Cartooneering - A Collaborative Workshop Approach to Develop Scenarios with Users

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Abstract

In software engineering, establishing a shared vision in projects with heterogeneous stakeholders is a known challenge. This paper explores the application of Cartooneering as a collaborative workshop approach, incorporating storyboarding, proto-personas, and visual storytelling to address this challenge. We present our experiences in conducting human-centered workshops using the Cartooneering method based on two case studies and how it proves to be a valuable approach for workshops aimed at finding a detailed understanding of the processes involving the product. To apply Cartooneering in workshops, end users actively participated in the comic design process to develop their own software visions. During the workshop, participants used paper-based comic elements and had the freedom to make design choices according to their specific user needs, allowing them to create user-centered software visions. The paper presents outcomes that emphasize the effectiveness of Cartooneering in facilitating collaborative vision creation with stakeholders. These findings contribute to the advancement of usability methods by recognizing workshops as central to collaborative scenario development with users.

Keywords
Creativity Workshop, Product Definition, Human Centered Design, Process Definition, Requirements Engineering

1. Introduction & Motivation

In order to start a successful software engineering project a key challenge is the establishment of a shared vision of the product to be built [1,2]. We argue that design methods and conceptual modeling have been proven to be useful, but project stakeholders and end users often find them difficult to use reflecting barriers to expressing important domain knowledge and user needs during the conceptualization of a software vision. Practitioners may not have the time to learn modeling languages, so we propose that defined storytelling techniques can make conceptualization more tangible, more collaborative, and lower barriers to creating shared visions [3].

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When faced with this challenge in two projects with heterogenous stakeholders, we developed a method called Cartooneering [4]. Cartooneering is a storyboarding technique that combines proto-personas with visual storytelling. The idea behind this technique is to use a series of comics, designed in a minimalistic way, to visualize the vision and the use cases of a product. In this approach, the personas serve as the main characters, illustrating scenarios of the application. The comics focus on the emotional state of the persona and the journey from the problem to fulfillment. Furthermore, Cartooneering provides guidelines for storytelling and best practices designing the comics' appearance. Cartooneering aims to identify and communicate the product vision among stakeholders. It fosters collaborative discussions by maintain an easy-to-understand scenario description. Initially, Cartooneering was developed as an approach for design professionals rather than for stakeholders such as end users, because creating vision comics requires design expertise.

Based on our positive experience, we came up with the idea of making the Cartooneering process accessible to end users through interactive workshops. These serve the purpose of identifying new use cases and expanding existing solution processes. The proposed approach aligns with the design thinking principle of involving users throughout the product design process. This paper focuses on the application of Cartooneering in workshops and presents our experiences and findings based on two case studies to answer the following research questions:

- How can vision workshops benefit from storyboarding techniques like Cartooneering?
- How do workshop participants need to be prepared for the use of storyboarding techniques?
- Which creativity and visualization tools must be combined to use comic style storyboarding techniques efficiently?

The positive results of the approach confirmed our assumptions of collaborative vision creation together with different stakeholders. The paper is structured as follows. In the next section we give an overview of the related work. The section Cartooneering in Workshops describes how we have made use of it in the workshops. Afterwards, we report from our two cases studies by first introducing the workshop concept in the section Workshop Agenda and Design and then the results from the kindergarten project as well as the digital education project. Following this, our results are discussed. We end this paper with conclusion and possible directions for future work.

2. Related Work

At the beginning of software engineering projects, it is important to have a vision for the software to be built. The vision can be visualized through a combination of scenarios as those are suitable for making the use of an application explicit through concrete interactions and thus drawing attention to the needs and concerns of the users. Scenarios can be presented in text, prototypes or storyboards [5]. The software engineering community has developed several approaches that can be used to design and the vision of a software project.

Storyboarding is the presentation of scenarios as short graphical narratives. It is used to demonstrate system interfaces and usage contexts. Depending on the development phase, problem scenarios, activity scenarios, information design scenarios, or interaction design scenarios can be created to derive concrete ideas for user requirements, specify activities, or

facilitate understanding of functionality. Guidelines for creating storyboards include elements such as level of detail, inclusion of text, people and emotions, the number of frames and the portrait of time [6]. Wikström et al. [7] show that using storyboards in workshops stimulates creativity, and supports idea generation.

SAP Scenes provides a toolbox for creating analog and digital storyboards with predefined elements without the need for drawing skills. The elements like characters, buildings, devices or call-outs can be used in various workshop formats [8,9]. Haesen et al. [10] formalize a collaborative engineering approach, COMulCSer, for comics in storyboards to achieve a common understanding in interdisciplinary teams. The authors present emotions through facial expressions and body language, differentiating characters and transitions between images as principles. These guidelines have been considered but not explicitly evaluated for storyboarding software.

Further studies have focused on the use of comics to improve communication and understanding of complex concepts especially in data visualization and business processes. Zanan & Aziz [11] explore different visual styles within data storytelling. Zhao et al. [12] present a framework for automated conversion of charts into comic-style. A framework for rapid generation of stylized story illustrations is outlined in the work of Zhang et al. [13], while Wang et al. [14] emphasizes the educational potential of data comics. Dospan & Khrykova [15] show that the use of data comics can successfully increase the understanding of complex business processes. The study by Barros et al. [16] shows that the use of comics can facilitate the identification of requirements in business processes, and further work [17] explores the use of comics in teaching software engineering.

Storyboard techniques such as comics are useful methods for scenario-based communication of complex information and enable a shared understanding of a vision. However, there is a need for further methodological research into the process of designing them and especially for their use in collaborative workshops with different stakeholders.

3. Cartooneering in Workshops

Using comics in end user workshops goes beyond the creation of vision scenarios by design professionals based on stakeholder input. The objective of the workshops outcomes is to gain an understanding of how the participating stakeholders conceptualize the process in and around the product. This insight helps in formulating solution concepts that are tailored to address those needs. This includes the mapping and validation of existing scenarios and associated user journeys by the participants themselves. Since the overall product vision is derived from these scenarios, the modeled process should have an impact on shaping and enriching the vision. In projects where project members are not the end users; this is important because it helps incorporate new details that were not initially identified during discussions with the team. Therefore, it is crucial to consider that this situation may lead to a gap in understanding between the problems assumed by the project team and the problems faced by the users [18].

In contrast to Cartooneering as used before, end users work with defining, enlarging, or updating the scenarios and not experts. So, everyone must be able to work with the panels of the comics. Two principles helped us in enabling the participants of the workshop to do so:

Principle 1: The workshop is structured in such a way that the participants are given initial input captured so far together with stakeholders about the problem or processes. This makes it possible to gather more details about the problem and to identify new processes or change them. Principle 2: Participants need support and guidance in creating comics. There is an obstacle to making even small drawings. Creating a complete user journey in the form of a comic would be an even bigger challenge. These two principles led to the decision to use pre-designed comic panels from the existing comics instead of having the participants draw themselves.

We want to give the participants the freedom to design dialogues based on their knowledge, experience, and ideas. To this end, we provided participants with more paper-based elements with characters, locations, and predefined interactions between users. On the other hand, we have omitted details by hiding or blacking out text-based information such as speech bubbles. This is an element, which can be used if needed. Secondly, and non-optional, it is important to note that the panels are not handed out in any order. It is pure coincidence so that the original journey cannot be recreated based on the sorting of the panels.

In addition to the panels the participants receive printed paper-prototyping screen templates. This is helpful to be able to visualize the process in a variety of ways using the mentioned options. The moderation cards show the abstract process steps and give structure to it, the comics provide details on the interaction and the context and the screen templates for UI drawings allow the product to be described in detail at important points.

During the creation of the user journey by the participants, the moderation team hand out challenge cards. These cards contain a specific trigger, that must be considered while finishing the journey. For example, those triggers could be: 'how to ensure the quality of the product or service?' or 'how do we motivate people to use the system at all', etc. The main purpose of the challenge cards is to provide new input and focus on the problem. Often people do not think about all the needed processes, outcomes, or problems that an idea can bring with it. This is quite normal, but problematic for a usable solution. Highlighting those parts, participants have not thought of, with challenge cards is an efficient way of motivating them to solve the problem without dragging them to much away from their ideas and workflow.

Summarized all those steps led to the following workflow to create user journeys in a workshop: participants start with identifying the comic panels, putting them in an order that makes sense to solve the problem. To complete the journey participants must fill out speech bubbles to show the communication by the presented characters. Also, they can use UI templates to visualize their software ideas or add text on cards to highlight the important steps. To reduce the risk of overlooking problems in their process, the moderation team distributes the challenge cards.

4. Case Studies

This paper presents two case studies [19] from two projects in the field of digital transformation of rural areas. We used them to explore how we could use Cartooneering in the context of end user workshops to design software visions. Cartooning was used as a workshop method in two projects, comprising the (1) Project: Kindergarten Educational Offers and the (2) Project: Digital Competencies for Digital Novices. The choice of topics was predetermined and not part of the workshop. In both projects, the workshops were conducted on-site and lasted between two and three hours. Nine half-day workshops were conducted using Cartooneering.

Project (1) aimed to improve the digital networking of local kindergartens and cultural institutions in the region to provide child-friendly learning opportunities. Four workshops were conducted, including two workshops with citizens, one workshop with kindergarten staff, and one workshop with local cultural institutions. The number of participants in each workshop ranged from two to five. Project (2) focused on bringing together local citizens, associations, organizations, and curious individuals in the region to share digital media knowledge and skills. Five workshops were conducted, including two workshops with citizens seeking knowledge and three workshops with associations, organizations and students providing knowledge. The number of participants in each workshop ranged from six to eight people.

Each of the nine workshops followed a structured agenda based on design thinking principles [19]. Since the workshop structure was identical for both projects, we first present the workshop agenda and design, and then discuss the results and impact on each project in separate chapters.

4.1. Workshop Agenda and Design

Based on our experience and knowledge of other and especially our own internally used creativity workshops, we decided to start the workshops with brainstorming methods and open discussion sections. This creates the needed awareness level of the problem that the workshop is dealing with, to create creative ideas. The objective was for each participant to have a clear understanding of the needs they wished to fulfill. Afterwards, the existing comics can be extended with the found details or new comics can be derived. The workshop is therefore divided into three agenda points. The first two deal with understanding the problem and solution space, while the last uses the knowledge gained, to create the process. The workshop primarily involved group work, but individual brainstorming and discussions within the entire group were also incorporated. The process is closely aligned with the design thinking approach [19]. Figure 1 compares the design thinking approach with the workshop agenda.

First agenda part: In accordance with the principle of 'understand the problem first and then find solutions for it', our initial approach was to establish a shared understanding of the as-is situation to ensure that all participants would be working within the same problem space. As a result, we would be able to build a clear problem statement, that would lead into an efficient idea generation, the second part of the workshop. The moderation team used the first part as a checkup to see, if the made assumptions about the problem are correct.

Second agenda part: The subsequent step of the design thinking-oriented agenda placed emphasis on obtaining input from the participants, through the process of idea generation and gathering. Building upon the previously mentioned defined problem, the objective was to gather a multitude of suggestions and details about the usage of the planned software. We gathered this input through three different agenda parts, focusing on the content needed for the end user, but also on how this input should be prepared for optimal learning. The methods for this were based on brainstorming, like the problem-setting part. This part prepared all the necessary contextual information and ideas for the creation of the comics themselves and, most importantly, created an awareness of the right solution space among the participants.

Third agenda part: The last part of the workshop involved the creation of a comic, which aimed to depict how individuals would utilize the product. In the two other parts, enough ideas have been gathered, that could now be transformed into one idea. This part followed the process as described in the Cartooneering in Workshops chapter. Regarding the materials used; all teams were given the comic tiles at the beginning of this part. The images were modified by blocking

out text passages such as speech or thought bubbles. It was important for us to create a situation where the participants had as much freedom as possible to create their own comic. The teams had to add their own text, arrange the images in a logical comic sequence, and add UI sketches. This would allow us to do an A/B comparison with the original comics to test our assumptions. During the creation process of each team, the order and context of their work was analyzed by the workshop moderators. Based on the stories created so far, the teams were given the challenge cards to solve problems, that the moderators saw. The workshop ended with a short discussion of each comic created.
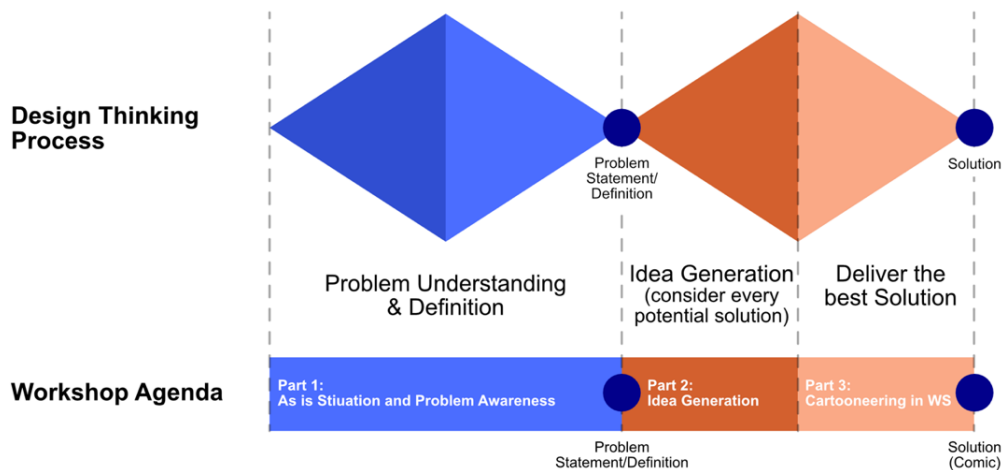

Figure 1: Comparison of the design thinking approach with the workshop structure.

5. Results

5.1. Project: Kindergarten Educational Offers

The first project in which the workshop design was applied aims on providing a digital platform for connecting providers of educational offers to kindergartens or vice versa.

As we were mostly interested in details of the process the participants were given two comics showing a single scenario from different perspectives. In many places the participants used UI templates to outline functions of the future product in more detail. These UI Sketches provided a very detailed insight into the stakeholders needs and expectations. It became clear that the application should be available on all devices and not only on mobile devices which was an initial assumption in the project. In addition, one group developed a new feature resembling an offer pool and integrated it into the existing comic by creating their own comic panels. Before, only requests for desired services were planned. In this context, both groups highlighted the importance of filters and categories to easily find the right offers. Working with the comics also allowed further important issues to be developed, such as the question of qualification of providers. Furthermore, the groups were allowed to change the dialogs or the written elements on the comic. This led to the identification of a slightly different scenario.

The results of the workshops provided a more detailed picture of the previously developed product vision. Existing ideas were refined and visualized. In addition, new functions and topics were discovered. Furthermore, we were able to verify and detail the process involved in and around the product.

5.2. Project: Providing Digital Competencies for Digital Novices

The second project, in which Cartooneering was used in workshops, also aims to create a digital platform, but in this case with a general educational purpose for the citizens of the region. The workshops were held with digitally proficient people, who would offer their knowledge; and citizens in general, that would need/want to consume knowledge, but could also offer it.

Cartooneering makes it possible to visualize emotions and interactions between the different users/user groups. Applying the results of it into a workshop concept and give the participants the freedom to extend and change the comics that were created with it had a positive impact on the understanding of the product and how its vision should look like.

The evaluation of the workshop made clear, that in general, the participants created comics that were very similar to the comics created before the workshop. But with the help of the workshop concept, we were able to empower the participants to give more details about that actual process, how they would use it to solve their problems and how they would apply it into their daily lives. Figure 2 shows a comic before the workshop in comparison to a version that was supplemented with further details based on the workshop results.

The results are detailed information about the interactions between user groups and the upcoming solutions that were not known before. Also, it was made clear, that the social aspect of the solution is one of the biggest challenges. The usage of the emotional elements of Cartooneering stated clear, that the 'feeling of cohesion' and the 'community thought' are key elements, to make the solution attractive and usable.

In summary, a lot of useful information was identified that made it clear how citizens need and want to interact with others. Questions regarding this were identified that were not known before.
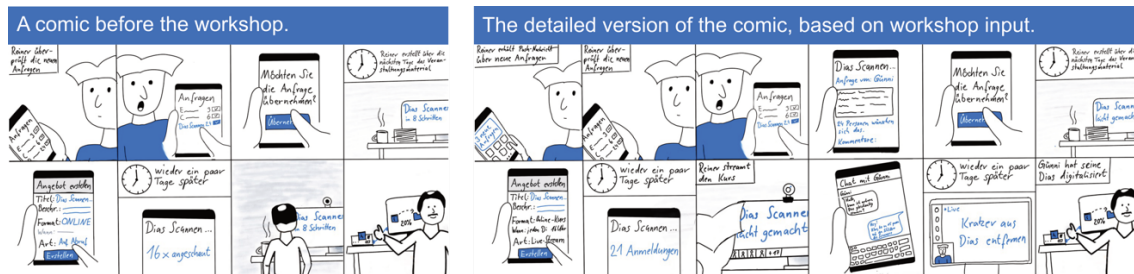

Figure 2: A comic in its 'pre workshop' state compared to a version with workshop input.

6. Discussion

This paper introduces the use of comics side by side with paper prototyping in combination with process modelling as an approach that provides non-technical stakeholders without software engineering knowledge an easy way to define scenarios for software projects. By using proto-personas, visual storytelling and tangible paper elements, the team can enhance their ability to effectively communicate the core vision of the planned software. Using comics enhances the understanding of stakeholders, processes, and the software vision. This helps to bring the user journey to the forefront and fosters a better understanding among team members. The user-centered approach ensures that the vision being designed fits the user needs and allows to capture aspects of the system that have not been considered before.

The use of comics provides an engaging and interactive way to convey information, leading to clearer and more effective communication among team members and stakeholders. It breaks down complex ideas into tangible comic snippets, making it easier for different stakeholders to understand and contribute to the software project. Using images side by side with moderation cards or UI snippets allows stakeholders to define the processes they need. Furthermore, it offers an easy-to-understand modeling process without requiring knowledge of a modeling language.

One challenge in drawing comics to visualize the scenario can be the lack of classification of the predefined elements. This can also have a negative impact on the workshops, as the participants lack tools to simplify their tasks. To overcome this hurdle, the use of pre-made, tangible paper elements can be employed to assemble a comic to a substantial extend instead of drawing it. While this approach reduces the barriers to expressing a scenario through drawing, it also presents the challenge of having a limited number of predefined elements. This limitation may result in missing elements during the work process. Therefore, a disadvantage of this approach is the inability to predefine an unlimited number of elements, requiring some form of classification for the predefined elements.

We explored scenarios with end users to validate assumptions about the solution process and user needs. A notable lesson learned emerged when comparing the workshops in the two use cases. In situations where there are only a few uncertain assumptions about software interactions, it is advisable to black out text elements, such as speech bubbles, during the workshop. This approach helps avoid getting caught up in detailed issues and instead provides insights into the high-level process. Conversely, when assumptions about interactions are more certain, integrating speech bubbles as text elements allows for validation and concretization of processes at a more detailed level.

The application of Cartooneering should be tailored to the specific needs, timelines, and expertise levels of the team. Considering these findings, the observations of Foehrenbach and Heldstab [20] are particularly relevant. They discuss the issue of requirements fragmentation in 'User Story Mapping' techniques and highlight the challenges it poses in maintaining an integrated product vision. Despite its usefulness in bridging gaps between usability methods and requirements, this point resonates with the drawback of balancing high-level overviews with detailed insights. Furthermore, Amna and Poels [21], emphasize the limited scope of research on 'User Story Mapping' techniques. They point out the need for more comprehensive studies and systematic reviews. This gap in the literature underscores the need for a deeper understanding and refinement of usability methods as tools.

7. Conclusion and Future Work

This paper presented our experience with applying Cartooneering in a workshop scenario. The use cases presented show that the use of Cartooneering in vision workshops is an easy way to enable stakeholders without software engineering knowledge to define scenarios for software projects. Furthermore, people which do not have advanced drawing skills were able to use Cartooneering. The knowledge of the stakeholders is incorporated and a common understanding of the software vision is created (RQ1). To achieve this, the workshops must be planned in such a way that they support the understanding and clarification of the problem area and the identification of initial ideas that could solve the problems. Aligning the workshop agenda with the design thinking principle helps to prepare the participants so that they have

sufficient knowledge to use storyboarding techniques effectively and efficiently (RQ2). The workshops showed that the best results were achieved by using different tools. The combination of pre-built comic panels with moderation cards and UI snippets allows participants to customize the scenarios and detail the processes (RQ3).

The Cartooneering approach forms the basis for further development and extension. As discussed, the implementation of a classification system is essential to facilitate a meaningful selection of design dimensions and pre-built elements. A classification system could help to organize and categorize relevant design options and prefabricated elements, enabling a more efficient design process. Consequently, a promising area for future research is the integration of a Morphological Box [22] as a comprehensive tool and construction kit to support software engineers in the systematic creation of vision comics. This approach would provide a set of design dimensions and selectable elements that serve as a roadmap for comic development. By integrating a Morphological Box into the Cartooneering method, software engineers would have a structured approach to tackle the complexity of vision development in software design. The goal is to encourage creativity and accuracy in the software development process by creating diverse and original vision comics.

Acknowledgements

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