

Cartoonering - Using Comics and Personas to Enable the Definition of a Software Product Vision

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Abstract

In the early stages of software development, establishing a common vision among stakeholders is a challenge, especially with unclear requirements. Especially in agile environments, requirements are elaborated highly iterative and change throughout the agile process. This paper presents Cartoonering, a graphical scenario-building technique based on proto-personas and comics. It is a lightweight approach to visualize different user journeys. It enables collaborative stakeholder discussions about their ideas and goals without the need for detailed and complex use cases on a visual level that everyone can understand, thereby enhancing their understanding of the overall product. The adaptability of comics enables iterative refinement of scenarios during the design process. Digital or paper-based elements like figures, objects, or speech bubbles enable gradual adaptations to the vision design without starting over. They also facilitate feedback integration from different stakeholder perspectives. The approach demonstrates agility in refining scenarios, fostering clear communication, and promoting a shared understanding among stakeholders. We share our experience and best practices in the form of design guidelines regarding the use of vision comics for requirement identification, validation, and the integration of multiple perspectives on a vision.

Keywords

Product Vision, Scenario-Building, Stakeholder Communication, Shared Understanding, Comics¹

1. Introduction

At the start of software development projects, the challenge to establish a common and shared vision among stakeholders must be solved [1,2]. Especially in agile projects where the requirements of the products are developed on a highly iterative manner, it is difficult to reach an agreement among the stakeholders as to what features the system should have and how they should be prioritized [3]. Addressing these obstacles requires well defined and clear use cases [4]. We have faced this challenge several times in projects having multiple equally important stakeholders having significantly different goals. Scenarios facilitate discussions about the system and its context with non-software experts, by enabling all stakeholders to actively participate in the visioning process. This work introduces Cartoonering, which we use as a graphical

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scenario-building technique to unite different stakeholder groups. The paper serves as an experience report and covers the background of the method, its application, our action recommendations identified from its use after having it applied in five projects, and the observed results.

We will address the following questions:

RQ1: How can we encourage discussions among stakeholders to facilitate scenario discussions among heterogeneous stakeholders for visioning?

RQ2: How can storytelling with comics be successfully applied in practice?

RQ3: What guidelines for visual representation support the use of comics among stakeholders?

This paper is structured as follows, Section 2 gives an overview on the related work and Section 3 gives an introduction into Cartooning and an overview of our applications. The results are presented in Section 4 and discussed in Section 5. The paper concludes with Section 6, the conclusion and drawing directions for future work.

2. Related Work

Visions for software projects can be created using different approaches. Some methods, such as SAP Scenes, involve compiling narratives using paper figures to construct a cohesive story [5]. Conventional techniques, like the use of UML use case models, provide a systematic framework for the representation of different application scenarios. Use case diagrams, a form of behavior diagram, illustrate various use cases for different types of users and the interactions between the users and the system; which can deliver easily observable and valuable information to stakeholders [6]. Also, storyboarding and user story mapping are common practices that offer visual representations of interactions among users and the workflows of a system [7,8].

In software development and data visualization, the use of cartoons as a storytelling technique has been the focus of several studies, specifically, the application of cartoons to improve communication and understanding of complex concepts. In the context of data visualization and business processes Dospan and Khrykova [9], delve into the innovative use of data comics to visually represent and communicate business processes. Furthermore, Zanan and Aziz [10] examine the impact of visual design styles in data storytelling, with consideration towards user preferences and personality differences. Additionally, Zhao et al. [11] introduce *ChartStory*, an automated approach to transform charts into comic-style narratives, thereby enhancing the visualization of complex data. In software development, Zhang et al. [12] present *StoryWizard*, a framework facilitating the rapid creation of stylized story illustrations, and Suh et al. [13] discuss *CodeToon*, a tool enabling story ideation, automatic comic generation, and structure mapping for code-driven storytelling. Wang et al. [14] and Suh et al. [15] explore the educational applications of data comics through workshops, introducing innovative ways to teach data visualization, storytelling, and programming concepts.

The landscape of research through design, texture mapping, and network dynamics in Software Engineering (SE) is enriched by Dylan et al. [16], who introduce comics as a creative medium for representing research through design processes. Additionally, Sýkora et al. [17] explore practical texture mapping techniques for hand-drawn cartoon animations. Sumi [18] investigates hyper-comic representation as a contextual navigation aid to enhance user interaction and understanding. In the realm of user research and dynamic network narratives, Haughney [19] focuses on using comics as a means to communicate qualitative insights.

The existing literature contributes to the growing body of research on the effective use of comics as an impactful storytelling technique. The integration of visual elements and storytelling through cartoons proves to be a multifaceted and engaging approach for communicating complex information.

3. Method Description

To collaboratively define a clear and understandable vision, a flexible approach that allows open discussion among stakeholders is required, one that includes communication of the vision to the development team. Various creativity and user journey methods, as well as story-building practices, were evaluated. We have identified the use of proto-personas² and visually presented stories of the customer journey in the form of comics as a good method for discussing scenarios. Since personas can appear in multiple comics and interact with other personas along their journeys, a network of comics is created. These comics can easily be updated in the iterative agile process. We identified several guidelines and best practices that form “Cartooneering”.

Proto-personas are assumed to be the basis for starting with Cartooneering. Each of them has at least one goal to achieve during their customer journey. Other personas may be involved in this journey, if they interact somehow, to achieve a positive outcome. This means that the solution scenario of the goal will be depicted from at least two different perspectives respectively customer journeys. **Figure 1** shows the mentioned key elements (proto-personas, customer journey and the network of comics/stories) of Cartooneering.

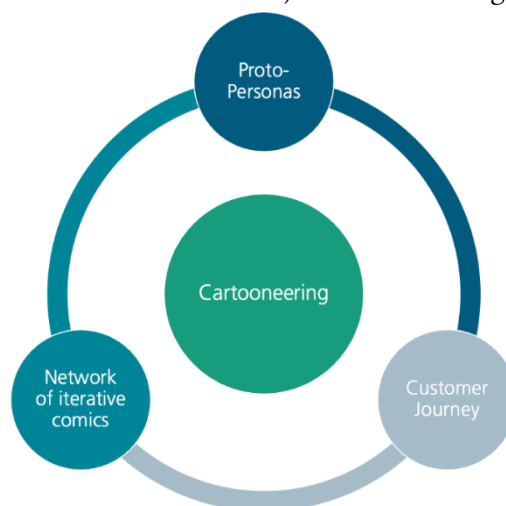


Figure 1: Cartooneering is based on three key elements: Proto-personas, which must be created before the usage of Cartooneering, customers journeys, which are identified iteratively, and the comic network, which will grow and change over the course of the project.

Several of our own challenges were solved. For example, personas and empathy maps, lack compact visualizations for stakeholder discussions. Scribble-based methods are fast, but too abstract, and mockups, while accurate at the design level, were challenging for less experienced

² More information about proto-personas: <https://www.nngroup.com/articles/persona-types/>

participants. Cartooneering emerged as a method for representing the protagonist's vision. It differs from storyboarding in that it supports heterogeneous stakeholder groups and focuses on the joint development of a vision across the project. In contrast to storyboards, Cartooneering provides rules to create comics efficiently, offers a clear structure, and a representation of emotional changes. Cartooneering focuses on an efficient vision creation process, addressing the limitations of storyboards that overwhelm stakeholders with disjointed information. **Figure 2** shows the mentioned characteristics and their relevance to the examined methods.

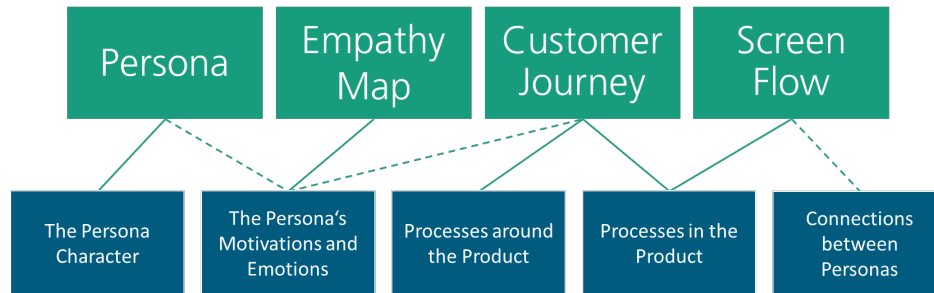


Figure 2: The top row shows common methods and their usefulness regarding our problem of understanding the users, the as-is, and the to-be situation. Identified core elements of each method are listed in the bottom row. A solid line means that a method fully supports this information, while a dashed line means that a method only partially supports it.

The goal of Cartooneering is to share a common understanding of users and problems when developing products by using proto-personas within comics to fully embody the product vision. Stakeholders can then recognize their own ideas without the need to see detailed use cases and have a better understanding of the product. To support this, we present an overview of our identified usage suggestions to structure the layout and visual design of these comics.

3.1. Story Composition & Structure

A good composition of the comics and a good structure of each individual comic are essential. To this end, we identified six best practices for Cartooneering in terms of storytelling.

(1) Create comics in five acts: The comics should follow the classic 5-act drama. In the first act, *Exposition*, the characters are introduced. The second act, *Rising Action*, is used to introduce the problem and how it affects the protagonist. In the *Climax*, the third act and division point between the first and second half of the story, the solution for the challenge is introduced. This is where it should be clear that the product will solve the problem. In the fourth act, *Falling Action*, the protagonist interacts with the product to solve the problem. In act five, *Resolution*, the solution to the problem as well as the story conclusion is depicted. Here we see how the use of the product results in a *happy end*.

(2) One protagonist and one task per comic: It is vital that the protagonist of the story is clearly recognizable. Even when other characters appear, the focus is on the protagonist and the challenge he must overcome. The solution to this challenge will be revealed as the story unfolds. If there are multiple challenges, it is best to show them in multiple storylines so that each storyline has a clear perspective. The comic's setting should be within the solution space, so that the system to be implemented is shown to help the protagonist solve the challenge.

(3) Supporting characters are personas whenever possible: Interactions in a user journey mostly take place between different user groups. Therefore, the individuals with whom the protagonist interacts ("supporting characters") can be different personas if they have their own problems in the product context. However, the problem of these supporting characters would be depicted in a separate comic.

(4) Create scenario from multiple perspectives: Describe the scenario in multiple perspectives when the protagonist frequently interacts with another character. Create a second comic from the perspective of the side character since both characters have their own challenges to overcome. For example, if someone wants to sell an old table over the internet and another person is buying the table. Even though both characters interact with the website the table is listed on, their motivations are different. Therefore, each perspective deserves its own comic. This reduces the risk of overlooking use cases, or other aspects, and shows dependencies.

(5) Focus on the entire journey and not on the product: When creating the comic, the priority should be on solving the problem and the conditions that need to be solved. Therefore, focus on solving the problem, not the product itself and show the entire user journey, not just the product. This means that the product itself does not need to be shown in detail. The focus lies in the introduction of the characters with their requirements, needs and goals, the plot, and the basic idea behind the project. Through this, a rule of thumb was established. Present the product in less than half of the comic panels. This concept is shown in Figure 3, where only three of the eight panels show the product being used. The remaining five panels focus on the motivations and needs of the characters.

(6) The plot must be recognizable immediately: The plot needs to be understood immediately. Keep panel detail to a minimum and use detail only when it is necessary to tell the story. The visual design guidelines help with this. We also identified good practices for the number of panels. Comics with fewer than six panels have been found to be insufficient to adequately depict the problem-solving process. Start with at least six panels to represent the problem-solving process. Expand to ten to twelve panels to refine the product vision. Avoid more than fourteen panels to maintain clarity. The guidelines for visual design aid in this manner. Make the story clear following visual design guidelines. Further details follow in the next chapter.



Figure 3: Highlighted panels that focus on a Persona's motivations and not the product.

3.2. Design Guidelines

The design guidelines are intended to help people achieve the best possible results with Cartooning. Overall, the guidelines are divided into six categories relating to colors, level of detail, emotions, and the communication of the characters in the comic.

4. Results of our Experience with Cartooneering

Cartooneering provides a creative and accessible approach by combining proto-personas and comics to create an easily understandable story that embodies the product vision. This allows the participants to familiarize themselves with the user's problem space and provides a solution concept as a big picture. To develop a common understanding of the different stakeholders and its requirements, the method considers different user perspectives. This enables the creation of a shared vision for the product to be developed.

The adaptability of comics, as a medium, allows for effective and iterative refinement of scenarios during the design process. Information or new insights can be integrated into existing comics as paper-based elements in the form of figures, objects, or speech bubbles, allowing for gradual adaptation without having to recreate the entire design. This approach is agile and facilitates the integration of feedback from different stakeholder perspectives.

Cartooneering can be used at very early on in the RE-process. With a basic understanding of our user groups, from which proto-personas were created, we held intensive discussions with stakeholders to get a rough picture of the problem. This information was aggregated and refined and translated into the first comics. From this point onwards, the comics were continuously taken to the stakeholder meetings and served as a basis for discussion and further development of the idea. It was an iterative process that simplified communication with the stakeholders and constantly sharpened the product and its vision. This iterative approach is one of the basic principles of Cartooneering and fits very well with agile development concepts.

After initial testing of the approach, some lessons about working with stakeholder collaboratives became clear. These included what kind of content in comics was important for a good understanding of the designed vision, and which design features played a critical role. The structure of the comics should follow a classic 5-act drama, with each act presenting specific elements for the vision. A comic should focus on a protagonist and a challenge, while personas can be included as secondary characters. The presentation focuses on problem solving and framing, with less emphasis on interacting with the product. Design guidelines prioritize reducing detail and color, while emphasizing action with color. The depiction of emotions is important for the reader to identify with the protagonist. The method can be easily integrated into projects and used for onboarding new members to help them understand the software vision. The fact that more and more details of the product can be incorporated into the comics as development progresses is one of the most important aspects of the method.

In summary, Cartooneering is a novel method for promoting a common understanding and clear communication of software visions. The method facilitates the creation of comics and enables efficient discussion and iterative refinement of scenarios in the SE process.

5. Discussion

In SE, approaches such as SAP scenes or story mapping are used to reflect the vision of a software project. Conceptual models are proven to be useful, but practitioners often find them difficult to use [20]. There are several reasons for this difficulty, and we are in agreement with Ionita et al. [21], that conceptualization is challenging; requiring significant effort and practitioners may not have the time to learn a modeling language. Storytelling with physical objects

can make conceptualization tangible and can have a positive impact on collaboration [22]. Multiple stories that collectively represent the vision of the project in form of user journeys can enhance understanding. While text-based user journeys can capture emotions and processes textually, they lack the ability to make them tangible to stakeholders. Graphical storytelling is effective in visualizing a process in a way that stakeholders can easily understand.

The problem with storyboarding techniques for us is that there are not enough rules or guidelines to create the comics in an efficient and consistent way. We need these rules to build the comics in a lightweight way, to discuss them quickly with stakeholders, and to make changes to the scenarios based on the received feedback. The defined set of rules of Cartooneering optimize the efficiency of graphical story creation.

The refinement process of the comics is another important issue to focus on. SE uses mostly agile and iterative processes. This means, that changes to the artifacts change based on new insights. The guidelines for story composition as well as the visual design of the comics are made for iterative refinement and continuous transformation, since the comics are easily to change due to their visually simple design language. In addition, new details can be added to a comic by adding additional panels to the comic. If a complex new user journey is identified or a different perspective is required, an additional comic can be created.

Furthermore, as the set of comics provides a visual representation of the user journey as well as the emotional states of the personas, the comics aid in prioritizing elements in the backlog as stakeholders can easily identify which items provide the most value to the product.

6. Conclusion and Future Work

This work introduces Cartooneering as graphical method for scenarios in the context of the definition of a shared vision. Especially in agile software engineering, requirements are rather loose and undefined in the beginning. Furthermore, they change and get detailed throughout the development process. Therefore, it is crucial to have a clearly defined and current vision on what the product aims to accomplish. The process of defining the product vision must allow everyone to easily participate in its creation for the vision to be widely accepted. To have a lightweight and easy method to start the discussion on scenarios, Cartooneering uses comics side by side with personas (RQ1). We have identified several best practices and guidelines for structuring the comics (RQ2) as well as their visual representation (RQ3), to make the method as easy to use and understand for every stakeholder. Beneficial for applying it in an agile context is especially that the cartoons are refined iteratively in terms of details as the vision of the product to be build is understood in a better way. Furthermore, the way the comics are built allows for an easy change as it is not of huge effort to alter a comic or create additional ones. The Cartooneering approach presented in this paper, can be built upon as there are opportunities for further development and expansion. A key area for future exploration is the incorporation of a *morphological box* [23], envisioned as a comprehensive toolkit, designed to aid in the methodical crafting of vision cartoons. This toolkit would offer a spectrum of design dimensions and a variety of selectable elements, serving as a roadmap for comic creation. Integrating the morphological box into the Cartooneering method provides a systematic and structured approach for navigating the complexity of vision development in software design.

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References

- [1] J.B. Awotunde, F.E. Ayo, R.O. Ogundokun, O.E. Matiluko, E.A. Adeniyi, Investigating the Roles of Effective Communication Among Stakeholders in Collaborative Software Development Projects, in: O. Gervasi, B. Murgante, S. Misra, C. Garau, I. Blečić, D. Taniar, B.O. Apduhan, A.M.A.C. Rocha, E. Tarantino, C.M. Torre, Y. Karaca (Eds.), *Computational Science and Its Applications – ICCSA 2020*, Springer International Publishing, Cham, 2020, pp. 311–319.
- [2] O. Karras, K. Schneider, S.A. Fricker, Representing software project vision by means of video: A quality model for vision videos, *Journal of Systems and Software* 162 (2020) 110479. <https://doi.org/10.1016/j.jss.2019.110479>.
- [3] R.S. Simhadri, M. Shameem, Challenges in Requirements Gathering for Agile Software Development, in: *Proceedings of the 27th International Conference on Evaluation and Assessment in Software Engineering*, ACM, Oulu Finland, 2023, pp. 406–413. <https://doi.org/10.1145/3593434.3594237>.
- [4] S. Matsuura, S. Ogata, Y. Aoki, Goal-Satisfaction Verification to Combination of Use Case Components, in: *International Conference on Evaluation of Novel Approaches to Software Engineering*, 2018. <https://api.semanticscholar.org/CorpusID:13975542>.
- [5] E. Laurenzi, K. Hinkelmann, D. Montecchiari, M. Goel, Agile Visualization in Design Thinking, in: R. Dornberger (Ed.), *New Trends in Business Information Systems and Technology: Digital Innovation and Digital Business Transformation*, Springer International Publishing, Cham, 2021, pp. 31–47. https://doi.org/10.1007/978-3-030-48332-6_3.
- [6] C. Kobryn, Modeling components and frameworks with UML, *Commun. ACM* 43 (2000) 31–38. <https://doi.org/10.1145/352183.352199>.
- [7] Y. Shi, N. Cao, X. Ma, S. Chen, P. Liu, EmoG: Supporting the Sketching of Emotional Expressions for Storyboarding, in: *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, ACM, Honolulu HI USA, 2020, pp. 1–12. <https://doi.org/10.1145/3313831.3376520>.
- [8] J. Patton, P. Economy, User Story Mapping: Discover the Whole Story, Build the Right Product, in: 2014. <https://api.semanticscholar.org/CorpusID:114475151>.
- [9] S. Dospan, A. Khrykova, Visualization of Business Processes Through Data Comics, in: I. Ilin, M.M. Petrova, T. Kudryavtseva (Eds.), *Digital Transformation on Manufacturing, Infrastructure & Service*, Springer Nature Switzerland, Cham, 2023, pp. 745–758.
- [10] M.F.B.B.M. Zanan, M.S.A. Aziz, A Review On The Visual Design Styles In Data Storytelling Based On User Preferences And Personality Differences, in: *2022 IEEE 7th International Conference on Information Technology and Digital Applications (ICITDA)*, IEEE, Yogyakarta, Indonesia, 2022, pp. 1–7. <https://doi.org/10.1109/ICITDA55840.2022.9971409>.
- [11] J. Zhao, S. Xu, S. Chandrasegaran, C. Bryan, F. Du, A. Mishra, X. Qian, Y. Li, K.-L. Ma, ChartStory: Automated Partitioning, Layout, and Captioning of Charts into Comic-Style

- arratives, *IEEE Transactions on Visualization and Computer Graphics* 29 (2023) 1384–1399. <https://doi.org/10.1109/TVCG.2021.3114211>.
- [12] J. Zhang, Y. Hao, L. Li, D. Sun, L. Yuan, StoryWizard: a framework for fast stylized story illustration, *Vis Comput* 28 (2012) 877–887. <https://doi.org/10.1007/s00371-012-0702-3>.
- [13] S. Suh, J. Zhao, E. Law, CodeToon: Story Ideation, Auto Comic Generation, and Structure Mapping for Code-Driven Storytelling, in: *Proceedings of the 35th Annual ACM Symposium on User Interface Software and Technology*, ACM, Bend OR USA, 2022, pp. 1–16. <https://doi.org/10.1145/3526113.3545617>.
- [14] Z. Wang, H. Dingwall, B. Bach, Teaching Data Visualization and Storytelling with Data Comic Workshops, in: *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*, ACM, Glasgow Scotland Uk, 2019, pp. 1–9. <https://doi.org/10.1145/3290607.3299043>.
- [15] S. Suh, C. Latulipe, K.J. Lee, B. Cheng, E. Law, Using Comics to Introduce and Reinforce Programming Concepts in CS1, in: *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education*, ACM, Virtual Event USA, 2021, pp. 369–375. <https://doi.org/10.1145/3408877.3432465>.
- [16] T. Dylan, M. Blythe, J. Wallace, J. Thomas, T. Regan, RtD Comics: A Medium for Representing Research Through Design, in: *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, ACM, Brisbane QLD Australia, 2016, pp. 971–982. <https://doi.org/10.1145/2901790.2901821>.
- [17] D. Sýkora, M. Ben-Chen, M. Čadík, B. Whited, M. Simmons, TexToons: practical texture mapping for hand-drawn cartoon animations, in: *Proceedings of the ACM SIGGRAPH/Eurographics Symposium on Non-Photorealistic Animation and Rendering*, ACM, Vancouver British Columbia Canada, 2011, pp. 75–84. <https://doi.org/10.1145/2024676.2024689>.
- [18] Y. Sumi, ComicQA: contextual navigation aid by hyper-comic representation, in: *Proceedings of the 19th International Conference on Information Integration and Web-Based Applications & Services*, ACM, Salzburg Austria, 2017, pp. 76–84. <https://doi.org/10.1145/3151759.3151790>.
- [19] E. Haughney, Using comics to communicate qualitative user research findings, in: *CHI '08 Extended Abstracts on Human Factors in Computing Systems*, ACM, Florence Italy, 2008, pp. 2209–2212. <https://doi.org/10.1145/1358628.1358653>.
- [20] D. Ionita, R. Wieringa, J.-W. Bullee, A. Vasenev, Tangible Modelling to Elicit Domain Knowledge: An Experiment and Focus Group, in: P. Johannesson, M.L. Lee, S.W. Liddle, A.L. Opdahl, Ó. Pastor López (Eds.), *Conceptual Modeling*, Springer International Publishing, Cham, 2015, pp. 558–565. https://doi.org/10.1007/978-3-319-25264-3_42.
- [21] D. Ionita, D.S. Nazareth, A. Vasenev, F. van der Velde, R. Wieringa, The role of tangibility and iconicity in collaborative modelling tasks, (2017). <https://research.utwente.nl/en/publications/the-role-of-tangibility-and-iconicity-in-collaborative-modelling-> (accessed February 9, 2024).
- [22] A. Grosskopf, J. Edelman, M. Weske, Tangible Business Process Modeling – Methodology and Experiment Design, in: S. Rinderle-Ma, S. Sadiq, F. Leymann (Eds.), *Business Process Management Workshops*, Springer Berlin Heidelberg, Berlin, Heidelberg, 2010, pp. 489–500. https://doi.org/10.1007/978-3-642-12186-9_46.
- [23] F. Zwicky, The Morphological Approach to Discovery, *Invention, Research and Construction*, in: 1967. https://doi.org/10.1007/978-3-642-87617-2_14.