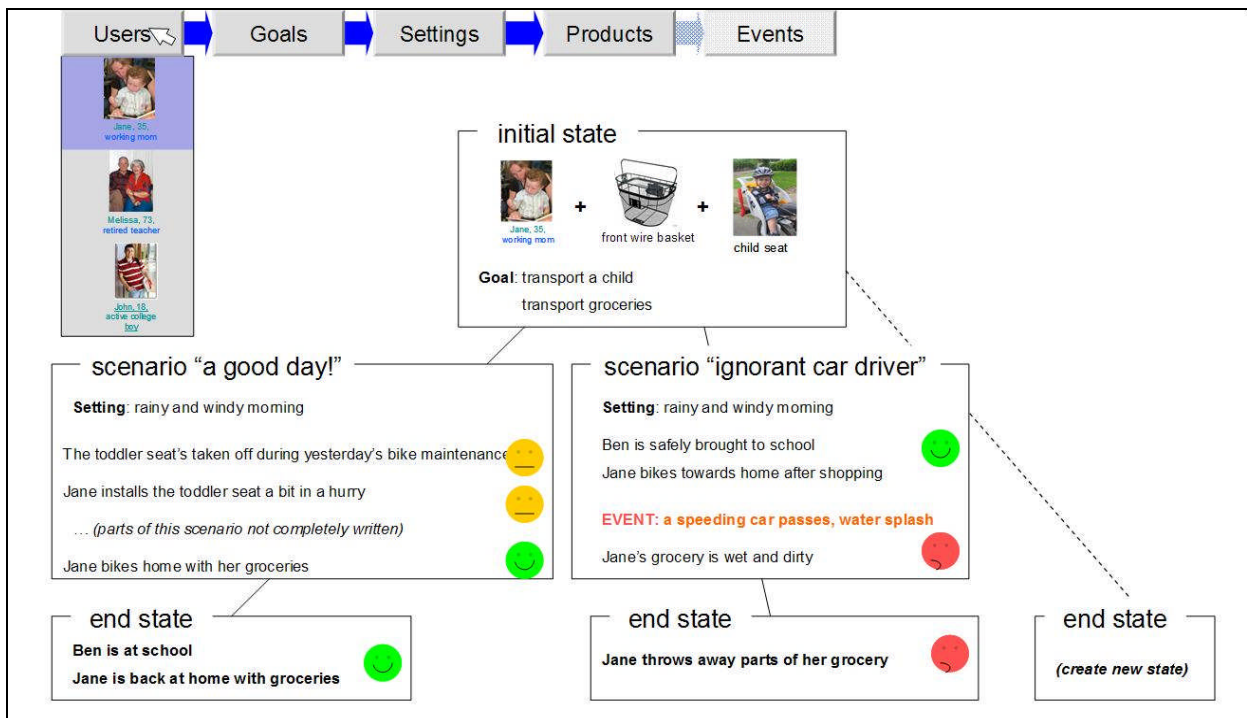

Figure 3: Scenario building toolbox consists of selectable elements which make it easier to compile scenarios.
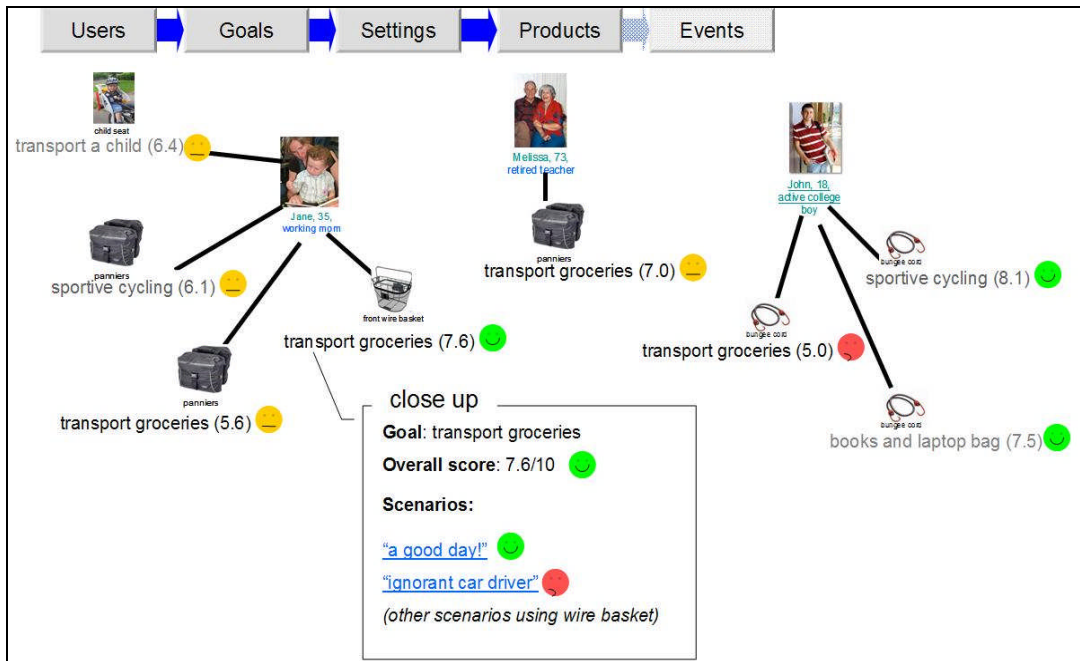
Figure 4: An overview of users, their goals and the products' performance in each goal.

Graspable overview of scenarios

Bits of information become more meaningful and memorable when composed into scenarios, making it an accessible knowledge. Nevertheless, with the diverse users and use aspects, the set of possible scenarios could grow more and more extensive throughout the design process. In the course of design, a scenario could be an important decision factor, though its existence might not be known by the decision-makers. Therefore a clear overview of all available information is crucial so that at least designers know where to look for more detailed information. Within a scenario-based approach, a specific form of support can be given by providing the design team with an overview of scenarios and the related scenario elements.

Current practice scenarios:

Please imagine the following situation…
The "bike luggage transporter" design team is meeting for the first time after the kick-off meeting. During this period, everyone has been busy doing research (desk research or field studies). Therefore, this meeting aims to be a forum where everyone can share what he or she has found during the research. And of course, if there's time left, the team can discuss what they must do now, how to move on, etc.

Again, an unproductive meeting

Before the meeting, designers (individual or in group) prepare presentations to describe their findings within 10-15 minutes time-frame. Most often, this is nowadays done using PowerPoint presentation which will be quite tedious to manage afterwards. Quite often, time runs out before any meaningful discussion gets to the table. When this happens, Mike the project manager (as a representative and member of the design team) and other management will have another meeting, and later on decide what to do next…

Future practice scenarios:

Imagine a different situation…
The "bike luggage transporter" design team is meeting for the first time after the kick-off meeting. During this period, everyone has been busy doing research (desk research or field studies) and now the "Scenario Central" application shows a good overview of the users and their use

scenarios (Figure 4). To get a rough idea about the performance of the registered products, each product is scored on how good it is to fulfil each particular goal. For example, from Figure 4 it can be seen that a bungee cord is not good for transporting groceries (low score).

Among these, some user-product relationships have been extended into a large set of possible scenarios. Mike the project manager has asked everyone to get acquainted with all the information posted on "Scenario Central". The meeting will discuss what to do next as a team, instead of explaining the design information (which is already registered in "Scenario Central") to one another.

Well-informed designers make a productive meeting

During the meeting, designers are 'empowered' with the well-organized information as they can easily refer to specific scenarios to back up their opinions. Mike suggests a discussion on the user goal "transporting groceries" because it looks promising as a tentative direction. The "Scenario Central" application has a function to filter scenarios based on a specific element. To aid their discussion, Mike uses the filter function to show only information relevant to the goal "transporting groceries" (Figure 5). The designers see the overview of problems with current products when their users "transport groceries" and this helps them to focus.
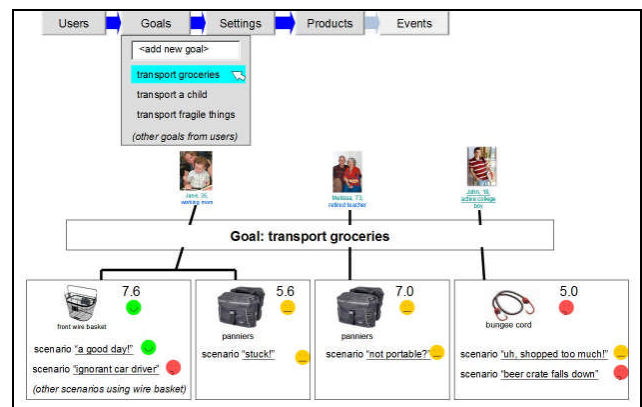

Figure 5: Filter on a specific goal, showing the users that share this goal and their use scenarios.

Scenarios as a test bed

An early product design such as a rough idea can already be tested for its validity using a good set of use scenarios. The realistic use scenarios enforce designers to reflect whether a small attribute or component change could influence the use aspect. It is not easy to detect the chain of influence between many elements in a design process. If designers can be wisely informed about other aspects and situations that may be affected by such modifications, they also receive a concrete reference on which scenarios are potential for testing purpose. The tool tries to realize this by suggesting a list of scenarios that may be affected by a modification elsewhere.

Current practice scenario:

Please imagine the following situation…

The design team is split into two smaller teams to brainstorm ideas/concepts. Bob and Charlie are in the same team. Charlie only knows a glimpse about the users from the presentation Bob gave earlier. He throws in quite a few ideas for the concept they are working on together. However, Bob has to reject some of Charlie's ideas because they don't fit in users' life situations. After some arguments and Bob's slight frustration, Bob and Charlie eventually come up with a rough concept which seems suitable for the users.

Be careful with what you change

A few days later, Bob and Charlie continue to refine the concept. They need to change/rearrange some components to make the size smaller. After squeezing in some components and removing parts that they think are not so necessary, they don't realize that now their concept design is becoming less secure. The design team hopefully will find it out during the final test much later.

Future practice scenario:

Imagine a different situation…

Evaluate from the eyes of the users

During a brainstorm session, the design team quickly comes up with many ideas. A rough concept (#1) quickly emerges: some sketches are drawn, specific features are proposed, and a to-do list is created (i.e. needed further studies to verify that the proposed concept is feasible) (Figure 6). Of course the design team does not forget to imagine how the users would use #1; it's user-centered design after all. The team chooses to try #1 in user Jane's life situation to see how it would perform (i.e. how pleased would Jane be using it?) (Figure 7).
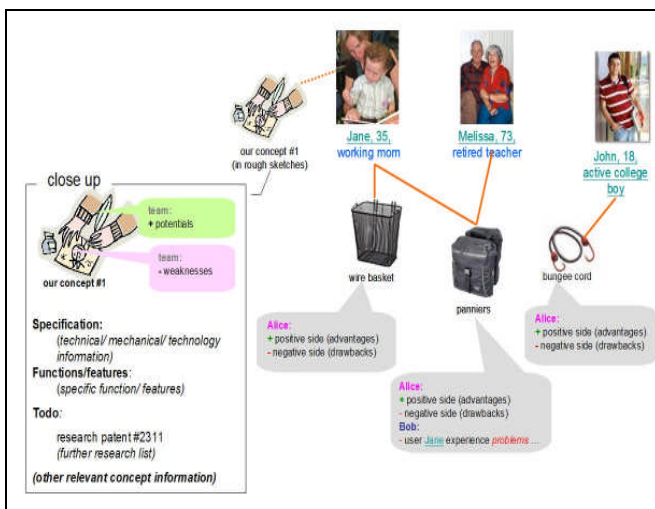

Figure 6: A new concept is reviewed and documented in a collaborative environment.
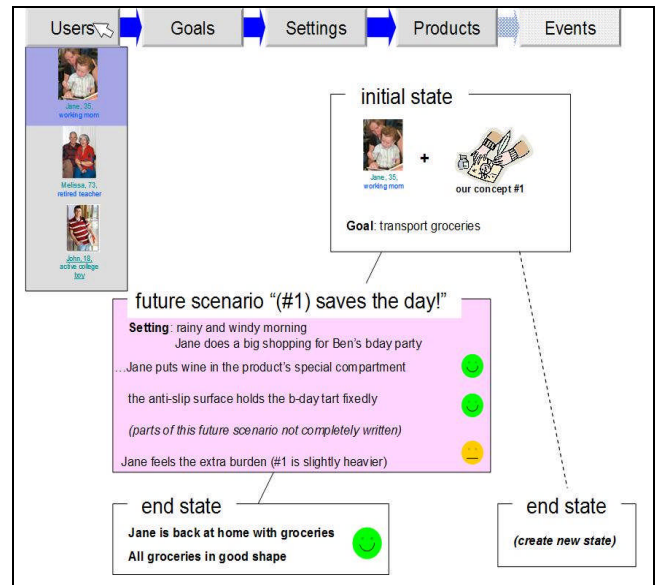

Figure 7: A new concept is evaluated in the hypothetical uses of users.

A few days later, Bob and Charlie have been working together to refine #1. Despite it seemed near perfect in the beginning, they still change many parts of concept #1. Luckily the "Scenario Central" application helps them to keep track what they are doing; it indicates to them other related parts of #1 and scenarios that might need to be adjusted.
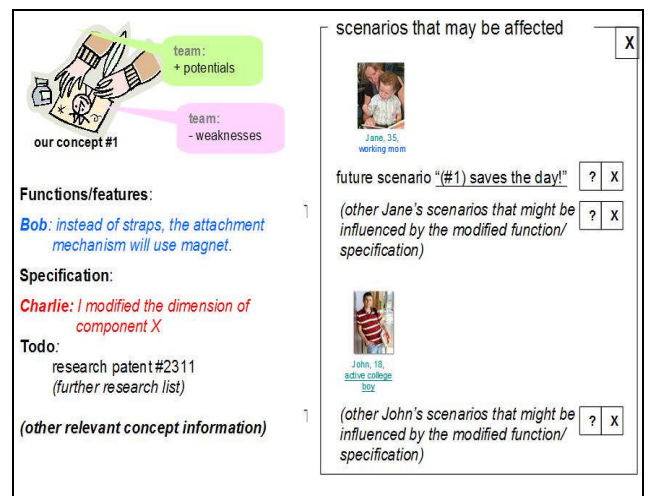

Figure 8 Scenarios reflect the consequences of changes/modifications to a concept.

4   DISCUSSION

The results described in the previous section are drawn from a workshop series at one Dutch design company. The identified problem areas, despite being familiar, could be idiosyncratic to this one particular company. Furthermore, the functionality proposed in this paper also strongly relates to the experience and needs in the company. We are aware that the contribution will not be scalable enough for design science without further verification with other design practices. Therefore, in parallel with the development and refinement of the support tool concept, we are surveying designers in different companies on their familiarity with the problem areas.

In the previous section, we have detailed the problem areas within the company's design practice. While

working on the verification of these problem areas, we assume that they are reliable enough as a foundation for our further proposal. As an answer to the problem areas, functionality of the scenario generation support tool has been proposed (see Table 1).

We are probing design practices to assess the most optimal way to realize the functionality and to improve designers' acceptance towards the tool. This research aims to provide a useful and easy-to-use tool to support scenario-based practice, and therefore a firm connection with current design practice is maintained. The set up of the proposed functionality is such that it is not rigid and therefore can be extended to address requirements that surface later on e.g. in the follow-up workshops.

In our effort to develop a practical framework for SBPD, we have adopted scenarios in our approach. Aided by the flexibility of scenarios, we are able to communicate the proposed functionality to our stakeholders without yet committing to any certain form. Reflecting on the fact that there are loose ends in our proposal, we have benefited greatly from using scenarios to acquire early feedback. In the future, we will continue using scenarios to involve designers in determining the most feasible form of the tool's functionality.

5   CONCLUSION AND FUTURE WORK

As the results of a workshop series at a design company, we have observed a design practice that utilizes

scenarios. Our finding indicates that though scenario-based product design seems ideal in literature/theory, there are still loose ends in practice. We have identified three problem areas within the scenario approach in the observed company. Despite yet being unverified for its scalability, we have used this finding to formulate requirements for support in applying a scenario-based approach. A set of functionality for a scenario generation support tool is proposed to answer these requirements.

Our future work includes verification of both the identified problem areas as well as the applicability of the proposed functionality in design practice in general. To find out whether the challenges are also experienced by designers in other organizations, a questionnaire to probe design practice is being circulated. Furthermore, more contacts with diverse designers are planned to determine the most feasible form of the functionality. As we aim to develop a useful support tool, designers will be actively involved to allow the tool to blend with their preferred future design practice. Eventually, a software prototype will be developed to demonstrate and evaluate the scenario generation support tool.

6   ACKNOWLEDGEMENT

Requirements		Functionality
Gather, register, organize relevant design information efficiently *(going broad, taking in information)*	←→	A "template" for documenting design information based on scenario elements and a "toolbox" to create scenarios using the information as building blocks
Be in the know of what information is available, especially for choosing the one important/relevant for a specific purpose *(from the extensive information, how to narrow it down to fulfill a goal)*	←→	A visualized summary of all scenarios and a possibility to relate, trace and filter scenarios based on the elements
"Quick-and-dirty" evaluation of concepts/ideas *(reliable without being a hindrance to designers' creativity)*	←→	The tool as a "wise wizard" that suggests to designers the scenarios which are potential for testing purpose. Rather than running through a long list of test cases, scenarios could be easily and quickly recalled to memory and thus less exhausting.
Communicating scenarios to other stakeholders for specific purposes *(e.g. testing functionality/ user acceptance/ safety, selling/ marketing, convincing clients/ management, brainstorming/ idea generation)*	←→	The tool presents the scenarios in narrative, which is the basic form of other types of scenarios. The narrative form offers scenarios a flexibility to be extended to different media (e.g. storyboard or role play).

Table 1 A summary of extracted requirements and proposed functionality.

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