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Case Study: Systematic Approach to Derive Needs Based on Future Scenarios and Personas in the Project C2CBridge

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Abstract

Rural regions often lack attractive and reliable public transport options, making private vehicles the default mode of travel for many commuters. The project Country to City Bridge (C2CBridge) addresses this gap by developing a modular vehicle and hub system to complement urban transit networks. To support this, a structured approach is needed to identify and articulate future user needs in a solution-open way. This paper presents a four-step methodology for systematically deriving mobility needs in complex system-of-systems contexts. The process integrates strategic foresight and product development practices, beginning with a system model to define relevant influence areas. In the second step, the scenario technique is used to identify and project key factors into alternative descriptions of future mobility environments. These scenarios then guide the development of future personas that reflect diverse user perspectives. Finally, product profiles are created based on these personas, capturing the needs and benefits for providers, customers, and users alike. The methodology was applied in the C2CBridge project through a series of co-creative workshops with consortium members. Product profiles were developed for the overall mobility system as well as for the integrated vehicles and hubs. The approach proved to be both practical and adaptable, offering structured support for need identification and valuable insights into the development of system-level solutions.

Keywords
Foresight, methods, mobility, needs, product engineering.

1. Introduction

Driven in part by limited urban housing availability and rising rental prices in cities, the demand for mobility solutions connecting rural and urban areas is increasing. Many individuals are required to commute regularly from the countryside to urban centers. While public transportation infrastructure within cities is generally well developed, rural areas often lack attractive and reliable connection options. Although bus services exist in the catchment areas of major cities, they typically operate on irregular schedules, leading many commuters to rely on private vehicles as their primary mode of transport.

The project Country to City Bridge (C2CBridge) aims to address this issue through the development of a vehicle and hub system designed to complement existing public transportation networks. To enable effective solution development, a clear understanding of the demand situation is essential. Therefore, the objective of this paper is to develop and apply a methodology to systematically identify and describe the needs and benefits for future providers, customers, and users within the emerging context of rural–urban mobility.

2. State of Research

2.1. Product Engineering Process – From the Idea to Innovation

The product engineering process (PEP) is a core component of the product life cycle and encompasses all stages from the initial idea and product planning through product development to production system design and the start of manufacturing. The early phases of product development are critical, as they exert a significant influence over later stages and largely determine overall success (R. G. Cooper & Kleinschmidt, 1993; Verganti, 1997). Product development can be understood as a continuous interaction between the system of objectives, the operating system, and the object system (Ropohl, 1975). Building on this system triple, Albers et al. (2016) developed the integrated Product engineering Model (iPeM), which describes the PEP across several phases using core and support activities. Multiple product generations, the corresponding production systems, overarching strategies, and validation systems are mapped onto distinct levels within the model (Albers et al., 2016). As products and systems are developed in reference to previous generations, Albers et al. (2022) proposed the model of SGE – System Generation Engineering, a descriptive framework for product development across multiple generations. Products are conceived as systems that are perceived and used as products. Multiple successive generations are developed concurrently, albeit at different stages. Elements of the reference system are transferred to the new system through mechanisms such as adoption, differentiation, and principle variation (Albers, Kürten, et al., 2022).

A forward-looking, systems-oriented development approach forms the foundation for future innovation (Albers & Gausemeier, 2012). Innovation is defined as the retrospectively successful implementation of a technical invention as a marketable product (Schumpeter, 1939). This definition was extended by Albers et al. (Albers, Heimicke, et al., 2018) through the concept of the product profile – a model used to describe a situation of needs, which delineates the solution space for product design and enables the validation of benefits for providers, customers, and users. This aligns with the perspective of Patnaik & Becker (1999), who emphasize the importance of focusing on user needs rather than on specific solutions at an early stage to preserve openness to a broad range of possible implementations.

Products should be developed based on the needs of their future users, a process that can be supported using product profiles. A seemingly obvious approach is to identify customers and directly inquire about their preferences. However, customers are often unable to articulate solutions or even clearly describe their existing problems and needs, making direct inquiries not always effective or sufficient. (A. Cooper, 1999) The persona method enables developers to consider various aspects of product use from the perspective of potential customers in order to design solutions that best meet their needs. This method supports developers in making informed decisions early in the design process to create user-friendly products. A persona represents the goals and behaviors of a hypothetical user group and serves as a tool for empathy-driven design (A. Cooper, 1999; Humphrey, 2017; Marthaler et al., 2019). An example template was published by Marthaler et al. (2019) to support practical implementation of this approach.

2.2. Strategic Foresight – Looking into the Future

One of the primary motivations for applying strategic foresight lies in the long development cycles typically associated with complex products, as well as the ambition to drive innovation (Gausemeier, 2019). While initially considered a standalone process, strategic foresight is increasingly being integrated into the product development process (PEP) (Müller, 2008). The concept originates from the field of future management, which aims to enable organizations to respond adaptively and swiftly to future changes (Westkämper, 2009). Strategic foresight operates on three analytical levels – operational, tactical, and strategic – each corresponding to different time horizons and tools. Prognoses address short-term developments, trends are aligned with the medium term, and scenarios are used for long-term planning (Siebe, 2018). Scenarios are distinguished from trends by their use of open and interconnected thinking, allowing for the systematic exploration of possible futures (Fink & Siebe, 2016).

The scenario technique developed by Gausemeier et al. (1998) comprises five key steps. It begins with an analysis of a predefined scenario field, often visualized by a system model, within which factors that characterize the current situation are identified. A subset of key factors is then selected based on evaluative criteria. For each key factor, alternative future projections are developed, defined along two independent dimensions. These projections are then combined in a consistent and plausible manner to form coherent scenarios. Each scenario is described in detail and located in a map of the future. Finally, actionable measures can be derived through scenario transfer, linking foresight outcomes to strategic decision-making (Gausemeier, 2019; Gausemeier et al., 1998; Siebe, 2018). The process of the scenario technique is visualized in Figure 1.

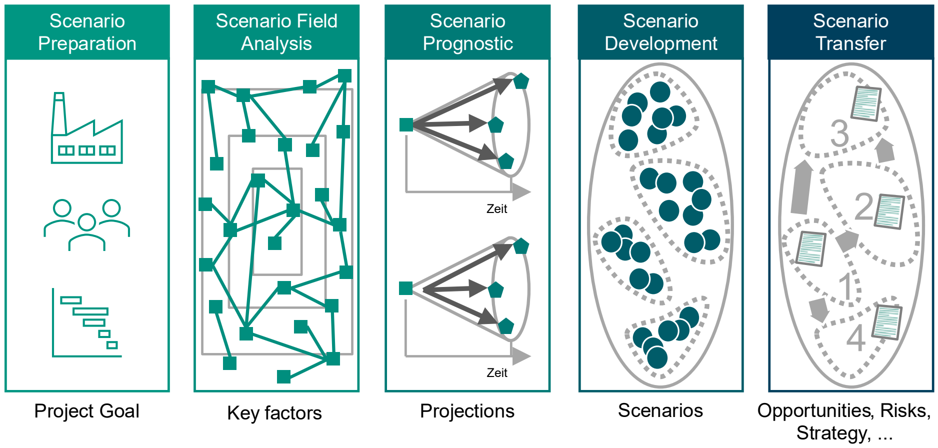

Figure 1. Process of scenario technique according to Gausemeier (1998) and Fink & Siebe (2016)

In addition to employing scenarios for the strategic orientation of companies, various approaches have been proposed to derive product characteristics for implementation within the product engineering process (PEP). According to Thümmel et al. (2022), a distinction can be made between future-oriented and future-robust product design strategies. Meyer-Schwickerath (2014) explored the integration of scenario techniques and strategic early warning – derived from strategic foresight – into the PEP within the framework of the integrated Product engineering Model (iPeM). His work demonstrated how foresight can be embedded in the PEP via the system of objectives.

Albers, Dumitrescu et al. (2018) emphasize the need for a methodological link between envisioned futures and technical subsystems (see Figure 2). Building on this, Albers et al. (2022) developed an approach for deriving product profiles and characteristics of future product generations based on strategic foresight. These characteristics are evaluated for their future relevance using, among other tools, the Kano model. If certain characteristics contribute to customer satisfaction across multiple potential future scenarios, they are considered future-robust (Albers, Marthaler, et al., 2022). The identified characteristics then serve as a foundational element for the definition of the PEP's system of objectives (Meyer-Schwickerath, 2014).

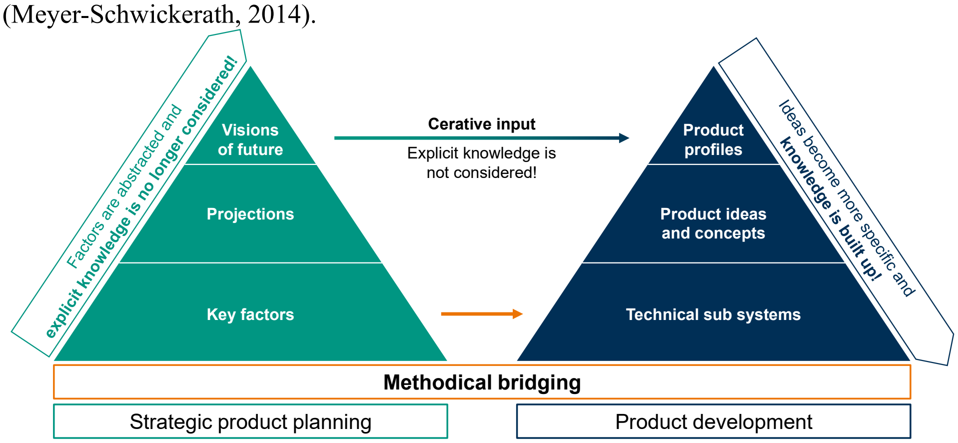

Figure 2. Methodical bridging between foresight and product development
(translated according to Albers, Dumitrescu et al., 2018)

3. Methodology

3.1. Research Need and Research Goal

As outlined in the state of research, there are existing approaches within product development and strategic product planning that aim to derive needs for future products and systems. Initial ideas and concepts for more holistic procedures have also been proposed. However, these are currently only described in vague terms – particularly regarding the formulation of product profiles and personas – highlighting the need to first design a structured approach.

Given the additional capabilities and expertise available within the C2CBridge project and its consortium, there is a need for adaptation to fit this specific context.

The product profile offers an established method for capturing and describing product needs in an open-ended, solution-neutral way, including the value proposition for providers, customers, and users. However, no suitable template or structured method currently exists for system-of-systems approaches that span multiple interrelated components. This indicates a clear need for both methodological adaptation and validation.

Accordingly, this paper aims to present a comprehensive methodology for systematically deriving demand scenarios for products and their overarching systems through the integration of foresight techniques. The proposed approach includes the development of scenarios and personas, as well as the creation of a simplified template for the initial description of a system-of-systems concept. This methodology was applied within the C2CBridge project, in the context of rural–urban mobility, with active involvement of the project consortium.

3.2. Research Design

Based on the research need and the research goal, the following research questions were derived to this research project. With the questions, this work can be structured and the results will also be analyzed and evaluated.

1. How can needs and benefits for suppliers, customers, and users be systematically derived for the context of mobility solutions between urban and rural areas?
2. How can future personas be modelled in the context of mobility?
3. How can the needs of a mobility system be described solution-open in the context of mobility between urban and rural regions?

To address the research questions and thereby achieve the defined research objectives, a combination of methodological approaches was applied. Several elements of the procedure can be described using the Design Research Methodology (DRM) by Blessing and Chakrabarti (2009). For instance, a survey was conducted within the C2CBridge project consortium to systematically gather influencing factors. According to DRM, this corresponds to a descriptive study aimed at analyzing the current situation as a foundation for developing a prescriptive study and related methodology. In addition, DRM outlines different types of research methods. The workshops conducted with members of the consortium can be interpreted in two ways: on the one hand, they represent elements of action research, as they involve both the application of methods and the generation of knowledge. On the other hand, the workshops can be classified as focus groups in the context of exploratory qualitative research.

Overall, the research activities are best situated within the methodological framework of a case study, as the investigation is focused on a specific application scenario in the context of the C2CBridge project.

3.3. Research Environment

The research presented in this paper was conducted within the framework of the project Country to City Bridge (C2CBridge). This collaborative initiative is part of the German Center for Future Mobility, funded by the German Federal Ministry for Digital and Transport. The overarching goal of C2CBridge is to explore user-centered public transportation offerings that provide attractive alternatives to private car use for commuting between rural and urban areas.

The project investigates a holistic mobility system involving services based on autonomous, platoon-capable on-demand taxis in passenger car dimensions, combined with intelligent transfer hubs. Immersive visualization techniques are employed to actively involve citizens and other stakeholders in the development process. The vehicle concept developed within C2CBridge is not intended to replace conventional public transport, nor is it limited to solving last-mile distribution. Instead, the project seeks to explore how different transportation systems can be optimally integrated and how the transitions between them can be effectively designed.

Key research questions include identifying which aspects and degrees of personalization are critical to achieving a behavioral shift toward sustainable, intermodal, and multimodal mobility. The project consortium includes multiple research institutions from the fields of mobility and transportation, as well as from product development. Within this interdisciplinary collaboration, both existing approaches and newly developed methods are being applied, refined, and evaluated. (C2CBridge Project Proposal, 2023).

4. Approach to Derive Needs based on Future Scenarios and Personas

The methodological approach was developed through a series of workshops involving five research associates, based on the literature and references outlined in the state of research. The procedure is primarily grounded in three established methods: the scenario technique (Gausemeier et al., 1998), the persona method (A. Cooper, 1999), and the product profile concept (Albers, Heimicke, et al., 2018). The aim is to systematically derive solution-neutral descriptions of needs for a system to be developed within a future context.

The overall approach is structured into four modular sub-packages. While each sub-package can be conducted independently, they build upon one another by utilizing inputs from previous stages. The structure of the approach is illustrated in Figure 3.

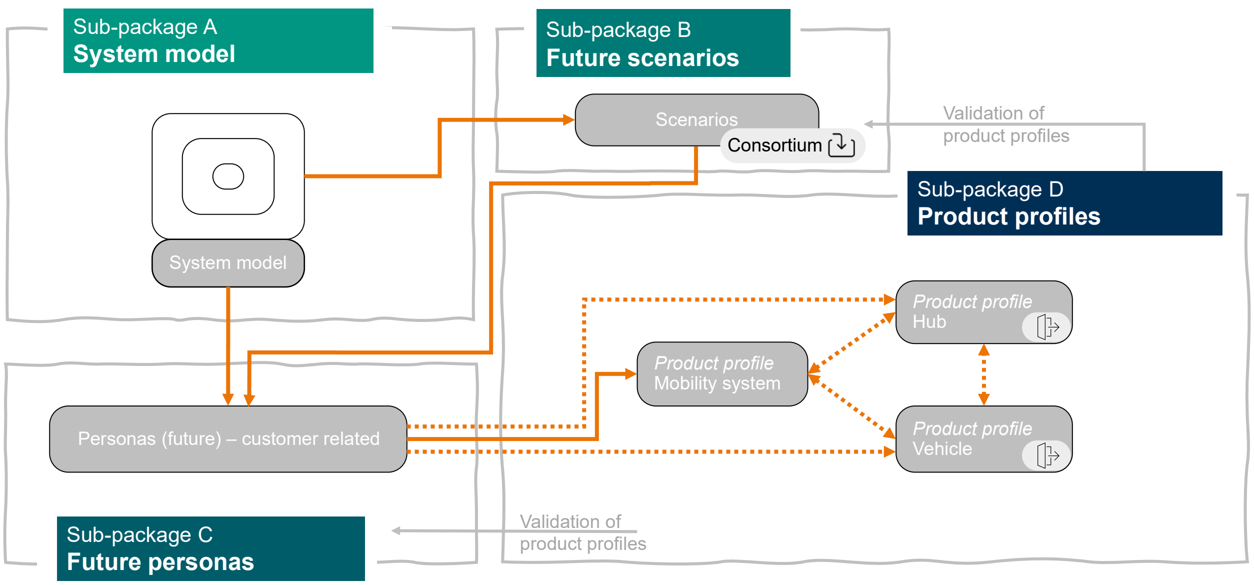

Figure 3. Structure of the approach to derive product profiles based on future scenarios and personas

In sub-package A, a system model is developed for the area or context under consideration. This is visualized using a layered shell model that depicts the focal field and adjacent areas with decreasing levels of detail, extending to overarching societal and political conditions. The objective is to provide a comprehensive overview and, especially in interdisciplinary settings, to align participants' understanding of the system. Additionally, the system model allows for a structured and systematic collection of influencing factors across all relevant domains, which are essential for the scenario development in sub-package B.

Sub-package B involves the creation of scenarios as alternative, consistent descriptions of potential futures. The approach is based on the scenario technique by Gausemeier et al. (1998) and Fink and Siebe (2016), as illustrated in Figure 1. Starting with the influencing factors derived from the system model in sub-package A – which forms an integral part of the scenario method – key factors are identified. These key factors are then projected along two dimensions with high and low expressions, forming a 2x2 matrix. By combining one projection for each key factor using a morphological box, distinct scenarios are constructed.

The aim of sub-package C is to define personas who will interact with the future system within the anticipated context. The system model and scenarios developed in the preceding sub-packages serve as key inputs. For persona description, a structured template is used, which should be adapted to the specific application context to capture all relevant aspects. Unlike in comprehensive quantitative studies, the personas are not based on representative surveys, but are instead derived through the domain knowledge and practical experience of the participants. These are collected as typical – sometimes deliberately illustrative – user types during expert workshops across relevant domains.

In the final sub-package D, product and system profiles are developed as solution-neutral descriptions of needs for the envisioned system. A distinction is made between profiles describing overarching systems and those detailing specific products. As with sub-package C, the development of profiles is carried out in workshops in order to integrate knowledge from various experts through collaborative interaction. The product profile template is already an established method for systematically addressing different aspects, with a particular focus on the value provided to providers, customers, and users. For the initial development of profiles during the workshops, the templates have been streamlined by omitting elements that would typically require extensive market research – such as competitive products, market demand, or regulatory frameworks – allowing the focus to remain on more qualitative and cross-functional elements. The input from the preliminary sub-packages are used to derive the system profile and in combination with that the product profiles. Also, there can be a linkage between the different profiles that has to be considered to keep all profiles consistent.

The overall approach answers the first research question on how needs and benefits for suppliers, customers, and users can be systematically derived for the context of mobility solutions between urban and rural areas. The subsequent sub-sections present the development and outcomes of each sub-package, as applied within the case study context of the C2CBridge project.

4.1. System model

The system model was developed through three workshops, each involving three to four experts from the field of product development. The process leveraged prior experience and expertise gained from past scenario-based projects, particularly regarding the creation of system models. In a meeting, the full methodology as well as the drafted system model were presented to the consortium and subsequently discussed. Minor adjustments were made based on feedback; however, the overall structure and content were confirmed. The structure reflects the core idea of the C2CBridge project – namely, a road-based mobility system that connects rural and urban areas. The aim was not to model exact dependencies but to illustrate the domains of influence and design. The system model is depicted in Figure 4.

At the center of the model is the direct context of mobility between urban and rural areas. Consequently, “city” and “countryside” were positioned as poles on the left and right, respectively. Each of these has a point of access, such as a train station or mobility hub, representing the endpoints of the connection. The traffic flow between them arises from the disparity between the mobility needs of individuals and the availability of suitable services linking urban and rural regions. This enables a depiction of the underlying mobility demand and supply. The realization of this flow requires infrastructure on which various transport modes can operate, each managed by a corresponding provider.

The two outer layers of the system model represent adjacent and surrounding domains that are not directly addressed by the project but exert influence on it. Given the project’s domain, a “mobility” layer was defined to consider related modes of transportation. While the project focuses on autonomous, road-based passenger transport in the sub-areas of a larger city, other transportation forms – such as long-distance travel by high-speed rail, water, or air transport – were identified as adjacent systems. Similarly, smaller-scale means of transport such as e-scooters or bicycles were included. Although the system may allow for luggage transport, the exclusive transport of goods is not intended and was thus also defined as an adjacent field.

The outermost shell accounts for general influencing factors. This includes societal and political values and regulatory conditions. Broad trends such as urbanization or rural depopulation reflect fundamental societal attitudes and movements. The “environment” field encompasses influences from both advocacy groups or organizations and natural factors such as geological or meteorological conditions. The “policy and legislation” field captures concrete legal frameworks and regulations, including those relevant to the acceptance and approval of new transport systems.

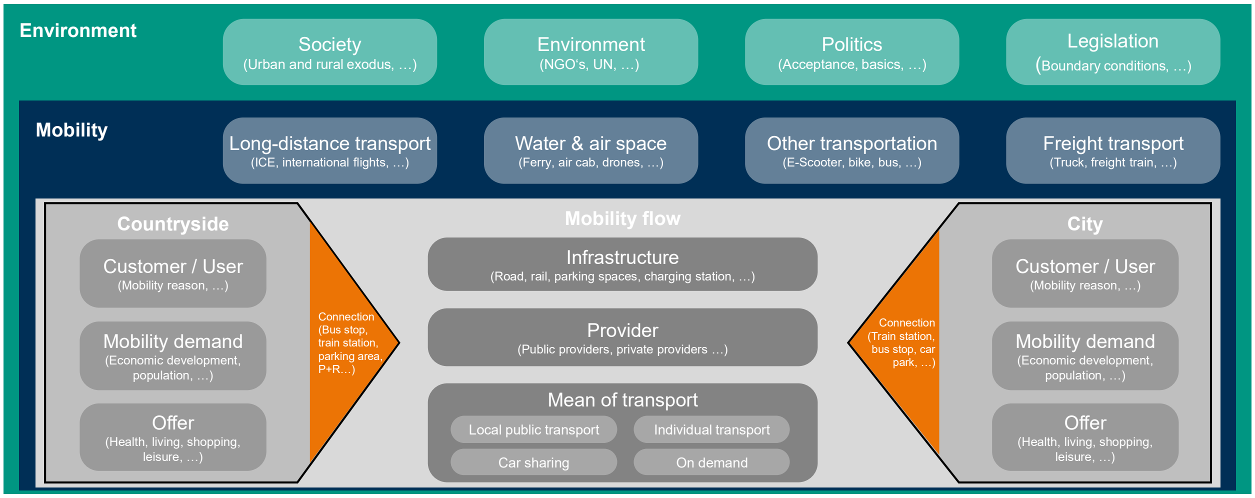

Figure 4. System model for the project C2CBridge

4.2. Future Scenarios of the Environment

In Work Package B, future scenarios for the C2CBridge project were developed using the scenario technique according to Gausemeier et al. (1998). To initiate this process, influencing factors were identified based on the previously developed system model. To capture a broad range of perspectives within the consortium, a survey was designed and distributed among its members. A total of 17 participants contributed, collectively naming 59 influencing factors across the areas identified in the system model. These responses were then consolidated to eliminate duplicates. Additionally, the factors were organized into seven clusters to structure the different foundational themes – such as monetary aspects, digitalization, and flexibility. Within each cluster, the factors were rated on a scale from 1 (low relevance) to 3 (high relevance) to determine the most critical influencing factors. Based on this assessment, 13 key factors were identified for further scenario development.

Next, two dimensions were defined for each of the 13 key factors. For instance, for the key factor “Availability of public mobility”, the dimensions were “Temporal flexibility” and “Spatial flexibility”. For “Mobility services”, the dimensions were “Availability of diverse mobility options” and “Reliability”. Within the scenario technique, each dimension can be represented in a high or low characteristic, resulting in four possible combinations per key factor. Scenarios were constructed by selecting one combination for each of the 13 key factors and combining them using a morphological box. Compatibility between the different characteristics was carefully reviewed to avoid inconsistencies and illogical scenario outcomes. A total of nine initial scenarios were developed, each based on a specific key factor by varying across all four possible characteristics. This approach ensured maximum coverage and diversity across the potential future states. Subsequently, one additional consistent scenario was created from the remaining, previously uncovered characteristics to further increase the variability and completeness of the scenario set.

After the initial scenario development, a consistency check was conducted. This involved both a qualitative review of the morphological boxes and a quantitative analysis using Multidimensional Scaling (MDS) to determine distances between scenarios. The analysis revealed that several scenarios were nearly identical, as reflected by their proximity in the MDS visualization. To enhance manageability and communication, similar scenarios were merged. Ultimately, eight consolidated scenarios were defined and illustrated in a scenario map, shown in Figure 5. Two fundamental axes were identified that distinguish the scenarios: the prevalence of public transport versus private individual transport, and the degree of autonomous versus non-autonomous mobility in the envisioned futures.

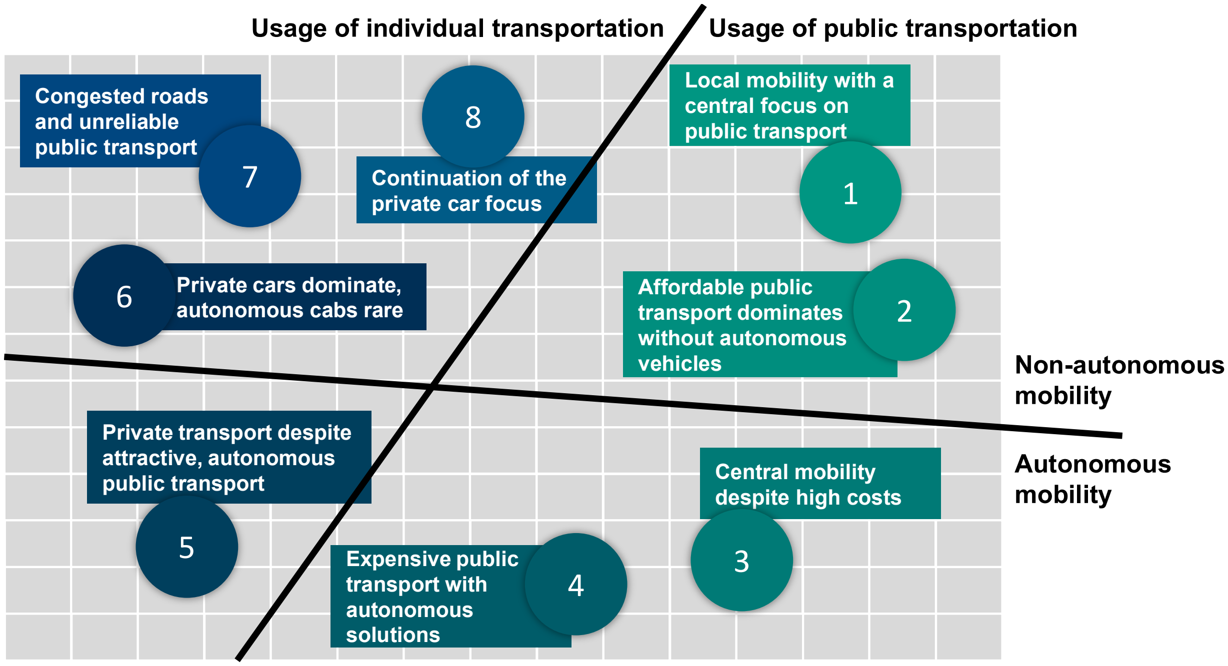

Figure 5. Map of the future as an overview of the scenarios in the C2CBridge project

4.3. Future Personas

Based on the preceding Work Packages A and B, future-oriented personas were developed in Work Package C. The process began with the creation of a persona template tailored to the context of mobility. In addition to general fields such as name, age, a brief description, and leisure activities, several mobility-specific fields were added. These included expectations regarding mobility, driving behavior, and the use of different types of mobility.

Inspired by discussions and input from transport researchers within the consortium, the template also incorporated mobility behavior over the course of a typical week – a time span commonly used in mobility and transportation research to describe typical application scenarios. This section of the template includes information on purpose or destination, frequency, mode of transportation, and travel duration. To capture parameters relevant for further development of needs and corresponding solutions, certain properties were added as scaled attributes, enabling both better comparability and faster persona generation. An additional field addressed scenario fit, indicating whether a given persona would feel comfortable and function effectively if a specific alternative scenario from Work Package B were to materialize. The template is illustrated in Figure 6. The template, together with the workshop concept, answer the second research question on how future personas can be modelled in the context of mobility.

The personas were created during a three-hour workshop attended by twelve consortium representatives. The workshop began with an introduction to the topic and goals, followed by a presentation of the template to ensure a common understanding among participants. Subsequently, pairs of participants filled out one persona each. In total, nine personas were developed. These personas do not represent a statistically accurate cross-section of the population. Rather, they serve as vivid archetypes of specific user groups. During the workshop, participants were encouraged to include underrepresented or marginalized groups – such as individuals with physical or cognitive limitations. Example personas include “Ralf Retiree”, who exclusively uses walking and public transport, and “Detlef Dementia”, who has a heightened need for safety and relies on guidance systems. After the workshop, the personas were digitized and refined linguistically to be used in Work Package D and as creative input for further project phases.

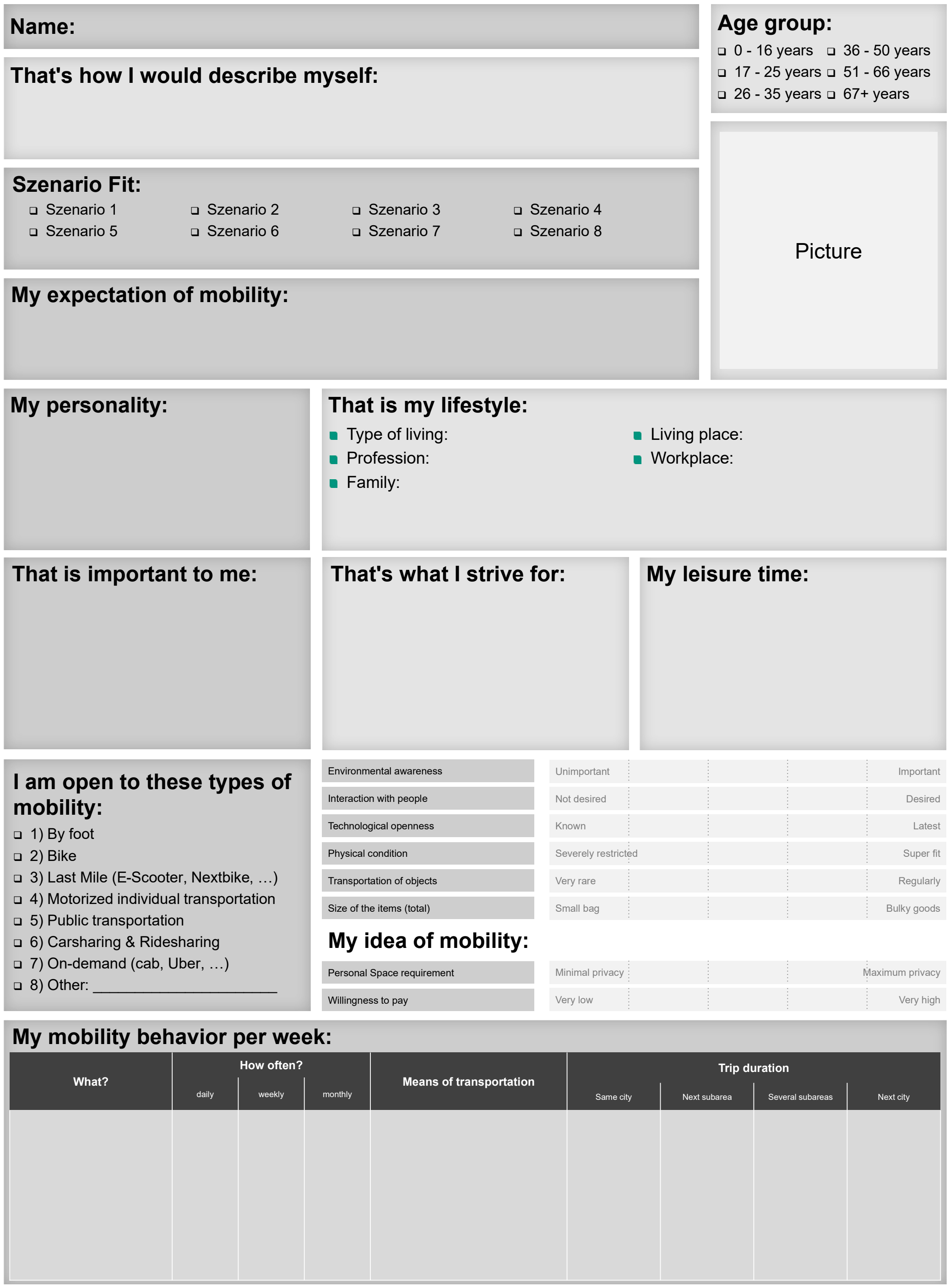

Figure 6. Template to describe personas in the context of mobility.

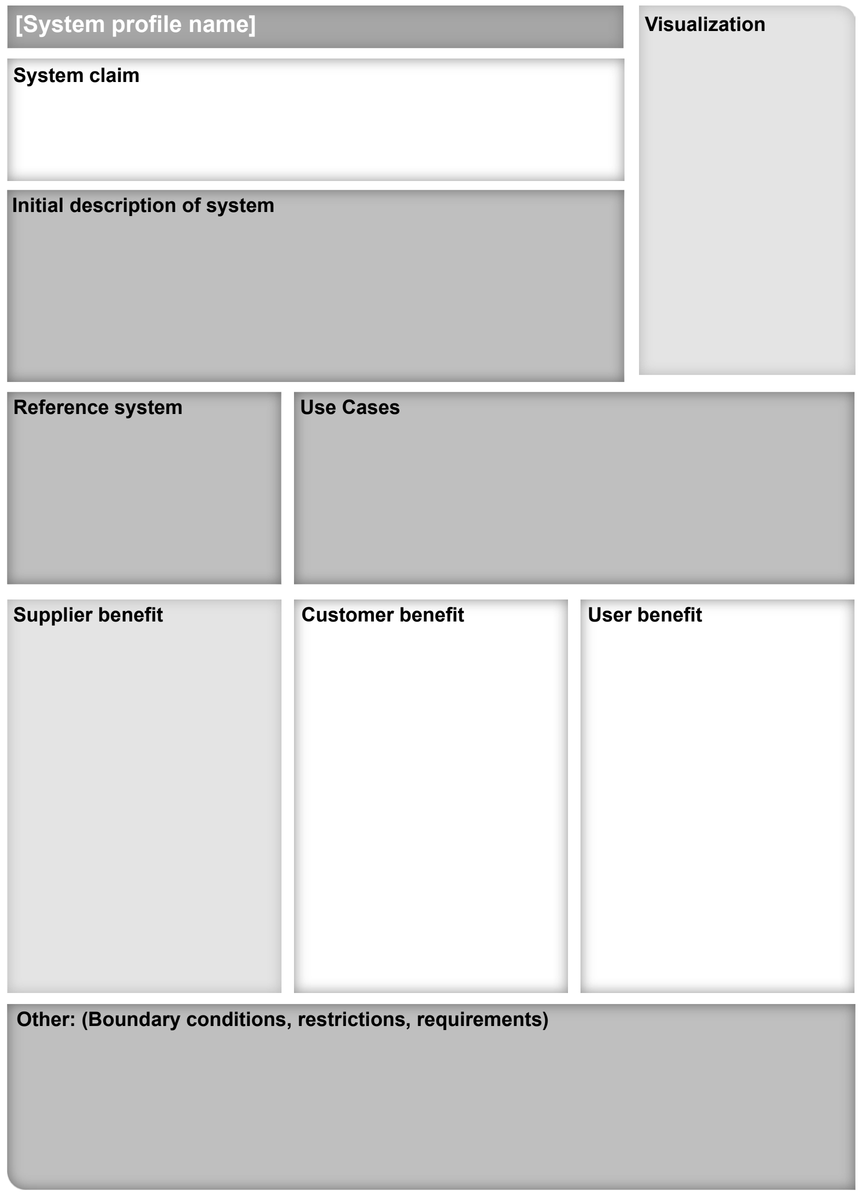

Figure 7. System profile template for solution-open description of needs and benefits

4.4. Product Profiles

The final work package of the approach focused on the creation of profiles for the overarching mobility system and the vehicles and hubs included within the C2CBridge project. This was achieved through two workshops with the consortium. The starting point was the product profile, whose template simplifies the solution-open modeling of needs and benefits for providers, customers, and users. A central element is the claim, which summarizes the overarching need and engineering task in one or two sentences. Due to the focus on creative identification and direct modeling, elements such as competitive landscape, demand, validation, and regulatory conditions were removed and modeled later in the process. As a result, the elements now include the claim, an initial description, a visualization, the reference system, use cases, the bundle of benefit (provider, customer, and user), and an additional section for remarks and preliminary conditions or restrictions.

Since there is little to no prior experience in describing overarching systems like the mobility system, and previous need descriptions in other projects have focused on specific products, the shortened template was also used here, albeit with adjustments to suit the system. The goal in this case, in addition to developing the content, was to gain insights into how to further develop a comprehensive system profile. The template used for the system profile is shown in Figure 7.

The creation of the profiles took place over the course of two three-hour workshops with the consortium, which were thematically split. The first workshop focused on the overarching mobility system, while the second workshop focused on vehicles and hubs within the context of the C2CBridge project. Since the participants in both workshops were almost identical, the first workshop included an introductory session on the topic, understanding the product profile, and the template itself. A brief exercise was conducted to familiarize the participants with the template using simple, concrete products. Following this, the product profile development began. The second workshop was split into two parts. One group worked on profiles for the vehicles, while the other worked on those for the hubs. After half the time, the groups switched topics. In total, 22 representatives from the consortium participated in the two workshops. The first workshop resulted in the creation of six system profiles, while the second workshop produced six product profiles for each vehicles and hubs.

After the workshops, the profiles were processed. It was observed that the system profiles showed significant overlap and could therefore be consolidated into a single comprehensive system profile. The profiles for the hubs also exhibited similar characteristics and were thus combined into one overarching product profile for the hubs. However, the vehicle profiles showed more diversity in some aspects, although they still shared certain similarities. Consequently, the six vehicle profiles were consolidated into three product profiles. These can be broadly described as follows: a small individual cabin for a maximum of two people, a large cabin with modular and flexible partitions, and a large cabin with strictly separated individual cabins, ensuring no interaction between passengers. This answers the third research question on how the needs of a mobility system can be described solution-open in the context of mobility between urban and rural regions.

4.5. Interim Summary and Discussion

The overall approach proved to be coherent, although the transitions between the individual methodological steps were not primarily characterized by direct result linkages but rather by creative input for the subsequent phases. This was particularly evident when applying established tools such as product profiles, which posed a unique challenge in the context of a mobility system: Due to the high level of complexity and the large number of stakeholders involved, it was initially unclear which actors would take on which roles – such as provider, customer, or user. To address this, the methodological approach and the corresponding template were designed to first identify stakeholder-specific needs before assigning roles, as these may overlap. Moreover, the process was shaped by numerous framework conditions already defined within the project, which potentially led to bias among workshop participants from the consortium. This limited openness to alternative solutions – a constraint that the use of scenarios aimed to partially offset. However, due to the high level of abstraction and the systemic complexity – particularly regarding mobility profiles – a complete neutralization of this limitation could not be ensured.

At the same time, the active participation of consortium partners in the workshops added value by providing them with insights into product development methodologies. Findings from these processes directly contributed to the further development of the templates, for instance by introducing the week as a time unit in the mobility description, or by differentiating between private individual transport and public transport.

Through discussions during and after the workshop, potential intersections with established methods from transport research were identified. These typically involve long-term tracking of actual user data to derive representative insights and identify marginalized user groups. The creative persona approach used here was seen as a faster way to gain initial insights, which could later be validated through empirical data. It was also emphasized that traditional data collection primarily reflects past behaviors, while this forward-looking method allows exploration of future user needs and preferences – highlighting potential for further integration and synergistic analysis between the two approaches.

5. Summary and Outlook

In the presented paper, a comprehensive methodology was developed and applied based on existing references. The goal was to systematically derive open-ended demand descriptions—referred to as product profiles—by utilizing personas and strategic foresight. The developed methodology consists of four key steps. In the first step, areas of influence are defined using a system model. In accordance with scenario techniques, the second step involves projecting relevant key factors into the future and creating scenarios as alternative representations of the future environment. These scenarios serve as input for the third step, in which future personas are described using a dedicated template. Finally, demands are derived from the personas and scenarios and documented as product profiles using a structured template.

The entire methodology was applied within the C2CBridge project in collaboration with consortium members. The objective was to derive product profiles for an overarching mobility system, as well as for the associated vehicles and hubs facilitating mobility between urban and rural areas. The methodology proved to be practical, transparent, and effective. However, particularly for the development of overarching system profiles, potential for further refinement was identified.

Looking ahead, the development and description of such complex systems should be addressed more directly to enable the efficient and effective definition of their needs and requirements. Moreover, the collaboration between product development experts and transport and mobility researchers revealed initial starting points for methodological cooperation. In the next phase of the project, these approaches and methods will be compared to identify synergy potentials. Due to the uncertainties inherent in long-term foresight and planning, there is also a need for ongoing validation. Therefore, the C2CBridge project plans to implement a monitoring approach to review and refine the results over time (Thümmel et al., 2025). This also serves as an additional way to validate the extended value of the demands described in the product profiles.

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Tobias Düser has been a full professor for product engineering and head of IPEK – Institute of Product Engineering at the Karlsruhe Institute of Technology (KIT) since October 2022. After his studies at the Karlsruhe Institute of Technology and subsequent doctorate at IPEK - Institute of Product Engineering, Tobias Düser held various positions within the AVL Group in the field of innovative development and validation methods. In particular, he worked on novel automation and simulation solutions for test benches. Among other things, he was involved in the development of a new business area, the product portfolio and partner network in the area of Advanced Driver Assistant Systems as well as for Automated Driving. He was a member of the global ADAS/AD leadership circle and also intensively involved in global strategy development. From 2015, he was responsible for the Advanced Solution Lab at AVL and head of the Karlsruhe branch office. In 2020, he additionally assumed global responsibility for ADAS/AD Virtual Testing Solutions. Tobias Düser and his team worked on virtual and XiL-based validation methods for the validation and testing of Advanced Driver Assistant systems as well as for Automated Driving. Furthermore, he participates in various working groups such as IAMTS or UNECE.

Albert Albers has been a full professor for product development and head of IPEK – Institute of Product Engineering at the Karlsruhe Institute of Technology (KIT) since 1996. He received his doctorate in 1987 under Prof. Palandan of the University of Hannover. Before his appointment to Karlsruhe, Prof. Albers worked for LuK GmbH & Co. OHG, most recently as head of development and deputy member of the management board. He is a founding and former board member of the scientific society for product development WiGeP, a member of the German Academy of Science and Engineering (acatech), and a member of the Advisory Board of the Design Society. Since 2008, he has been President of the Allgemeiner Fakultätentag (AFT e. V.). In addition, Prof. Albers engages in the VDI and serves on the advisory boards of several companies. In 2016, he and the IPEK team were awarded the Honorary Award of the Schaeffler FAG Foundation for excellent achievements and competencies in science, research and teaching in the technical-scientific field.