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Digital Participation in the VisLab: Sketching Urban Visions for the Harbour of Lachen (Switzerland) Online

GEO 511 Master's Thesis

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Abstract

For decades, citizen participation has been recognised as a crucial part of urban planning. Simultaneously, as our everyday life become more digital, digital tools are being increasingly used in the involvement of citizens and their perspectives on urban issues. In particular, 3D visualisation tools based on point cloud visualisations may have the potential to further enhance opportunities for citizen participation digitally. Yet, research on their application in digital participation processes has been limited. Therefore, this study attempts to bridge this gap by developing the Urban Sketch Tool (UST) and initiating a digital participation process VisLab with local stakeholders in Lachen (Switzerland). The aim was to investigate how the UST facilitates the sketching of urban visions for the harbour of Lachen, and how it supports a discussion between stakeholders. Furthermore, how stakeholders discuss their urban visions and whether they reach consensus or dissent was examined. The study's findings indicate that the Urban Sketch Tool is simple to use and allows for the sketching of urban visions, which facilitates discussion about urban issues by providing a common language for participants. With regard to the stakeholder discussion, the results suggest that the stakeholder mainly reach consensus through an exchange of knowledge and perspectives. However, dissent rarely occurs, because participants tend to avoid conflict or shift their opinion toward consensus. Notably, the current findings do indicate some limitations associated with the use of the UST and digital participation. As it turns out, the UST and digital access to participation may introduce new barriers, particularly for stakeholder who experience technical difficulties during the process or have a deficiency in digital skills. This results in the exclusion of individuals and unequal access to the digital participation process, resulting in unbalanced outcomes. Thus, it is recommended that digital tools be developed for those who face the greatest barriers to digital participation in planning. Additionally, it is advised that in digital participation, particular attention is being paid to conflict and the voices of marginalised participants. Finally, it can be concluded that digital participation and digital tools such as the UST such as the UST should not replace more traditional forms of participation, but rather complement them and thereby enable them to reach their full potential.

Keywords: Digital Participation, VisLab Lachen, Urban Sketch Tool, Urban Visions, Stakeholder Discussion, Point Cloud Visualisations

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In memory of my beloved mother, Esther Hofer-Walliser (1957-2009)

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Acronyms

ALS Airborne Laser Scanning. 23

AR Augmented Reality. A-1

C4D Cinema4D Software. 4, 28, 30, 31, 34–39, 46

CAD Computer-Aided Design. 21

DTM Digital Terrain Model. 30, 31, 34

GIS Geographic Information Systems. 21

ICT Information and Communication Technology. 13–15

LiDAR Light Detection and Ranging. 2, 23–25, 29, 30

PPGIS Public Participation Geographic Information Systems. A-2

TLS Terrestrial Laser Scanning. 23, 25, 30, 32, 33, 35, 40, 99

UST Urban Sketch Tool. ii, ix, xii, 1–5, 20, 26, 28, 31, 34, 42, 44, 45, 47–50, 53–56, 58, 59, 61–65, 70–73, 76, 82–86, 88–90, 92, 95, 97, 99–102, B-1

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Chapter 1

Introduction

Involving citizens in urban planning and research has long been a major focus. Considering that it is ultimately the urban population who experiences urban changes, it is crucial to incorporate the public's needs and perspective in urban transformation processes (Baker et al., 2007, p. 79). Notably, our environment has changed rapidly over the past few decades, as a result of digitalisation and newly developed technologies (Potts, 2020, p. 273). This also accounts for urban planning, which has seen an increase in the use of new digital tools for digital citizen participation on urban space-related issues (Evans-Cowley & Hollander, 2010, p. 398). Recently, visualisation tools with 3D point cloud visualisations have been used widely to facilitate participation (Lin et al., 2016; Spielhofer et al., 2017; Urech et al., 2020; Wissen Hayek & Grêt-Regamey, 2021). However, scholars seem to struggle in keeping up with the rapid development of new digital applications in urban planning. This has resulted in a scarce body of research addressing new digital opportunities for digital participation. To address this gap in research, the current study develops an 'Urban Sketch Tool' (UST) and initiates a digital participation process called VisLab in Lachen, Switzerland. The main purpose of this study is to evaluate the tool and how it supports a discussion between stakeholders. The latter was analysed in terms of reaching consensus or not, as well as the grey tones that exist between. This chapter introduces the study's background and context, to then outline the research questions and objectives and the study's relevance. This is followed by the methodology, and the study's limitations. Lastly, an outline of how the research process is structured is presented.

Communicative and collaborative planning was firstly introduced by Forester (1989) and Healey (1993) in the early 1990s. These contemporary urban planning practises, as Fainstein (2000, p. 454) notes, have since established a space for the public and seek consensus on urban-related issues through communication and decision-making. Thus, citizen participation plays a critical role in this context (Hillier, 2005, p. 110), allowing citizens to contribute to urban planning and decision-making processes to some extent (Arnstein, 1969, p. 216). More recently, however, the overarching goal of finding consensus has been criticised. For instance, Allmendinger (2017, p. 191) stresses that planning plays a role in

regulating growth in ways that avoid conflicts. Furthermore, Miessen (2012, p. 80) argues that citizen participation largely eliminates room for disagreement. Therefore, the current research focuses not only on consensus in a participatory process, but also tends to the possibility of conflict and its avoidance.

The majority of approaches to urban planning participation have been non-digital, also known as traditional forms of participation (Evans-Cowley & Hollander, 2010, p. 399). Yet, past research (Conroy & Evans-Cowley, 2006, p. 384; Baker et al., 2007, p. 86) indicates that citizens are often not adequately informed about their opportunities to participate in traditional processes, or that public access to on-site participation formats is not as accessible as it should be (Wilson et al., 2019, p. 297). Therefore, the current study draws from the emerging body of research on new technologies, that were being implemented in the early 2000s (Evans-Cowley & Hollander, 2010, p. 398) and paved the way for new modes of public involvement and interaction with urban planning issues (Wilson et al., 2019, pp. 290-291). These technological advancements and increasing availability of a variety of digital tools accelerated the emergence of 'digital participation' (Albrecht et al., 2008, p. 22), that uses digital tools to enhance people's involvement in decision-making processes (Albrecht et al., 2008, p. 4; Macintosh, 2004, p. 2; Tambouris et al., 2007, p. 9). By embracing these technological advancements and digital tools in the present study, the barriers to citizen participation may be reduced, and the public could be offered a more accessible opportunity to shape the future of their neighbourhood (Wilson et al., 2019, pp. 290-291).

According to Lange (2001, pp. 164, 179), 3D visualisation tools, in particular, have the potential to be used as digital planning tools due to their visual representation of the real world and ability to visualise future scenarios. Thus, this study will leverage these advantages while also applying recent progress in the Light Detection and Ranging (LiDAR) technology (Laing, 2019, p. 55), which led to a limited number of studies using 3D point clouds to visualise rural (Lin et al., 2016; Spielhofer et al., 2017; Wissen Hayek, Müller, et al., 2019; Wissen Hayek, Spielhofer, & Grêt-Regamey, 2019) or urban landscapes (Urech et al., 2020; Wissen Hayek & Grêt-Regamey, 2021). Given the research's emphasis on digital participation, 3D visualisations are particularly relevant because they enable multiple levels of interaction (Lange & Hehl-Lange, 2005, p. 554), provide a common language for participants (Al-Kodmany, 1999, p. 45; Wissen et al., 2008, p. 194), and thus facilitate discussion among them (Urech et al., 2020, p. 7; Wissen Hayek, Müller, et al., 2019, p. 252). These possibilities provided by the application of 3D visualisation tools with point clouds seem to provide engaging ways to involve participants and invite them to discuss urban issues, thereby exploring emerging new forms of digital participation processes.

Therefore, this study develops a 3D visualisation tool, called Urban Sketch Tool (UST), which incorporates site-specific point cloud scenarios for the harbour

of Lachen (Switzerland) and allows for sketching urban visions for this study area. The tool is tested via a digital participation process VisLab Lachen. Another objective of this study is to conduct and analyse an online discussion with local stakeholders. Three objectives were specified for this purpose: to develop the UST, to initiate a digital participation process to test the tool, and to investigate a stakeholder discussion to evaluate if they find consensus or dissent, and what grey tones exist between. This has resulted in one overarching research question and three related sub-questions:

'How does a digital participation process involving stakeholders and using the Urban Sketch Tool (UST) shape the co-sketching of urban visions for the harbour area of Lachen (Switzerland)?'

1. How can the UST technically be developed?
2. How does the UST help in the sketching of one's own urban vision and support stakeholder discussion?
3. How do stakeholders discuss their urban visions, find consensus or dissent, and what grey areas exist between?

Thus, this study aims to contribute to the sparse knowledge of digital participation using 3D visualisation tools, including point cloud visualisations. By adopting a sketch tool, which was only used in rural areas by Celio et al. (2020), and developing the Urban Sketch Tool, as well as four scenarios for the study area, the tool is tested and evaluated in a digital participation process and an urban context for the first time. Thereby, I intend to provide valuable insights into how participatory digital tools and point cloud visualisations can be developed. Furthermore, the digital participatory processes reveal useful information about how to conduct participatory processes online using 3D visualisation tools and what challenges can occur in doing so. Finally, the analysis of the stakeholder discussion sheds light on a debated topic in planning research, the search for consensus in participatory planning processes, and tries to make space for dissent or conflict avoidance.

For this research, the harbour of Lachen, as the specific study area within the municipality of Lachen, was chosen. The specific study area was narrowed down by consulting the municipal construction administration, and discussing five potential locations derived from the ETH Zurich's 'Raumplus' database (Professorship for Spatial Development, n.d.). Lachen is a regional centre of the Canton of Schwyz and located on Lake Zurich within the 'March' region of the Zurich metropolitan area (Professorship for Spatial Development, 2010, p. 41). As a part of the 'Obersee' agglomeration programme, it is one of the region's most populous municipalities and a significant business location (Canton of Schwyz, 2020b, p. 11). However, to its favourable location and tax rate, the municipality faces increased settlement pressure (Professorship for Spatial Development,

2010, p. 41) and is challenged by the obligation to adhere to the revised spatial planning law's requirement for inner development in Switzerland (ARE, 2014). Based on these legal requirements, the Canton of Schwyz defined concrete guidelines for inner development and communal planning processes in its cantonal structure plan (Canton of Schwyz, 2020a), according to which Lachen's role as regional centre is to be expanded (ibid., p. 30).

Due to the Lachen's scarcity of building reserves, it is forced to inner develop and densify the existing building stock. Thus, I argue that the harbour of Lachen is an ideal study area. In particular, the two large car parks at the lakefront, which lay on public ground, seem to dominate this most prominent location. Under the circumstances of increased settlement pressure and indications of already ongoing planning at this place, they may no longer be reasonable. This exemplifies that this area offers great potentials to develop future scenarios. Furthermore, the popularity of the harbour offers optimal conditions to invite local stakeholders to sketch their urban visions, discuss local urban issues, and thereby test the Urban Sketch Tool and investigate the digital participation process. For this research, however, this can only be accomplished through the use of a mixed method approach. Due to the fact that this work entails the development of the UST with four scenarios, as well as initiates an online participatory process for its subsequent testing, this study consists of two methodological parts.

The first method part is technical and covers the development process of the UST and the simulation of four point cloud scenarios. This includes several steps as the collection of 3D data and their post-processing to generate a point cloud model of the harbour area, simulating point cloud scenarios with various 3D components, and the adoption of the existing sketch tool code (Celio et al., 2020). During a slight cloudy day and at various position within the study area, millions of points as 3D data for point clouds were collected by shooting laser light with a terrestrial laser scanner (Laing, 2019, pp. 56-57). The subsequent computer processing steps enabled the collection and integration of LiDAR data into a single colour 3D point cloud model, resulting in a precise and realistic 3D landscape point cloud visualisation of the harbour of Lachen. On this basis and with an established scenario systematics, The four scenarios 'Today', 'Green', 'Activity', and 'Dense' were simulated by combining various 3D point cloud components in Cinema4D (C4D). The rendered scenario images could then be integrated in the adopted UST code with JavaScript. Finally, the UST was made accessible online and served for the digital participation process, allowing for sketching urban visions of the harbour in Lachen.

The second part is qualitative and explains the VisLab participatory process and its design. It was launched after the UST was online. For the VisLab design, the current study adopted the Delphi method (Balram & Dragicevic, 2003; Julsrud & Uteng, 2015; Linstone & Turoff, 1975; Pullar & Tidey, 2001), which is not per se a method a technique for achieving consensus (Coates, 1975, p.

194). Considering the aforementioned planning critique (Allmendinger, 2017), and the seek for conflict rather than consensus of this contribution, this allowed to borrow a typical Delphi structure. The VisLab consisted of three rounds, for which eight local stakeholders were invited to participate online over a period of two weeks, and a fixed discussion at the beginning of summer 2021. Communication during the process was mainly by phone or email. For the first and second round, the participants had to sketch an urban vision based on the provided scenarios by using the UST. Between the first and second round, the sketched visions were distributed among the participants anonymously, which could have inspired for changes within the second vision. In addition, two questionnaires for each round were distributed, asking about the use of the UST. During the third round, the stakeholders got the opportunity to discuss their contribution and major subjects via a Skype conference, which was recorded and moderated by me. It was crucial to take as less influence on the discussion flow as possible to not disturb any dynamics that could have lead to consensus, dissent or other outcomes.

Before delving deeper, the thesis's structure is briefly described. The first Chapter 2 establishes a theoretical framework and begins with an introduction to contemporary planning theory and citizen participation. Additionally, it discusses how increasing digitalisation has influenced planning practises, resulting in the emergence of digital participation processes that rely increasingly on digital tools. The focus is then narrowed to 3D visualisation tools and point cloud visualisations. Chapter 3 contains more detailed information about the study area. Moreover, it details the process of developing the UST and includes an overview of all work phases and technological requirements, as well as a conclusion reflecting on the process. Chapter 4 explains the qualitative methods used in this study and goes into greater detail about the three VisLab rounds and their distinct tasks, the research sample, the data collection process, the data sources used, and the data analysis. Additionally, this chapter discusses the research's methodological ethics and offers reflections on the digital participation process. Furthermore, Chapter 5 covers the research findings, followed by Chapter 6, which contextualises the study results in light of the literature and states the research's limitations, as well as gives recommendations for future research or practical applications. The concluding Chapter 7 summarises the study's key findings and connects them to the stated research objectives. Additionally, the study's significance and contribution to the field are addressed.

Chapter 2

Theoretical Framework

The theoretical framework for this thesis begins with an introduction to contemporary planning theory that reintroduced citizen participation in urban planning practices. Following that, Section 2.2 will explain how new technologies have resulted in a shift towards new digital modes of citizens participation and delves deeper into the application of digital tools in such processes. Lastly, the final Section 2.3 will sharp the focus on 3D visualisation tools and point cloud visualisations that can serve, as they do in this research, as planning tools.

2.1 Citizen Participation in Urban Planning

Contemporary urban planning has its roots in Habermas' 1981 communicative turn in planning theory (Hillier, 2005, p. 110). Thus, this research introduces Habermas' theoretical concept and makes reference to (Forester, 1989) and (Healey, 1993), who applied the concept to planning practise by emphasising communication and collaboration among stakeholders. In her essay, Healey, summarised key aspects of communicative planning and established a planning agenda, from which relevant points for this research are discussed. Furthermore, communicative planning practises have been criticised (Allmendinger, 2017; Purcell, 2009). In particular, Allmendinger's 2017, p. 191 introduction of the terms 'depoliticisation' and 'post-politics' inspires this study to focus outside the overarching goal of planning, consensus building, during the digital participation process.

This research makes a distinction between communicative planning (Forester, 1989; Habermas, 1981; Healey, 1993) and citizen participation (Arnstein, 1969; Davidoff, 1965), as the latter may be discussed in other democratic decision-making processes as well (Macintosh, 2004; Tambouris et al., 2007, p. 2). They are not, however, mutually exclusive. In fact, communicative planning has reintroduced citizen participation as a critical component (Hillier, 2005, p. 110). Additionally, this topic is pertinent because the purpose of this study is to initiate a participatory process. Likewise, it provides a basic framework for a literature review on the impact of digitalisation on citizen participation. Thus,

Subsection 2.1.2 defines citizen participation in the context of urban planning (Arnstein, 1969; Laurian, 2004; Roberts, 2004) and discusses its objectives (Innes & Booher, 2004). Furthermore, the advantages (Albrechts, 2002; Arnstein, 1969; Potapchuk, 1996; Burby, 2003) and disadvantages (Innes & Booher, 2004; Irvin & Stansbury, 2004; Selle, 2013; Stivers, 1990) found in the literature are identified. Finally, Arnstein's 1969, p. 217 'ladder of citizen participation' is explained, as well as how it has been adopted for the present time (IAP2, 2014; Hasler et al., 2017), in order to determine the participation level of the VisLab Lachen.

2.1.1 Communicative Planning Theory: A Turn towards Consensus

Since the late 1960s, according to Hillier (2005), formal planning processes have represented a plethora of projects centred on citizen activism through 'advocacy', such as lobbying, or through 'intermediate proceedings', such as civil disobedience (p. 110). However, he asserts that in the 1980s and 1990s, concepts such as active citizenship and public participation were reintroduced, as were new conceptions of democracy as being inclusive rather than representative. Urban planning practises entail concepts such as communication among diverse stakeholders, as well as conversing with and listening to citizens (ibid.).

As Fathejalali (2017, p. 25) asserts, urban planning was first embedded in top-down planning techniques. As a result, theorists began developing novel theoretical approaches to demonstrate the value of planning (ibid.). Habermas (1981), for instance, believes in communicative modes of action that emphasises consensus in decision-making and policy formulation, advancing democratic and participatory processes. He introduces the concept of communicative action and rationality, which is criticised for being overly abstract by Low (1991). Moreover, Healey & Hillier (1995) criticise him for offering little explanation on how such an approach may function in practise. However, some attempts have been made to convert his concepts into planning practise (see Allmendinger, 2017, pp. 247-248).

According to Fainstein (2000, p. 454), communicative planning is based on Jürgen Habermas' theory of communicative rationality. As Fathejalali (2017) mentions, in Habermas' (1981) communicative rationality, 'post-structuralism, language, and untwisted communication', all play a crucial part in reaching consensus (p. 24). Habermas' communicative action creates a space for the public, in which all participants can freely express their opinion and make choices through communication. In this context, a consensus builds on confidence and should not be warped by underlying power structures, he notes (ibid.). Furthermore, Allmendinger (2017) believes that Habermas' work serves as the 'backbone of the communicative approach' and has had a significant influence on those who research planning as a communication process (p. 242). Forester (1989, 1993),

Healey (1993, 1997), and Sandercock (1998, 2003) then applied Habermas' (1981) concept to planning practise.

The 'communicative turn' in planning theory has demonstrated the significant role of communication in planning decision-making and the significance of collaboration among as many stakeholders as feasible in achieving 'political democratisation of daily communication', Forester (1989, p. 21) argues. Additionally, planning is fundamentally a pragmatic activity shaped and influenced by power (ibid., p. 5). He further sees planners as 'gatekeepers' who selectively draw attention to a variety of opportunities in a liberal environment based on communication (ibid., p. 15). Furthermore, Sandercock (1998, p. 183) believes that planning should strive to create a more pluralistic and varied society. Furthermore, she argues (ibid.) that contemporary planning is founded on modern ideas and is socially restrictive, gender prejudiced, racially intolerant, and incapable of uniting various minority voices.

Patsy Healey (1993), one of the principal theorists who advanced Habermas' theory in urban planning, summarises some key statements on communicative planning at the time. This planning agenda can assist in identifying focus areas for this research project. According to her essay, planning is an interactive process that emphasises decision-making. As such, the decisions made by stakeholders during the sketching process are of particular interest. Additionally, dialogue is a critical component of planning. This element is represented by the exploration of stakeholder decisions and perspectives through the exchange of sketched urban visions and their discussion in the VisLab Lachen. Additionally, in the context of communicative planning, this engagement can include the identification and evaluation of urban issues. Furthermore, the VisLab participants acquire knowledge about one another and engage in a process of mutual learning through interaction. This process has the potential to result in mutual understanding among stakeholders, which is a main objective of communicative planning. Lastly, Healey argues that planning serves as a forum for conflict resolution and consensus building, which will be considered differently in this study (ibid., pp. 242-244).

Various scholars (Allmendinger, 2017; Purcell, 2009) have criticised the communicative planning method. As Allmendinger (2017, p. 191) notes, the terms 'depoliticisation' and 'post-politicisation' are increasingly considered useful approaches in understanding contemporary planning. They can be thought of as a lens through which modern planning may be viewed and interpreted. He notes that 'depoliticisation' has historically been regarded as a broad process and direction of travel that exemplifies the shifts of contemporary planning towards limiting transparency, towards accountability and towards governing with adequate (but not excessive) democratic input to keep legitimacy. 'Post-politicisation' is primarily concerned with a set of strategies for deferring and relocating discussion away from planning into administrative or technical (post-political) arenas.

Both, however, emphasise that modern planning operates in a different era, one in which planning plays a critical role in the regulation of growth by avoiding conflict through a stage-managed seek for consensus (ibid.). Purcell (2009, p. 143) raises another critique and makes aware of the existing power imbalance and hegemony within urban planning. He contends that communicative planning is an approach for achieving democratic legitimacy through consensus building to be able to develop urban space in accordance with neoliberal needs (ibid.).

Allmedinger's (2017, p. 191) critique reveals a contradiction between planners' open and growing commitment to increased public participation and the public's dissatisfaction with and rejection of planning processes and outcomes. Taking this into consideration, this research agrees with this criticism, and thus attempts to address it by trying to detect potential depoliticising tendencies during the participatory process. Moreover, the two theories overlap in the critique of consensus building. Furthermore, Purcell (2009, p. 155) emphasises that planning practices should not only focus on reaching consensus, and advocates to empower participant voices that could be conflicting. Therefore, this research seeks to look outside the overarching planning goal of consensus building by trying to uncover conflict dissolutions or avoidances. Eventually, in recognition of the power imbalances inherent in urban planning (Purcell, 2009, p. 143), the VisLab should be kept as balanced as possible. This can be accomplished by carefully selecting stakeholders and moderating the participation process as neutral and uninfluential as possible.

2.1.2 Citizen Participation: Definitions, Aims, Benefits and Disadvantages

The concept of citizen participation entered the realm of urban planning in the 1960s with Davidoff's (1965) introduction of advocacy planning. Since then, researchers have attempted to elucidate many facets of this discourse. Arnstein (1969) examines citizen participation through the lens of citizen power in decision-making. Participation, she argues, 'is the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future. It is the strategy by which the have-nots join [...] [and] by which they can induce significant social reform which enables them to share in the benefits of the affluent society' (ibid., p. 216).

Roberts (2004) defines contemporary citizen participation as 'the process by which members of a society (those not holding office or administrative positions in government) share power with public officials in making substantive decisions and in taking actions related to the community. The focus is on direct participation (when citizens are personally involved and actively engaged) as opposed to indirect participation (when citizens elect others to represent them) in the decision process' (p. 320). Citizen participation is seen as in this research as

an approach that encourages individuals to engage and share their perspectives on urban issues by providing them with a voice and thus the ability to influence planning decision-making processes and results. However, it should be noted that the participation process VisLab has no influence over any local planning decisions.

Innes & Booher (2004) define seven aims for citizen participation that include the majority of the justifications for participation commonly voiced in the literature. One is (1) for decision makers to ascertain the public's preferences in order to include them into their decisions. A second purpose is (2) to enhance decision-making by integrating individuals' local expertise. A third reason for involvement is (3) to foster a more fair and just planning process. Fourth, (4) citizen participation ensures that public choices are legitimate. As a fifth priority, (5) it is something planners and public officials must undertake by law. Finally, according to methodologies, the sixth and seventh aim of involvement (6, 7) can include building civil society and creating an adaptable, self-organising political system capable of resolving challenges in an informed and effective manner (ibid., pp. 422-423).

In addition to this, literature also discusses the benefits (Albrechts, 2002; Arnstein, 1969; Burby, 2003; Potapchuk, 1996; Selle, 2013) and disadvantages (Day, 1997; Innes & Booher, 2004; Irvin & Stansbury, 2004; Selle, 2013) of citizen participation. The engagement of people, according to Arnstein's (1969) work, increases residents' knowledge and awareness, fosters commitment, improves the responsiveness of the government, and contributes to the development of social capital in a civic society. Furthermore, Selle (2013, p. 19) summarises the benefits of citizen participation as follows: it reduces conflict and accelerates planning processes; it strengthens local democracy and improves political decisions; it fosters local identity and increases social capital; and it compensates for a lack of legitimacy. According to Albrechts (2002, pp. 331-332), citizen participation fosters the gathering of varied citizen perspectives, provides genuine political opportunities, and raises awareness on local needs and issues.

Potapchuk (1996) and Burby (2003) highlight further benefits of citizen participation. Potapchuk (1996, p. 34) believes that if planners succeed in engaging a diverse range of stakeholders in the planning process, they may produce better plans and improve the potentials of government action on topics that initially lack public support. As he mentions (ibid.), this public participation may generate knowledge and understanding, as well as lead to consensus on issues and possible solutions. In addition to this, Burby (2003, pp. 57-58) proposes for 'visioning' as a participatory practise-based approach. He points out (ibid.) that a shared vision developed collaboratively by citizens, local government, and other institutions can serve as the glue that binds disparate programmatic and political initiatives together, thereby providing a sense of direction for them all. Methods for inclusive community visioning inspire optimism and have the potential to

empower participants, he adds (ibid.).

Despite the benefits stated before, citizen participation is seen as an ambiguous concept in the literature. In an essay, Day (1997) discusses citizen participation in urban planning as a fundamentally contested notion. Furthermore, Irvin & Stansbury (2004, p. 58) claim that participation creates downsides for both participants and the government. The decision-making process is time-consuming and costly for both sides, they argue. In addition, if decisions are not executed, they appear to be pointless for the public. On the other hand, participation processes may backfire and increase public hostility towards the government. When it comes to the outcomes of participation processes, Irvin & Stansbury (ibid.) contend that if they are overly influenced by opposed interest groups, this may contribute to bad decisions for participants. Moreover, bad decisions are impossible for the government to ignore, which leads to a potential loss of decision-making control with less budget for actual project implementation (ibid.). Additionally, Stivers (1990, p. 89) observes that consensus exists regarding the unworkability of significant public participation in government. On the contrary, Selle (2013, p. 4) discusses the drawbacks from a practical standpoint. He (ibid.) claims that involvement is time-consuming and expensive, that nothing will happen as a result of it, and that the outcomes of participation will not be included into the plans. Finally, people believe they lack the ability to change previously made decisions, he adds (ibid.).

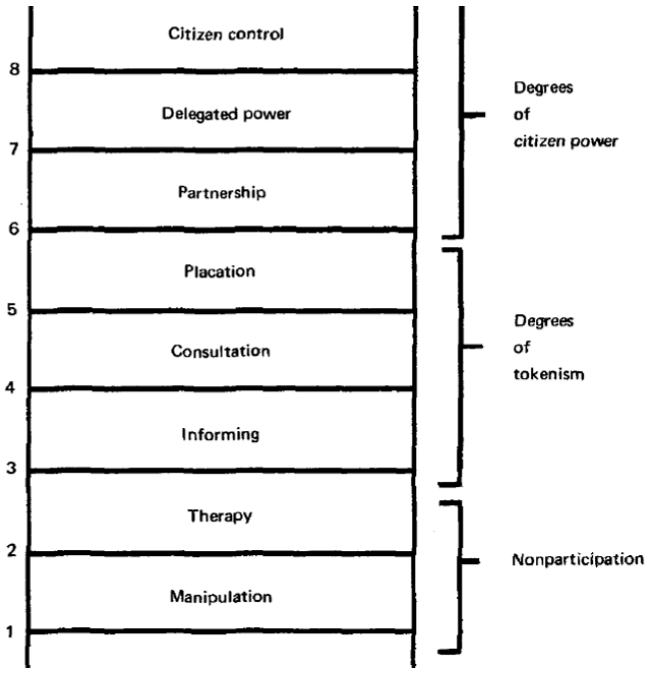


Figure 2.1: Ladder of citizen participation (Arnstein, 1969, p. 217)

Despite the well-known disadvantages of participation processes, Innes & Booher (2004, p. 419) emphasise that they are frequently neglected. Furthermore, they claim that participation methods for involving the public in decision-making processes are ineffective, mentioning several points of criticism: no genuine level of involvement in planning or decision-making processes is achieved; certain groups of society feel that their voice is being ignored; made decisions are rarely better than before; and the public is not adequately rep-

resented. Additionally, participatory planning discourages competent people from contributing to participation processes that intend to fulfil legal requirements. In addition, Innes & Booher assert that planners and other authorities are often hesitant to hear from the public at all. Nonetheless, these techniques are an important aspect to them, and they persist despite widespread awareness of their failings (ibid.).

Aside from the benefits and drawbacks of participation, various formats of public participation with varying degrees of involvement exist in practise (Arnstein, 1969; Hasler et al., 2017). Arnstein (1969) developed a ladder of citizen participation to categorise participatory processes based on the citizen's power to influence or change the outcome. However, as Hasler et al. (2017, p. 233) highlight, these categories are now obsolete and do not account for contemporary citizen participation, which is often digital (this topic will be addressed in Section 2.2). Nonetheless, such a ladder is necessary for recognizing various forms of participation and defining citizens' roles and involvement in participatory planning processes. Therefore, Hasler et al. (ibid.) propose a new ladder that includes digital participation methods. This contemporary proposition helps to categorise the VisLab Lachen.

The ladder pattern by Arnstein (1969, p. 217) integrates eight levels of citizen participation, as shown in Figure 2.1. While this is a simplification, Arnstein (ibid.) asserts that the ladder demonstrates the often-overlooked fact that there are substantial levels of public involvement: (1) 'manipulation' and (2) 'therapy' are the ladder's lowest rungs. These two rungs correspond to various degrees of 'non-participation'. Rungs (3) 'informing' and (4) 'consultation' advance to degrees of 'tokenism' that enable the have-nots to hear and speak. Rung (5) 'placation' is just a higher-level tokenism, since the ground rules let have-nots advise but reserve the ability to decide to power holders. (6) 'partnership' allows them to negotiate and make concessions to power holders. At the highest rungs, (7) 'delegated power' and (8) 'citizen control', have-not citizens acquire the majority of decision-making seats, if not all management authority (ibid.). Lastly, Arnstein (1969, p. 217) emphasises the limitations of such typologies, which are inherent in the process of classification. According to her, the opposing factions are no homogeneous blocs. Additionally, there may be 150 rungs with less defined and clear differences. Besides, some characteristics shown for each of the eight categories may apply to other rungs too (ibid.).

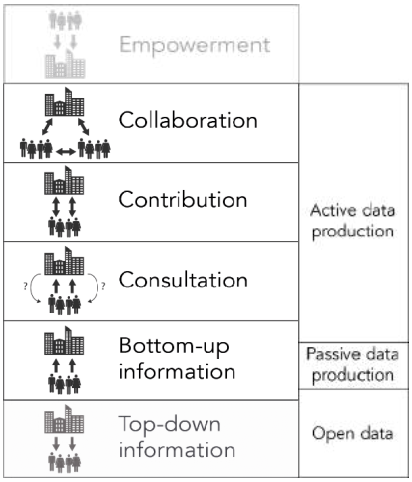


Figure 2.2: New ladder proposal for digital citizen participation (Hasler et al., 2017, p. 233)

In contrast to earlier classifications, the approach of Hasler et al. (2017, p. 233), as shown in Figure 2.2, does not focus primarily on citizens' role in decision-making. Rather, it highlights the contributor's level of participation through interactions with urban authorities. This implies that the greater the level of participation, the more exchanges between the participants and the authorities take place. The interactions at the two lowest rungs of the ladder, top-down and bottom-up information, are one-way. At the consultation level, people respond to questions posed by city authorities, for example, through online surveys. Contribution is a term that refers to digital tools (covered in Subsection 2.2.2) that enable people to express their perspectives and interact freely on particular projects. At the level of collaboration, people may openly share their thoughts and proposals. For instance, participants may vote or leave comments on other contributors' ideas and opinions. The highest level, empowerment, was excluded from the research due to the lack of classifiable examples at this point (ibid.). Due to the fact that this work's participation process enables the stakeholders to sketch their own visions, which are then shared among participants and finally discussed in a focus group setting where everyone can express their perspectives, the VisLab can be classified as a 'collaboration' process, according to the ladder of Hasler et al. (ibid.).

2.2 Digital Citizen Participation in Urban Planning

It is still unclear how comprehensive digitalisation processes affect citizen participation. This is critical to establish because this study establishes a digital participation process with the Urban Sketch Tool. Therefore, the emphasis at the outset of this section is on the evolution of participation methods towards digital approaches over the last decades. By doing so, this review seeks to explain the increasing use of information and communication technologies (ICTs) (Potts, 2020) by discussing the failure of non-digital forms of participation to engage people (Evans-Cowley & Hollander, 2010; Krek, 2005), as well as stating their drawbacks highlighted in the literature (Baker et al., 2007; Conroy & Evans-Cowley, 2006; Evans-Cowley & Hollander, 2010; Wilson et al., 2019). Furthermore, it attempts to grasp the opportunities offered by the use of new technologies, which eventually led to new digital forms of participation (Conroy & Evans-Cowley, 2006; Evans-Cowley & Hollander, 2010; Gordon et al., 2011; Wilson et al., 2019). Subsection 2.2.2 then defines digital participation and discusses its overarching objectives (Albrecht et al., 2008; Macintosh, 2004; Tambouris et al., 2007). Moreover, because this study employs a variety of tools during the VisLab, more attention is paid to ICTs, as well as their benefits and drawbacks for digital participation processes (Albrecht et al., 2008).

2.2.1 Emergence of New Technologies in Citizen Participation

According to Evans-Cowley & Hollander (2010, p. 399), the majority of spatial planning participation methods thus far have been non-digital, frequently referred to as traditional or face-to-face. As Krek (2005, p. 2) notes, this involves personal discussions, meetings held in public spaces, and presentations of planned activities using analogue maps. Baker et al. (2007, p. 86) and Conroy & Evans-Cowley (2006, p. 384), on the other hand, argue that traditional planning methods are limited to involve citizens and fail to inform them about participation opportunities. Furthermore, Wilson et al. (2019, p. 297) believe that on-site participation events are not as accessible to the public as they should be. Thus, Evans-Cowley & Hollander (2010, p. 401) note that they are frequently accompanied by the same participants. Additionally, they argue (ibid., p. 399) that institutionalising participation in traditional forms limits the amount of time and knowledge an individual can acquire about a complex issue. As a result, they argue, participation in this environment has become less meaningful and effective for knowledge exchange or learning than it could be. Consequently, planners are increasingly exploring novel methods of involving citizens in planning, including online techniques (ibid.).

As Potts (2020, p. 273) notes, the internet (also referred to as the web) evolved through three distinct phases concurrently with the communicative turn in planning over the last several decades. Between the early 2000s and the late 2000s, Evans-Cowley & Hollander (2010, p. 398) note that planners widely adopted ICTs relying on Web 2.0. According to Potts (2020, p. 274), Web 2.0 introduced new ways for individuals to connect through personal profiles and share, read, and change information on social networks. The introduction of new mobile devices such as laptops, tablets, and smartphones facilitated this process (ibid.). Web 2.0 allows people to not only read about planning issues and policies on local government websites, but also to interact in new and more participatory ways (Conroy & Evans-Cowley, 2006, p. 372). Furthermore, Wilson et al. (2019, p. 288) emphasise that citizens may better comprehend planning and raise awareness of participation opportunities by embracing online technologies in participation processes. Additionally, this reduces barriers to citizen participation and forge a link between community perspectives on urban issues and new participatory planning methods. Thereby, the accessibility to participation is improved, enabling the public to shape the future of their neighbourhood more easily (ibid.). The VisLab is designed in a way that it should allow for interactive participation. It is unknown whether digital access is beneficial for the stakeholders as a result of digital interaction and the use of the UST. Thus, these two points will be evaluated, as well as the capabilities of the UST in particular.

Online participatory platforms and other ICTs, as Evans-Cowley & Hollander (2010, p. 398) points out, are increasingly utilised to involve communities in planning. In their study, Gordon et al. (2011) show that ICTs enabled new meth-

ods for gathering and analysing data on urban systems and their inhabitants, for informing and making choices, for comprehending diverse interests, and for involving stakeholders in the planning process. Additionally, studies (Stratigea et al., 2015; Wilson et al., 2019) demonstrate that the growing diversity of ICTs (hardware and software) enables enhanced communication, collaboration, and consultation, as well as the collection, analysis, and interpretation of data, often in real time. According to Potts (2020, p. 272), planners' main emphasis on communication and communicative rationality during this time period was undoubtedly encouraged but also accelerated in part by advancements in ICTs and the increasing availability of participatory tools and platforms. She emphasises that almost every aspect of modern planning practise now incorporates technology (ibid.).

Recent advancements in the field of web-based and user-friendly applications, as well as the growing use of the internet for communication and interaction, all contribute to the emergence of new modes of citizen participation, Krek (2005, p. 2) states. There exist various terms that are used to define citizen participation based on ICTs, including 'ICT-supported participation' (Palen & Liu, 2007), 'online engagement' (Chen & Dimitrova, 2006), 'digital participation' (Smith & Craglia, 2003), 'web-based participation' (Kingston et al., 2000), 'online participation' (Wojcieszak, 2009), 'internet-based participation' (Evans-Cowley & Hollander, 2010), and 'electronic participation' (eParticipation) (Conroy & Evans-Cowley, 2006; Macintosh, 2004) (Fathejalali, 2017, p. 35). Throughout this study, the term 'digital participation' will be utilised.

2.2.2 Digital Participation and Tools

The widespread use of web-based ICTs, coupled with a tendency towards increased citizen participation in decision-making in urban planning, has been the main driver of the emergence and development of digital participation (Loukis, 2012, p. 96). Thus, according to Hasler et al. (2017, p. 231), citizen participation processes that uses ICTs can be defined as 'digital participation'. Consequently, as this study includes the use of ICT and in particular the Urban Sketch Tool, it can be classified as a digital participation process. Furthermore, to briefly clarify terminology, the term 'digital tools' will henceforth be used in this research to refer to ICTs.

Albrecht et al. (2008, p. 22) state that in practise, a variety of formats and/or digital tools are available to facilitate the adoption of new technologies in participatory processes. According to them, 'the term "tool" refers to the technical functionality and implementation, whilst "format" refers to the abstract information and communication pattern' (ibid.). Table A.1 in the appendix Chapter A covers a selection of digital formats and/or digital tools as partly mentioned in Albrecht et al. (2008, pp. 19-21). Fathejalali (2017, p. 46) asserts

that each tool of participation provides distinct roles and levels of participation that address distinct demands and needs during the citizen participation process in urban planning. In this research, during the VisLab process, a variety of digital tools were used to involve and communicate with stakeholders such as email, online questionnaires, online surveys or a videoconference (more detail on the use of these tools can be found in Chapter 4) (ibid.). In particular, the four scenario simulations of the UST may allow people, in the light of Albrecht et al. (ibid.), to interact with a topic playfully and may simulate the results of sketching decisions by the stakeholders.

According to Albrecht et al. (2008, p. 22), there is no discernible distinction made between mobile tools that may be accessed using mobile applications and stationary tools that can be utilised at home or at work. The term mobile refers to the ability of a particular application and/or format to be accessed by a variety of mobile devices such as laptops, tablets, and smartphones in different locations. One significant distinction between internet-based and mobile-based digital tools is that the latter must be customised to the unique feature of mobile access (ibid.). Although the UST can be accessed with a smartphone, the display size is too small for the sketching. Therefore, a computer screen or tablet is best for using the UST. Lastly, tools can be customised and adapted for a specific participatory procedure, allowing them to be used exclusively for that procedure Fathejalali (2017, p. 46). The UST with the four scenarios of the Lachen harbour is specifically developed for the VisLab in Lachen. However, with new adoptions and other simulations, it also allows sketching visions of other places.

Macintosh (2004, p. 2) and Albrecht et al. (2008, pp. 17-18) state overarching objectives of digital participation, which are adopted for this research. To begin, the authors believe that a wider variety of interests and points of view can be reached through digital participation. The current study attempts to accomplish this objective by conducting a targeted outreach to stakeholders, which can be facilitated by digital capabilities. As a secondary purpose, the use of digital tools should make participation easier for people involved. Thirdly, a more accessible and comprehensible format should be provided to encourage more informed stakeholder contributions and discussion. Fourth, equality should be increased through digital participation. Fifth, pertinent information should be offered during the participation process to support decision-making. Sixth, digital participation should facilitate dialogue between divergent points of view, which is addressed in the VisLab discussion. The seventh goal is to increase transparency regarding stakeholder decisions made during the vision sketching process. The use of the UST in the VisLab should, eighth, raise participants' awareness of the Lachen harbour and its future development, and ninth, contribute to the formation of opinions on the subject (ibid.).

In a nutshell, Afzalan & Muller (2018, p. 165) mention the broader objectives of digital participation, which include inclusive planning, consensus building, and

learning from local knowledge. Similarly, the current study seeks to achieve as much inclusive participation as possible by involving a diverse group of stakeholders and soliciting their support. However, as a sidenote, the inclusion in the VisLab is limited due to the small number of participants. Furthermore, it is interesting to note that research on digital participation reflects various priorities of communicative planning, most notably consensus-building. As previously stated, the participation process VisLab is not solely focused on reaching consensus. Nonetheless, its debate is necessary. Lastly, learning from local knowledge entails for the VisLab the exploration of stakeholders' perspectives on the Lachen harbour area. On the basis of these three themes, the advantages and disadvantages of digital participation are discussed.

Inclusive planning. Evans-Cowley & Hollander (2010) argue in their study that digital tools engage more participants and a more diverse community in participation processes. Additionally, Conroy & Evans-Cowley (2006, p. 374) write that through the use of digital technologies, information is easier to share or misinformation is rectified. Such technologies may improve residents' overall planning experience by delivering one-way information flow in an appealing, interactive manner (ibid.). Furthermore, according to Godschalk (2004, pp. 8-9), they facilitate two-way interaction with stakeholders and enable numerous kinds of agencies to discuss scenarios at various geographical scales. In particular, the possibility for participants in the VisLab process to sketch, share and discuss their own visions may generate interaction in many directions. Moreover, Hasler et al. (2017, p. 235) believe that digital tools enable new sociodemographic profiles such as young people and families to be reached, thus amplifying unheard voices. In addition, Randolph (2004, p. 74) asserts that digital tools enable engagement in ways that assist participants with time or financial constraints in overcoming barriers to participation. If the stakeholders can access and handle the UST, they can use it from anywhere at any time, which may indeed save time and costs for them.

On the contrary, there has been widespread criticism in research about the equity of digital participation processes in the face of the digital divide and social exclusion (Graham, 2002; Dezuanni et al., 2018; Norris, 2001; Kuder, 2018; Pham & Massey, 2018; Seifert et al., 2018). Pham & Massey (2018, p. 316) identify both technological issues such as access to technical devices and software and non-technical issues such as digital skills as prerequisites for achieving access to digital participation. Participation through digital technologies may thus be socially selective, as Klemme et al. (2017, p. 9) claim. As researchers indicate, disparities in access and digital skills exist between the wealthy and the poor (Graham, 2002), urban and rural areas (Pham & Massey, 2018), as well as between young (Frank, 2006) and elderly (Seifert et al., 2018) people, posing a risk of exclusion. Additionally, Klug et al. (2010, p. 22) note that barrier-free access is frequently not implemented for disabled people. Graham (2002, p. 36) argues that digital tools exacerbate the marginalisation of disadvantaged peo-

ple and empower the wealthy, resulting in socially biased plans or developments. Furthermore, Klemme et al. (2017, p. 4) say that the use of digital tools does not increase the number of participants, and unmatched sections of society remain invisible throughout the process. Thus, Klug et al. (2010, p. 22) and Wilson et al. (2019, p. 4) emphasise the importance of designing digital tools that are user-friendly and accessible to those who face the greatest barriers. Bernstein & Kaußen (2019, p. 533) assert, however, that the majority of individuals do not accept a significant portion of digital participation tools. As a result, they argue, missing contributions are the greatest risk associated with digital participation, which is why the procedures are used informally (ibid.). These criticisms are important to keep in mind because they may undermine goals of digital participation such as providing improved access to participation, equality or data collection (Macintosh, 2004; Albrecht et al., 2008). Additionally, if one is versed in using digital tools, it can easily be forgotten that this may not be the case for others, especially older people (Seifert et al., 2018). Therefore, particularly in light of social exclusion, a focus on digital skills is crucial during the VisLab process.

Consensus building. Innes & Booher (2010) led to a debate about the feasibility of achieving consensus and mutual understanding in online environments within the context of communicative rationality theory (Forester, 1989; Habermas, 1981). In their study, Afzalan et al. (2014) argue that digital tools facilitate consensus building. They are effective, according to Mandarano's (2015) research, because they allow individuals to engage at their convenience. Additionally, Hampton & Wellman (2003) focus on online neighbourhood discussions that allow participants to exchange ideas, clarify their arguments, and reach consensus, all of which contribute to the development of social connections and trust among participants. However, Kubicek's (2017) study demonstrates that providing information online does not always result in increased transparency regarding digital participation. Furthermore, Miessen (2012, p. 80) argues that digital participation largely eliminates room for disagreement and results in multiplications rather than new insights. He believes that dissent and conflict are necessary components of more productive participation (ibid., p. 78). Thus, it seems to be beneficial if stakeholders develop an understanding of one another during the VisLab. However, it appears critical to recognise, and Miessen highlights this again, that consensus does not have to be the only outcome of a participation process; other dynamics such as conflict or conflict avoidance may also occur, for which this research specifically seeks to create space.

Learning from local knowledge. According to Afzalan et al. (2014, p. 155), digital tools make it possible to learn from many people. They may contribute to the collection of local knowledge and needs by reviewing online contributions made by participants (ibid., p. 167). As Seltzer's (2013) study shows, digital tools assist in the development of novel ideas and act as a springboard for additional community interaction or engagement. Furthermore, as Hasler et al.

(2017, p. 235) point out, they enable access to a broader variety of data types and formats. This enables the collection of data that were previously unavailable or difficult to collect, such as information about perceptions, opinions, or ideas. These citizen-centric urban data sets gathered through digital methods provide an insight into a place that is both unique and more accurate, she writes (ibid.). With the application of the UST, the sketched urban visions may be an interesting dataset to analyse (Hasler et al., 2017, p. 235), as they may help identify local needs for the Lachen harbour (Afzalan et al., 2014, p. 155). Even though, the purpose of this research is to discuss these contents. Additionally, the simulated scenarios may assist stakeholders in forming new ideas or making decisions that can be discussed (Seltzer & Mahmoudi, 2013). Furthermore, Al-Kodmany (1999, p. 43) believes that digital tools, as the UST, can allow participants to engage actively in the process. According to him, digital sketching improves the collection of information and ideas about a location, such as how it should appear and which characteristics should be included (ibid.).

However, Evans-Cowley (2011, p. 3) asserts, that digital participation requires technological support and regular communication with participants about the process. Moreover, Nanz & Fritsche (2012, p. 91) argue that asynchronous participation requires the presence of a time-flexible moderator who, as Laing (2019, p. 51) explains, mediates between users and facilitates discussion. These statements thus suggest that information and the availability of support be communicated repeatedly throughout the VisLab process (Evans-Cowley, 2011; Nanz & Fritsche, 2012). Furthermore, according to Laing (2019, p. 51), having the discussion without a moderator seems indispensable. Besides that, Selle (2017, p. 18) asserts that attempting to connect with the community online may have the opposite effect, resulting in fatigue, boredom, and disinterest of them. Furthermore, Eisel (2016, n.p.) claims that the information content supplied by digital technologies influences participants' critical views on the subject at hand. This, as Münster et al. (2017, p. 2402) indicates, could make it challenging to extract relevant data during the analysis.

Laing (2019, p. 55) notes that data creation and management need advanced skills and technological requirements, resulting in additional financial outlays. As this research project is a scientific project, the financial costs are less important. However, in practise, the costs associated with public involvement may be relevant due to possible time or budget restrictions. Besides the cost of hardware, developing digital tools often requires specialised expertise from external suppliers who influence the process via their creation of participation formats (Klemme et al., 2017, p. 10). This point is reflected in the VisLab through the scenario simulation process and the process moderation, both of which are dependent on my decisions and competences. What is more, Van Zoonen's (2016) study raises privacy concerns about the information shared by participants. The data may be beyond the control of involved local authorities or initiators but within the legal rights of data storage providers or software suppliers (Afzalan & Muller, 2018,

p. 167). Therefore, this study seeks to follow the recommendation of Hasler et al. (2017, p. 237) that data must be protected, and access rights must be transparent.

2.3 Digital Participation in the Third Dimension: 3D Visualisation Tools and Point Cloud Visualisations

By delving deeper into 3D visualisation tools and point cloud technology, this research's background increases the degree of concretisation one final time. Because this study's aim is to develop the UST using point clouds, this is a critical category to cover within the numerous digital tools for participatory processes. This is accomplished through an examination of the purpose and communicative potential of 3D visualisation tools for participatory processes (Al-Kodmany, 1999; Laing, 2019; Lange, 2001; Wissen et al., 2008). In particular, this section will examine the possibilities presented by 3D visualisations of the real world (ibid.; Wissen Hayek, 2011), as well as the visual content and components of such representations (Hall, 1990; Lange, 2001; Lovett et al., 2015). Additionally, it can be insightful for this research to identify the objectives for the use of 3D visualisation tools mentioned in the literature (Laing, 2019; Sheppard, 1989; Wissen et al., 2008; Wissen Hayek, 2011), so that these can be addressed through the application of the UST in the VisLab. Furthermore, the mentioned benefits (Al-Kodmany, 1999; Lange & Hehl-Lange, 2005; Wissen et al., 2008; Wissen Hayek, 2011) and drawbacks (Al-Kodmany, 2001; Laing, 2019; Lange, 2001; Lange & Hehl-Lange, 2005; Wissen Hayek, 2011) should be considered in order to gather arguments for the applications of 3D visualisation tools, as well as to know the challenges that can arise.

Because the scenarios for the Lachen port are simulated in this thesis using point cloud visualisations, Subsection 2.3.2 examines recent developments in this field. It explains the method (Laing, 2019) and underlying data sources used in research (Spielhofer et al., 2017) for generating an accurate and realistic three-dimensional point cloud visualisation (Spielhofer et al., 2017; Wissen Hayek, Spielhofer, & Grêt-Regamey, 2019; Urech et al., 2020). Finally, the literature provides insight into the advantages and disadvantages of using point cloud visualisations (Laing, 2019; Lin et al., 2016; Kuliga et al., 2015; Spielhofer et al., 2017; Urech et al., 2020; Wissen Hayek, Spielhofer, & Grêt-Regamey, 2019), which are tested and contextualised with the UST in the VisLab Lachen.

2.3.1 3D Visualisation Tools

As Al-Kodmany (1999, p. 39) points out, traditional planning methods fail to engage the public because they also lack a visual representation of what is being proposed in relation to what already exists. According to Wissen et al. (2008, p. 184), the challenge inherent to participatory planning processes is effectively communicating critical planning information to all stakeholders. Moreover, Laing (2019, p. 179) argues that in order for planning disciplines to be more easily understood by the public, they must operate in three dimensions. As Al-Kodmany (2001, p. 13) claims, 3D visualisations have a high potential for naturally communicating information and making it understandable to the public. Because three-dimensional visualisations enable the connection of all dimensions, visual and non-visual aspects of the landscape, and even provide new planning tools: 3D visualisation tools for the representation of the third dimension and image of the real world (Lange, 2001, p. 164).

Not only the current, but also the future state of the landscape is critical for planning. Therefore, Lange (2001, p. 179) stresses the need of using 3D visualisation tools to depict virtual landscapes. Then, since they provide spatial and temporal flexibility, retrospective as well as prospective, their potential applications are manifold. Via the use of digital visual simulation, the past, present, and even the future, as represented through scenarios, may be depicted concurrently, he says (ibid.). Furthermore, as shown by Lange & Hehl-Lange (2005, p. 554), 3D visualisations allow for various degrees of interaction, which is essential for their use as a communication tool. Thus, viewers can intuitively assess changes in the visual environment by contrasting different scenarios and time periods (ibid.). As Al-Kodmany (1999, p. 43; 2001, p. 6) emphasises, 3D visualisation tools are particularly effective during the early stages of participatory processes. Or, as Wissen Hayek (2011, p. 934) puts it, when it comes to motivating participants, increasing their awareness, and focusing their attention on a particular subject such tools are particularly effective.

According to Lange (2001, p. 165), a digital simulation is always an abstracted representation of a complex reality. As he mentions (ibid., 164), the primary components are terrain, buildings, and vegetation. He adds (ibid., 180) that a virtual landscape with a highly detailed orthophoto and 3D objects can realistically represent a specific landscape. Hall (1990, p. 191) defines the term 'realistic' as 'producing an experience that is indistinguishable from the actual one; providing the same stimulus as the real environment; generating the same perceptual reaction as a real scene'. According to Lovett et al. (2015, p. 86), a frequently used simulation method is to collect data for a study area in a computer-aided design (CAD) or geographic information systems (GIS) database and then generate various types of three-dimensional outputs. As they put it, this could be accomplished through the creation of still images or scrolling panoramas from predefined viewpoints that enable user interaction with the visual content (ibid.).

As Wissen Hayek (2011, p. 928) points out, such approaches may increase the transparency of the planning process or, in the case of realistic 3D visualisations, the visualisation process.

Sheppard (1989, p. 51) identifies three objectives for 3D visualisations: '(1) they are understood by people, (2) they are convincing to people, and (3) they are unbiased'. As such, Laing (2019, p. 80) argues, they have the potential to convey and contain information. Additionally, Wissen et al. (2008, p. 185) highlight that interactive visualisations enable different target groups to individually view, combine, and explore the underlying geodata. Moreover, 3D visualisations are typically information tools, which means they can be used to support and encourage participation (Wissen Hayek 2011, p. 928; Laing 2019, p. 80). The following paragraphs will discuss the benefits and challenges of utilising 3D visualisations in participative processes in more detail.

A key benefit of 3D visualisations is that they offer participants a common language. Additionally, by providing a basic initial assessment, 3D visualisation tools foster participation and encourage stakeholders to discuss scenarios from various viewpoints (Al-Kodmany 1999, p. 45; Wissen et al. 2008, p. 194; Wissen Hayek 2011, p. 921). Moreover, Wissen Hayek (2011, p. 934) argues that 3D visualisations are useful for gathering local knowledge because they let information flow throughout all directions. This is consistent with the findings of Lange & Hehl-Lange (2005, p. 849), which show that visualisations expand the opportunities for participation and improve communication between experts and the public, as well as facilitate discussion among them. Furthermore, according to Wissen et al. (2008, p. 194), realistic 3D visualisations raise 'awareness, [contextualise] information, and [encourage] a critical comparison with one's personal perception as well as the further analysis of a topic'. Finally, Lange & Hehl-Lange (2005, p. 833) asserts that 3D visualisations may serve as a mediating tool in resolving conflict between stakeholders. As a result, 3D visualisations support for more rational and informed decision-making, as Al-Kodmany (1999, p. 45) points out.

In addition to these benefits of 3D visualisations, Lange (2001, p. 180) stresses that they represent a virtual environment only at a single moment in time. While a simulation can be altered digitally, the place-based dynamics, diversity, and variation, he adds, cannot be captured (ibid.). Additionally, as Al-Kodmany (2001, p. 27) emphasises, the manipulation or simulation process still largely remains in the hands of the computer programmer, not the public. Furthermore, according to Wissen Hayek (2011, p. 928), there is an indication that fairly complex visualisations are ineffective when utilised in workshops with a lay audience consisting of individuals unfamiliar with understanding spatial patterns based on abstract data. She asserts that the involved stakeholders cannot be expected to grasp all the abstract 3D visualisation's content, and that the amount of information included therein is often too great for the viewer to

comprehend (ibid.). Further, as Laing (2019, p. 55) notes, the adoption of 3D visualisation tools requires advanced skills that are not established in the planning industry. Also, the usage of hardware and software, as well as the need for data post-processing, constitute a costly expenditure, he says (ibid.). Thus, according to Lange & Hehl-Lange (2005, p. 180), 3D visualisation tools may be seen as a luxury addition to participatory planning processes.

2.3.2 Point Cloud Visualisations

Urech et al. (2020, p. 2) asserts that 3D visualisation tools are pervasive in contemporary planning practise. However, he states that such reconstructed models have lost or partly changed their aesthetic and scientific significance due to the strict adherence to the principles of geometric simplicity and the level of detail they can represent (ibid.). Apart from technological advancements in 3D visualisation techniques, Laing (2019, p. 55) observes that laser scanning technology, or Light Detection and Ranging (LiDAR), has evolved concurrently in recent years to become an accurate source of 3D data and thereby expanding the possibilities for 3D visualisations.

Laing (2019, pp. 56-57) explains the laser scanning or LiDAR technique as follows: High-definition scanners operate by shooting laser light to gather millions of data points that combined form a 3D point cloud representation of the landscape around the scanner head. A single scan takes a few minutes to gather a high-definition cloud. It may cover ranges of several hundred metres, depending on the equipment. The resulting point cloud can be seen from any angle digitally and is not restricted to the scanner head's initial location. He recommends collecting data from numerous scanning locations and connecting or registering them to create a more complete 3D point cloud model (ibid.).

As Spielhofer et al. (2017, p. 208) further differentiates, 3D point clouds may be generated from a variety of data sources, including aerial and terrestrial LiDAR scans, and can be classified according to their suitability for display at a variety of spatial scales. Airborne laser scanning (ALS) data offer extensive coverage of an area at a very low resolution. As a result, they are ideal for overview visualisations. In contrast, data from terrestrial laser scanning (TLS) produces high-resolution point clouds that are helpful for representing landscape elements in a scene's fore- and middle ground (ibid.). At last, preparatory steps allow for the gathering and integration of LiDAR data into a single colour 3D point cloud model, resulting in a precise and realistic 3D landscape visualisation (Spielhofer et al. 2017, p. 207; Wissen Hayek, Spielhofer, & Grêt-Regamey 2019, p. 252; Urech et al. 2020, p. 2). Or, as Shaw & Trossell (2014, p. 29) put it, a digital replication of reality, from landscape to 'scanscape'.

Urech et al. (2020, p. 2) assert that, along with high-resolution 3D landscape visualisation, point cloud models can be altered to reflect future landscape

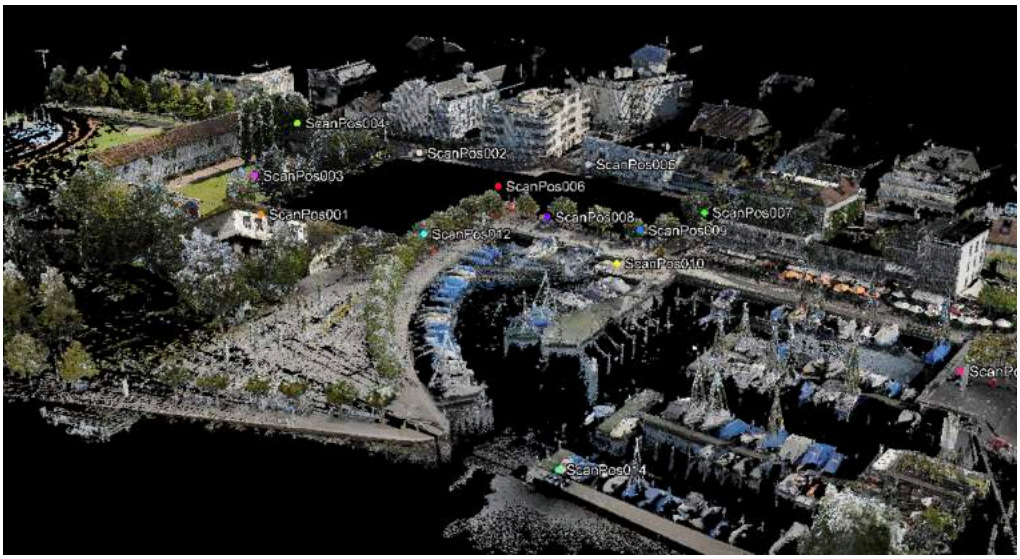


Figure 2.3: 3D point cloud model of the harbour area of Lachen in Switzerland

scenarios. The transformation process involves manipulating point cloud models that represent an existing site in a 3D digital environment. As they state, selected sections of the original point cloud model's coordinate and scalar values can be modified to create a new model that incorporates site-specific characteristics. In their study, they refer to this manipulation technique as 'point cloud modelling' (ibid.). Manipulation of point cloud models is mostly accomplished in three distinct steps: 'disassembly, transformation and reassembly' (ibid.). According to the authors, transformed 3D point cloud models enable the visualisation of new spatial configurations in the digital realm. Additionally, they enable investigation of a selective landscape transformation that preserves data integrity in regions where the model stays unaltered (ibid., p. 6).

Despite being a relatively new technology, Urech et al. (2020, p. 7) assert that LiDAR technology provides advancements that have the potential to significantly affect how people interact with the landscape in the digital realm. Additionally, point cloud models show the physical form of the landscape and elucidate factors that help to manage the landscape character. The use of the modelling method in planning offers new options to create and test scenarios (ibid.). However, only few studies exist which examine the usage of 3D point clouds to shape virtual landscapes: Spielhofer et al. (2017) assessed people's perceptions and reactions to potential future landscape development scenarios in rural areas. Additionally, Wissen Hayek, Spielhofer, & Grêt-Regamey (2019) discuss the lessons learned from creating 3D point clouds of rural landscapes to be used as stimuli in landscape preference studies. Furthermore, Lin et al. (2016) create 3D point cloud-based river rehabilitation scenarios for urban landscapes, while Urech et al. (2020) offer a method for integrating urban landscape planning

and design approaches via the use of point cloud models as a shared medium.

Besides the already-mentioned key property of point cloud models, the precise and realistic representation of rural or urban landscapes, additional benefits can be identified. Lin et al. (2016) and Spielhofer et al. (2017) demonstrate that with 3D point cloud models one is no longer required to generate a three-dimensional digital model of the study area manually and can therefore inform the design process from the start. Furthermore, the descriptive function of point cloud models is expanded by manipulating them to envision landscape transformation (ibid.). Additionally, Urech et al. (2020, p. 7) add that the point cloud modelling method may aid in the facilitation of cross-disciplinary discussions. Moreover, using point cloud models as a source for design development allows the description and integration of site-specific characteristics (ibid.). On this basis, according to Wissen Hayek, Spielhofer, & Grêt-Regamey (2019, p. 252), 3D point cloud visualisations can be used to create targeted stimuli for viewers, which makes them useful in stakeholder discussions.

Even though the value of using LiDAR data for 3D visualisation of landscape changes has been established, Spielhofer et al. (2017, pp. 211-212) identify several issues with its preparation. They note that performing TLS scanning in the field is time intensive; additionally, the application of various software packages needed to gather and process the data that is to be visualised, as well as to set up development scenarios, may be challenging; also, dense 3D point cloud collections result in large 3D model volumes, posing additional processing challenges; finally, the foreground appears at a low resolution in the 3D point cloud model, which contrasts with the otherwise precise and realistic representation (ibid.). Concerning the method itself, Laing (2019, p. 56) states that it is less applicable, not due to a lack of expertise, but rather due to the financial costs associated with adoption.

Furthermore, when using 3D point clouds in practise, Sheppard (2014, p. 244) emphasises the need of being aware of such highly realistic 3D visualisations, since they have the ability to affect viewers' emotions and attitudes in undesirable ways. Additionally, Kuliga et al. (2015, p. 373) indicate that extremely realistic-looking visualisations may result in so-called 'uncanny valley' consequences, such as a negative emotional reaction to a representation that seems almost but not truly realistic. As the research by Wissen Hayek, Spielhofer, & Grêt-Regamey (2019, p. 252) reveals, elements of 3D point cloud models may be judged unrealistic by stakeholders despite and because of their high accuracy in representing the real image. Thus, for the viewer, a thin line exists between something is feasible or unfeasible, which must be considered and may be challenging when manipulating highly realistic 3D point cloud models (ibid.).

Chapter 3

Technical Methods: Development of the Urban Sketch Tool

The Urban Sketch Tool is the primary tool of the VisLab participation process, and its development is a main focus of this study. Therefore , this chapter details the UST development process. Prior to presenting the UST workflow, additional information about the Lachen harbour is provided by referencing the Canton of Schwyz report 'Fokusraum March' (Canton of Schwyz, 2020b) and the Lachen structure plan (Canton of Schwyz, 2020a), as well as explaining how the ETH Zurich's 'Raumplus' data was used (Professorship for Spatial Development, n.d.). Section 3.2 then provides a high-level overview of the UST workflow depicted in Figure 3.3, which is divided into three stages: the '3D data collection and post-processing', the 'simulation and rendering process', and the 'UST programming'. Each of these three development stages is discussed in more detail in its own section. Section 3.3 details the collection of 3D data in the harbour area using a terrestrial laser scanner, as well as the post-processing of the data. As discussed in Section 3.4, the second major step in developing the UST can be divided into two sub-steps: preparation for the simulation process of the four scenarios, which required the establishment of a 3D data library and a scenario systematics, and simulation and rendering of the four scenarios, which resulted in four point cloud simulations and panoramic images. Section 3.5 describes the third stage of the UST workflow, the UST programming process, and the adoption of the existing sketch tool, as well as the integration of the four scenarios, new icons, and a comment function. Finally, a reflection is made on the development process.

3.1 The Harbour of Lachen as Study Area

The municipality of Lachen on Lake Zurich is a regional centre of the Canton of Schwyz (see Figure 3.1) (Professorship for Spatial Development, 2010, p. 41).

The Canton of Schwyz has grown significantly in recent years (plus 1.3 percent per year since 2000) and at a higher rate than federal projections at the time predicted (Canton of Schwyz, 2020b, p. 11). The cantonal structure plan defines the settlement area for requirements up to 2040 on the basis of a high population scenario (plus 0.77 percent per year) with 189,000 inhabitants and full-time employees (Canton of Schwyz, 2020a, p. 32). Up to 2030 and 2040, growth will average plus 0.80 percent per year, with the majority of it concentrated in the urban settlement area to which Lachen belongs (Canton of Schwyz, 2020b, p. 11). The population growth and the associated increase in employment are not precisely defined within the reports. However, given Lachen's second-highest population growth rate of 2.5 percent or 218 people in 2020, it is reasonable to assume that this trend will continue under the forecasts given (Canton of Schwyz, 2021).

Figure 3.1: Municipality of Lachen in the Canton of Schwyz, southeast of Zurich (based on Swisstopo, 2021a)

According to the Canton of Schwyz's report 'Fokusraum March' (Canton of Schwyz, 2020b), Lachen should absorb a significant part of this prognosticated growth, and thus expand its role as a regional centre (Canton of Schwyz, 2020a). With the revised Spatial Planning Law (ARE, 2014), this aim could only be realised through inner development and the transformation of the existing building stock. For this, it can be valuable to identify Lachen's settlement area potentials within the existing communal building zones, of which the ETH Zurich's

'Raumplus' data set provides an overview. The overview enables spatial, quantitative, and qualitative, as well as situational assessments. This enables the identification and implementation of focal points for the inner spatial development of settlements. Furthermore, the 'Raumplus' data allows insights about the use, the planning status, the ownership conditions, and when settlement areas might be available for inner densification, as well as the reasons for any existing impediments to their mobilisation (Professorship for Spatial Development, 2010, p. 6).

The settlement area potentials for this research were identified and visualised on a map using the 'Raumplus' data (Professorship for Spatial Development, n.d.). Following an assessment of the areas associated with the statements, five locations near the centre were identified as being eligible for this research. To obtain a local opinion on this site assessment and to narrow the selection to a single location, the department of construction and environment of the canton of Schwyz was consulted. Applying local knowledge, the prominently located harbour of Lachen in the centre of the village was chosen as the perimeter for this study. Furthermore, it had to be determined which parcels could be used to simulate future scenarios. Following a review of the municipality's zoning plan Lachen SZ (1995), the areas illustrated in Figure 3.2 were identified: the public zone of the cantonal secondary school, for which a cantonal plan for an expansion of the school with new buildings exists; the two car parks in the areas centre, both of which have direct access to the lake; and the parcels adjacent to the small car park owned by Octapharma, which was considering establishing its headquarters at this location (Grüter, 2019). Otherwise, the area is surrounded by residential buildings and restaurants such as the Hotel Marina.

3.2 Workflow for the Development of the Urban Sketch Tool

The development of the UST required a variety of software and hardware. All computations were carried out on a standard system running Microsoft Windows 10 and equipped with a six-core Intel processor (CPU-World, 2021) operating at 3.7 GHz and 8 GB of graphics RAM. Additionally, a terrestrial RIEGL VZ-1000 3D terrestrial laser scanner (RIEGL, 2017) was utilised to acquire 3D point cloud data for the scenario simulations. Apart from the hardware, numerous software packages were needed as it was not feasible to perform all stages in a single application. Following data collection, the software products RiSCAN Pro (RIEGL, 2014) and CloudCompare (CloudCompare, 2020) were used to post-process the collected 3D data. Cinema4D (C4D) R21 (Maxon, 2019) was utilised for simulation and point cloud modelling. The LAS file format was standard, as it is in a variety of software applications (Mongus & Žalik, 2011, p. 2508), to display or exchange 3D point cloud data across the various software programs.

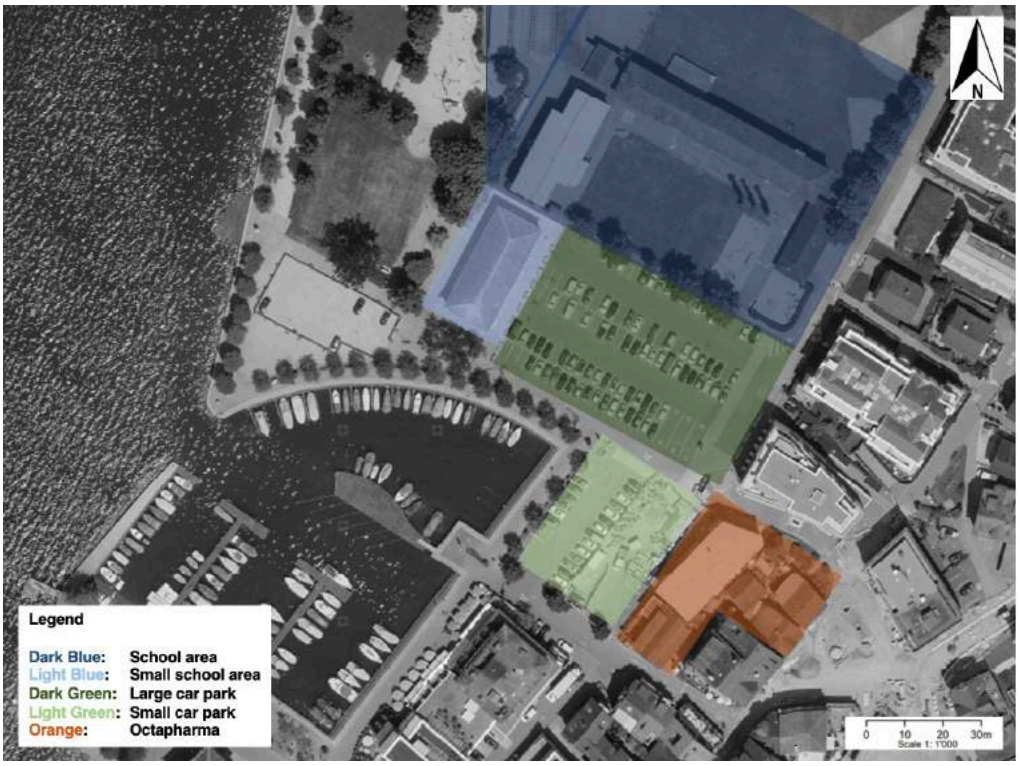


Figure 3.2: Zones for simulating various scenario (based on Swisstopo, 2021b)

To create custom 3D models or alter 3D models found online, in addition to C4D, SketchUp Pro (ComputerWorks, 2021) was employed. They appeared in several 3D polygon file formats, which were then imported into Cinema 4D and virtually scanned with the LAZPoint 2 extension (Cinemaplugins.com, 2017). This virtual scan process converted the 3D polygon objects into 3D point cloud objects and LAS files, respectively. After the simulation process was complete, a virtual 360° camera developed by Glanzmann (2018) was applied to render the scenario simulations into panoramic images. After that, they were processed in Photoshop. Finally, JavaScript programming language was used to programme the UST.

The Workflow 3.3 is divided into three stages of development. The initial stage of 3D data collection and processing necessitated fieldwork. A terrestrial RIEGL VZ-1000 laser scanner was used to conduct several scans at the Lachen harbour location. Terrestrial laser scanning generated LiDAR (3D) data that were registered to a single point cloud model. Additionally, following each scan session, a Nikon D700 camera mounted on top of the scanner captured images of the surrounding area for subsequent colourisation of the scans on the computer. After that, the 3D data was imported into RiSCAN Pro as LAS files. The 3D data were registered and colourised to create a cohesive 3D point cloud

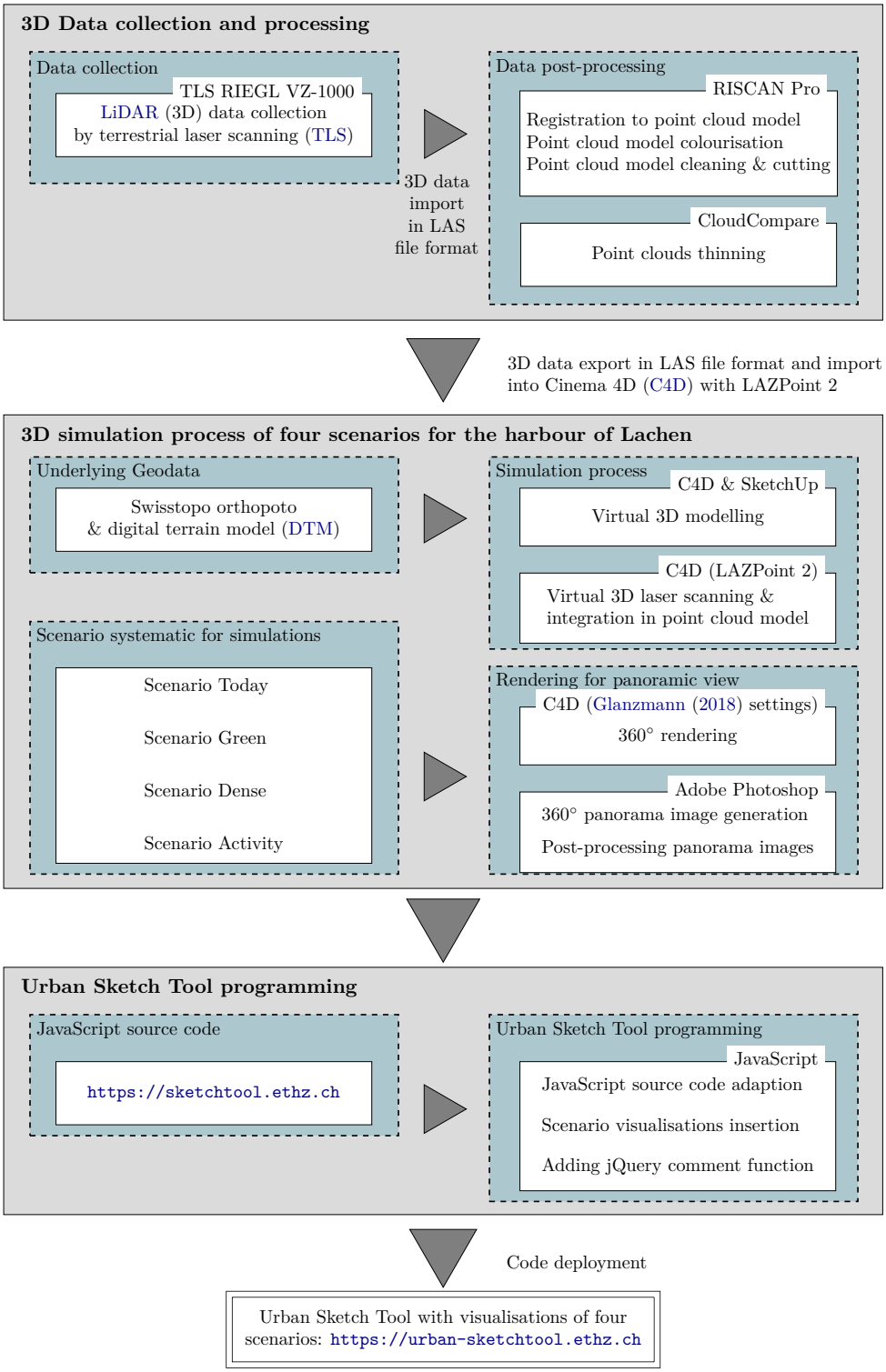


Figure 3.3: Workflow for the Urban Sketch Tool development

representation of the site. CloudCompare was then used to clean and cut the point cloud model, as well as thin out the volume, resulting in a reduction in the model's point count and size. Following these post-processing steps for 3D data, the point cloud model could be exported and imported into C4D as LAS file. This initiated the workflow's 3.3 second stage.

Prior to importing the point clouds as LAS files, geodata was used to simulate the local geographic conditions. The digital terrain model (DTM) and the corresponding orthophoto served as the underlying geodata for the 3D data import. After import, the 3D point clouds were appropriately positioned within the digitised geographical environment. Additionally, a scenario system had to be developed in order to determine what should be simulated and what types of options should be created for the participants to sketch. This is explained in more detail in Subsection 3.4.2, Table 3.1. With these two preparation steps completed, the point cloud modelling in C4D could start. Due to the anticipated high volume of data, each scenario was created as a distinct project. 3D polygon data components, modelled in SketchUp Pro or C4D and virtually scanned in C4D using the extension LAZPoint 2, were combined with 3D point cloud data components to create four scenario-specific point cloud simulations.

The four scenarios should be implemented as panoramic images for the UST's web interface. Which then enabled a 360° perspective from a single viewing point online, from which the scenarios based on today's situation could be sketched using the computer mouse. At that point, there was no rendering instrument that allowed for the rendering of a whole virtual landscape in a single rendering step. Thus, the virtual 360° camera developed by Glanzmann (2018) was used to take images of the four 3D scenario visualisations. It consists of one spherical camera for taking a 360° panoramic image, however, without capturing point cloud data, and 36 subordinated virtual cameras with each twelve downwards, twelve horizontal, and twelve upwards viewing angles. As a result, the Glanzmann camera allowed the rendering of an equirectangular panoramic picture visualising the underlying geodata. Additionally, the 36 points of view enabled rendering 36 separate images that overlapped. Photoshop (Adobe, 2020) was then used to import and post-process the panoramic image and the 36 single images. On the basis of the equirectangular panorama picture, the 36 individual images were merged to create panoramic images of each point cloud scenario. This was then clipped and exported as a PNG file to be able to insert it into the code.

The adaptation of an existing sketch tool and the programming of the UST was the last stage of the technical development process. The existing sketch tool source code (ETHZ PLUS, 2020) was adapted using the JavaScript programming language. The interface was modified in particular, and a jQuery comment function (JQuery, n.d.) was added. This enables participants to leave comments. Additionally, due to the fact that the UST contained four scenarios, the number of scenarios inside the source code had to be reduced. Furthermore, new icons

had to be designed in Photoshop and then imported as PNG files into the code. Then, the icon titles on the interface had to be updated to indicate which situation the user is sketching. Following several local browser tests, the code for the UST was deployed and made accessible online. The following sections go further in-depth about each of the three parts of the technical development process of the UST.

3.3 3D Data Collection and Processing

For the 3D data collection, this study followed the approach of Spielhofer et al. (2017, p. 208). To collect LiDAR data from terrestrial laser scanning (TLS), a RIEGL VZ-1000 3D terrestrial laser scanner with a Nikon D700 camera mounted on top was used. This scanner features a fast and accurate laser scan mechanism with a range of more than 1400 metres (RIEGL, 2017, p. 1). To ensure a complete LiDAR data acquisition of the area, different terrestrial scan points were defined and printed as a map (see Figure 3.4, which was then taken into the field. Finally, 13 scans were performed on a slightly cloudy day in late summer, when the green leaves of the vegetation were still visible.

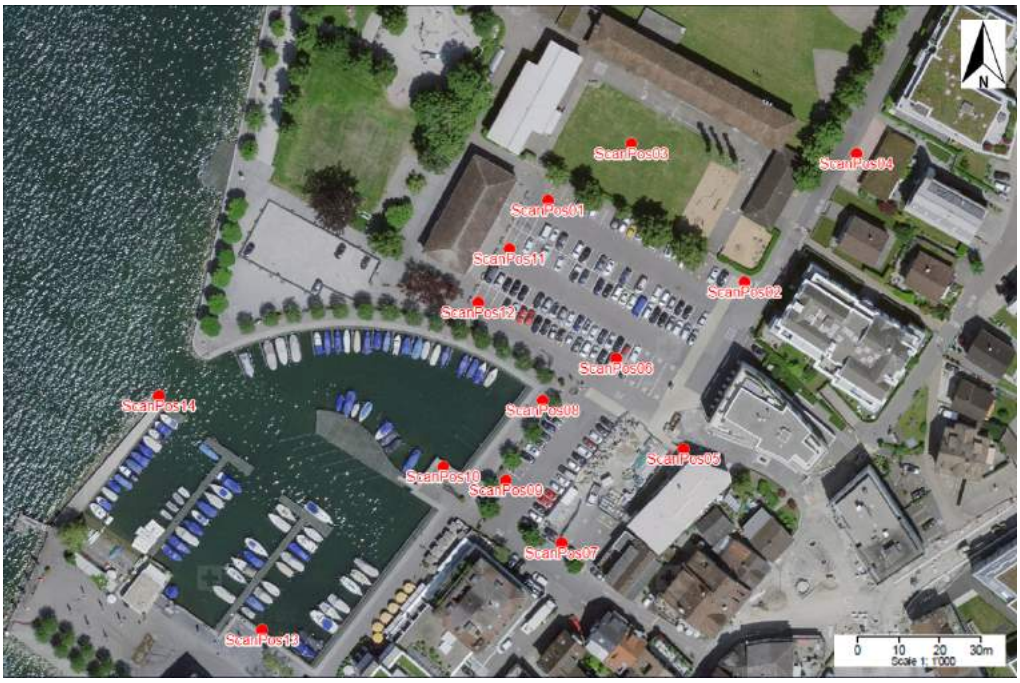


Figure 3.4: On site terrestrial laser scanning positions (based on Swisstopo, 2021b)

The RIEGL Laser Scanner manufacturer's software solution RiSCAN PRO 2.0 (RIEGL, 2014) was used to further process the gathered TLS data. This

process profited from the software key features of 3D visualisation, automatic registration, multi station adjustment, colourisation of point clouds, and volume calculation (RIEGL, 2020, p. 1). First, the software RiSCAN Pro was used to colourise the TLS data. Red, green, and blue (RGB) colour values were assigned to the points using camera images captured by the Nikon D700 at the end of each scan. Next, the scans were registered in the software to form a single point cloud model and produced a 3D scene of the harbour of Lachen shown in Figure 3.5.

Figure 3.5: Noisy point cloud model of the Lachen harbour in RiSCAN Pro (RIEGL, 2014), with the car parks in the centre, the school area on the left, and the Octapharma area on the right

The single scans, which formed the raw model, could then be cleaned by cutting out noise caused by, for example, laser beam reflection on windows or swarms of insects in the air. Figure 3.6 depicts a clean point cloud model of the site. On a virtual, larger scale, the software could be used to remove larger parts of the point cloud that were irrelevant for the later steps. The cars parked in the car parks at the time of the fieldwork, for example. Thus, at this point, the cleaned point cloud had 460 billion points and could be used as a basis for further processing. However, before the point cloud or parts of it could be further processed, the open-source programme CloudCompare (CloudCompare, 2020) was used to thin out the model. This allowed a significant reduction of the point density.

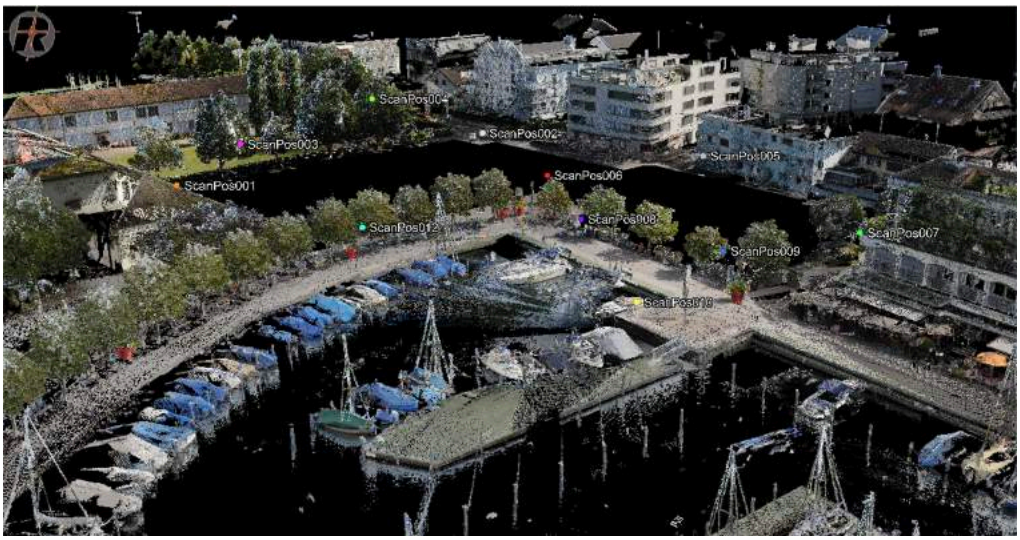


Figure 3.6: Clean point cloud model of the Lachen harbour in RiSCAN Pro (RIEGL, 2014), with two black areas in the image's centre created by removing the points that formed the two car parks

3.4 3D Simulation Process of Four Scenarios for the Harbour of Lachen

The second main step for UST development can be divided into two sub-steps: the preparation for the simulation process and the simulation and rendering processes. Various software solutions and data were used for development stage. Yet, for working with point clouds, the LAS format was standard. The four scenarios were simulated and 3D modelled using C4D R21 (Maxon, 2019) and SketchUp Pro (ComputerWorks, 2021). In order to work with LAS file formats, scan virtual 3D models and display point clouds in C4D, the installation of the extension LAZPoint 2 (Cinemaplugins.com, 2017) was required. Thinning point clouds was always done with the CloudCompare software (CloudCompare, 2020). However, preparation was necessary before simulating the four scenarios: C4D needed to be configured taking into account the local geographic conditions. Second, the four scenarios' content needed to be fleshed out. Finally, the Lachen harbour's point cloud model needed to be adjusted for the simulations.

3.4.1 Preparation for the Simulation Process

As a first step, it was critical to imitate the local geographic conditions. As a result, a digital terrain model (DTM) from a grid with the dimensions of 4000 to 504 to 5000 metres (Swisstopo, 2019) was imported into C4D as relief object and textured with the corresponding orthophoto from 4000 to 4000 metres

(Swisstopo, 2017), exported from ArcMap (Esri, 2020). Prior to importing the orthophoto, it was retouched in Photoshop (Adobe, 2020) to remove cars and ships and create a clean ground or water surface for future scenario simulations. To depict the current scenario, parking lines that were removed during the previous cutting and cleaning step (see Figure 3.6) were redrawn in Photoshop. Additionally, a blue sky from C4D was added. The virtual scene was then prepared for loading the point cloud model into C4D. However, certain components of the model required processing first.

Figure 3.7: Octapharma-owned parcels in RiSCAN Pro (RIEGL, 2014), in front of the small cut-out car park

Figure 3.8: School area in RiSCAN Pro (RIEGL, 2014), with the old gym hall on the left, next to the large cut-out car park

To create space for the insertion of 3D components such as buildings, the identified plots within the harbour area for future developments in Chapter 3 were cut out of the 3D point cloud model in RiSCAN Pro (RIEGL, 2014). Figure 3.7 and Figure 3.8 show these transformation spaces. Additionally, the LAZPoint 2 extension (Cinemaplugins.com, 2017) had to be installed in order to load the model into C4D as a basis for further manipulation. This enabled the import of the LAS files into C4D and their embedding within the prepared virtual landscape scene. However, it appeared as though the point cloud model as a whole did not fit the digital terrain model well. This was because the Swisstopo data were less precise than the TLS data. As a result, the 3D model of the harbour in RiSCAN Pro has been divided into three sections to account for this inaccuracy: the water area, which includes the ships, the waterfront area adjacent to the lake, and the upper area towards the village centre. All three point cloud model

components were then imported into CloudCompare as LAS files and thinned to 0.05 metres. This resulted in a reduction in the volume of the point clouds and the size of the LAS files.

At this point, the majority of the configuration in C4D was completed. However, the four scenarios' visual content for the simulation process remained undefined. As a result, scenario ideas and a systematics were developed:

- **Scenario Today** was intended to depict the current state of the harbour;
- **Scenario Green** was meant to visualise the harbour with a lot of green space;
- **Scenario Activity** was intended to represent a middle ground between the scenarios Green and Dense, with open spaces for social activities as well as buildings with ground-floor uses;
- **Scenario Dense** was expected to enable the idea of a dense spatial development on site.

Systematics of the UST's four scenarios				
Parcel name	**Scenario Today**	**Scenario Green**	**Scenario Activity**	**Scenario Dense**
Large car park	Retouched car park	Green park	Park with gravel areas, street furniture and playground	Asphalted park with modular furniture and water feature
Small car park	Retouched car park	Green park	Park with gravel area and street furniture	Ground-floor commercial building
Octapharma	Status quo	Residential buildings	Ground-floor commercial and residential buildings	Business building
School area	Planned school building extension project			
Small school area	Status quo	Gravel area with trees	Outdoor sports activities	Ground-floor commercial building

Table 3.1: Systematics of the Urban Sketch Tool's four scenarios

The visual content for each parcel group was defined in Table 3.1 in order to implement these ideas and provide participants with a variety of choices for the sketching process later on. From the start, it was clear that the planned school extension project should be included in all future scenarios. In the **Scenario Today**, all plots were displayed in the order in which they were scanned. Only the scanned cars were removed from the two car parks. This scenario should later be used as the base scenario in the UST, upon which the other scenarios could be sketched over. Additionally, it should provide the option for participants to preserve the status quo if desired. For the **Scenario Green**, both car parks should appear as green parks. Furthermore, the Octapharma parcels were intended for housing development. To complement the existing lake park, the small school park facing the lake should be expanded with gravel ground and trees. With an emphasis on green spaces, this scenario aimed to increase focus on recreation at the harbour and ecosystem services such as inner-city cooling and water retention.

For the **Scenario Activity**, both car parks should be given more usages. Furthermore, this scenario attempts to bridge the gap between the other two. Parks should provide additional space for recreational activities, while mixed-use areas should include housing and retail, which are already present. The structured gravel areas with street furniture should promote social interaction, and a playground on the large car park area should facilitate this. Additionally, outdoor sports activities near the school were planned for the small school park. On the Octapharma site, the idea was for a building with commercial space on the ground floor and residential building above. All areas except the large car park should be densified in the **Scenario Dense**. An office building was intended for the Octapharma areas. The idea for this came about as a result of Octapharma's plans to construct a headquarters there (Grüter, 2019). Furthermore, the large car park was planned as an asphalted space for seasonal events. This should be facilitated by the modular adjustable street furniture surrounding the water feature at this place. These ideas for the park were inspired by the existing school extension plans and the Sechseläutenplatz in Zurich (Google, n.d.-d).

3.4.2 Simulation and Rendering Processes

After completing all the preparatory steps, the simulation and rendering processes were initiated. To begin with, the following paragraphs describe the simulation process. To accomplish this, the 3D modelling software C4D (Maxon, 2019) and SketchUp Pro (ComputerWorks, 2021) were used, as well as CloudCompare (CloudCompare, 2020) to thin out point cloud components. Additionally, throughout the development process, 3D objects from databases such as Free3D (2021), Cgtrader (2021), Trimble Inc (2021) and Evermotion (2020) were downloaded and manipulated to integrate them later as virtually scanned 3D point cloud objects. Second, this section describes the process of rendering

the simulations. To capture the visual content, Glanzmann's camera settings were used. The images were then merged to create panoramic images, which served as a visual representation of the point cloud scenarios. Finally, they were post-processed in Photoshop prior to being integrated into the Urban Sketch Tool (Adobe, 2020).

Simulation Process

The simulation process involved expanding the 3D point cloud model of the harbour of Lachen with additional 3D objects on selected areas. To avoid appearing unrealistic, these simulations were based on the zoning plan (Lachen SZ, 2020) and building regulations (Lachen SZ, 1995) of the municipality of Lachen. Furthermore, the complexity was reduced to make the simulations more readable. Therefore, scanned humans were removed and no human 3D objects were included. As a result, the appearances should be uncluttered and not overloaded. Due to the high memory and graphics performance requirements of point clouds, a single C4D file was created for each scenario simulation. Each of them contained identical preparation sets as described previously in the Subsection 3.4.1. However, the orthophoto was imported differently. Given that the 'Scenario Today' depicts the current status quo, the orthophoto depicts the existing parking lines. Because the two parking spaces in the other scenarios were altered to function differently, the ground markings on them were retouched.

Figure 3.9: 3D model of the planned school building project in SketchUp Pro (ComputerWorks, 2021)

The first step in point cloud modelling was to build a 3D library. Online platforms (Free3D, 2021; Cgtrader, 2021; Trimble Inc, 2021; Evermotion, 2020) were searched for 3D objects of various buildings, plants, street furniture, and park inventory. Within the wide selection of 3D file formats, FBX, OBJ and C4D proved suitable for importing 3D objects into C4D. This, however, limited the available free 3D objects. Additionally, C4D did not load the textures for the 3D models saved in the OBJ file format. As a second step, a 3D model of the school building had to be available due to published plans for a local school expansion project. However, even after a consultation with the architectural bureau involved, it was not possible to obtain them. This, combined with the scarcity of 3D objects, required the creation of one's own 3D models.

C4D and, in particular, SketchUp Pro were used to create and texture various 3D objects. Additionally, available and fitting 3D objects from databases were

modified or expanded in part. For the school extension project, for example, the existing school plan was consulted, and the school was then designed to adhere to these specifications as closely as possible (see Figure 3.9). Besides, a small parking building with a lift served as an indication for the underground parking. For the buildings with commercial ground floor uses, the ground floors were represented by areas that were textured with shop images from Google Street View (Google, n.d.-e; Google, n.d.-a). On the other hand, the majority of the 3D objects were created using existing on-site scans. RiSCAN Pro was used to select point cloud objects such as trees, street furniture, and ground surfaces within the point cloud model and copy them to subsequently import them into C4D via the LAZPoint 2 plugin. Visual variety was achieved by varying the object's size and rotation. The parks, in particular, are a collage of existing objects in the harbour area and inspired by real-world examples. The large park in the scenario Dense can be compared to Zurich's Sechseläutenplatz (Google, n.d.-d), while the parks in the scenario Activity can be referred to Zurich's Hardplatz (Google, n.d.-c).

To combine the various data components required for the simulations, all 3D objects were imported into the existing point cloud model of the harbour as point clouds. 3D objects, such as the school building model, were imported into C4D and virtually scanned with the LAZPoint 2 extension's virtual laser scanner to convert them to the LAS file format and integrate them into the point cloud model. To help imagine the simulation process in C4D, Figure 3.10 and Figure 3.11 illustrate the 'Scenario Green' simulation of the 3D point cloud model. It became clear during the process that the appearance of various file formats as scans varied. For example, when 3D models were exported from SketchUp Pro, the FBX format was found to be more organic than other formats. Additionally, each object required a unique setting due to its varying shape and size. It was critical to select a high resolution and to employ randomisation in order to ensure that these virtual scans visually resembled the objects scanned on-site. As a result, four scenarios were created using terrestrial and virtual-scanned 3D objects: the 'Scenario Today' contained four point cloud components, the 'Scenario Dense' contained 51, the 'Scenario Activity' contained 81, and the 'Scenario Green' contained 227.

Rendering Process for Panoramic Visualisations

The existing Sketch Tool's visualisations (see ETHZ PLUS, 2020) are projected onto a virtual cone. This cone would appear as a panoramic image when unfolded on a table. Therefore, the four scenario simulations in C4D must be rendered as panoramic images. Due to the fact that the Sketch Tool source code, used for the Urban Sketch Tool adaption, only allowed for one perspective, it was important to consider the location of the 360° point of view. The location chosen ended up being between the two car parks, which provided a broad view of the Lachen

Figure 3.10: 'Scenario Green' simulation of the Lachen harbour in Cinema4D (Maxon, 2019) (view from the lake)

harbour. To ensure a clear view of distant objects, the camera was virtually positioned at a height of five metres. Then, to render the simulations in C4D, a virtual camera with presets by Glanzmann (2018) was used. This camera is composed of one spherical and 36 subordinate cameras that provide a panoramic view from a single point using twelve frames oriented downwards, horizontally, and upwards. This allowed the capturing of 36 overlapping shots, which could then be merged in Photoshop to create a panoramic image. However, it became visible that the various point cloud components were not rendered with the same resolution as displayed on the screen.

The on-site TLS scans and the integrated virtual-scanned objects during the simulation process appeared to be a resolution-inconsistent ensemble in the initial rendered images. In particular, the resolution was decreased in the render images the larger and closer an object was to the Glanzmann camera position. This is because, from a technical standpoint, adjacent points that form a point cloud have a wider gap to one another when objects are viewed up close. This was especially true for objects such as buildings. Furthermore, simulations of ground-floor uses, which were incorporated into the building objects as a surface with a photo texture, were nearly invisible in the render outputs. In this case, the points are arranged in a horizontal line along the front of a building, with no volume to the rear. Hence, the number of points is too small to depict the shop texture, and thus get drowned out by the multitude of points that represent the building behind.

Due to these visual distinctions, the rendering process was characterised by

Figure 3.11: 'Scenario Green' simulation of the Lachen harbour in Cinema4D (Maxon, 2019) (view from the village centre)

iterating between test rendering and fine-tuning the various point cloud components. To adjust the resolutions of the individual point cloud components to each other, the CloudCompare thinning function or C4D transparency preferences (strength and surface fading distance) were used. For example, larger objects rendered with a close camera perspective required special pre-rendering adjustments. To increase their resolution, they were duplicated in position numerous times and enhanced with a virtual scan of the building's façade. Because the self-modelled objects were less detailed, they needed more randomisation when virtually scanned, which concealed their more rudimentary appearance slightly. Furthermore, the volume of the tripartite TLS point cloud model of the harbour area had to be increased. To accomplish this, the point cloud model was thinned in CloudCompare to a distance of 0.005 metres between the points rather than 0.05 metres. The three parts of the TLS point cloud harbour model were then reimported into C4D. As a result of this iterative process, the point cloud components emerged uniformly as a homogeneous ensemble representing the various scenarios.

Finally, the virtual urban harbour scene could be rendered at 150dpi in one final round to ensure that the collected images contained sufficient detail. Each rendering process was done separately in each single scenario project in C4D. Due to the fact that C4D has a limit of points that can be rendered, it was necessary to activate only the point cloud components visible in the used camera frame. For the same reason, it was impossible to complete the panorama image with a single rendering or by the use of a render queue. Thus, each of the 37

camera angles of the Glanzmann (2018) camera had to be rendered separately. As a result, 36 single full-HD 1920x1080 pixel wide-angle shots were taken from the same point of view. Each 360° tour consisted of twelve images taken from a lower, middle, and upper position with a 50 mm focal length. Additionally, an equirectangular panorama of 20040x10020 pixels was rendered using the Glanzmann (2018) preferences' spherical camera, which enabled the panoramic view without points, only the underlying geodata was visualised.

After rendering all the images, the individual images for each of the four scenarios had to be merged in Photoshop (Adobe, 2020) using the spherical panorama image as the background for further adaptations. This image depicted the underlying geodata in a 360° panoramic view without points. The resulting panoramic images were then scaled to a resolution of 21614x4400 pixels in order to be clipped to a resolution of 20040x4000 pixels. This step enabled the panoramic images to appear as clean rectangles. To compare all the panoramic images and ensure that certain orientation points matched when the images were later stacked in the UST, the clips were loaded twice on the spherical panoramic image (20040x10020). Two clips were combined side by side to create panoramic images for each scenario, which were then saved as PNG files. Finally, because the asphalted ground looked unrealistic in comparison to the pointy surroundings, the resulting images were retouched in Photoshop by stamping the asphalted point cloud ground over the necessary areas. At this point, the scenarios were rendered as panoramic images and prepared for their inclusion into the UST code.

Legend: 1. Brush **2.** Scenario 1 **3.** Scenario 2 **4.** Scenario 3 **5.** Scenario 4 **6.** Scenario 5 **7.** Rubber/Current Situation **8.** Brush Size **9.** Save Vision

Figure 3.12: Sketch Tool interface of adopted source code (ETHZ PLUS, 2020)

3.5 Urban Sketch Tool Programming

The UST code was derived from the ETH Zurich's existing Sketch Tool code (ETHZ PLUS, 2020), of which the interface is shown in Figure 3.12. Celio et al. (2020) used this tool in a study on rural Switzerland. They put the Sketch Tool into practise by allowing participants to alter the virtual scene and sketch their vision (ibid., pp. 14-15). For the development of the UST, this research adopted this idea by using it within an urban setting as Urban Sketch Tool. This required the adaptation of the Sketch Tool source code. It was shared and received via Bitbucket, a web-based application that enables the sharing, maintenance, and deployment of code (Atlassian, n.d.). The code was developed in the JavaScript programming language, which, according to Haverbeke (2019, p. 5), enables interaction with web-based applications. With the obtained access, a branch was created with the same JavaScript patterns as the source code. This code was then modified for use in this research by adding new visualisations, icons, and a comment function.

(a) Scenario Green (b) Scenario Activity (c) Scenario Dense

Figure 3.13: Icons symbolising the UST's scenarios and comment function

To incorporate the four simulated scenarios into the UST, their panoramic images had to be included in the code as PNG files. Because the original Sketch Tool images were scaled for a resolution of 3000 to 600 pixels, the visualisations created for this research were, accordingly, adapted to those dimensions. Panoramic images were then inserted as PNG files to replace the original rural landscape visualisations. Additionally, the UST necessitated the addition of new icons to represent the visual content and commenting functionality (see Figure 3.13). These icons were created in Photoshop by referencing the original icon design. Due to the reduced number of scenarios, the JavaScript code required a reduction in the number of icons. They were then included in the code as PNG files. Following that, the titles of the icons were changed to correspond to the scenarios' titles, allowing participants to differentiate the visual contents and functionalities of the icons.

Furthermore, the UST should include a comment section for participants to elaborate on their sketch choices. This was accomplished by utilising the 'jQuery-comments' (JQuery, n.d.) patterns from the jQuery library. The comment functionality allowed users to leave a comment, which could be processed or deleted. Additionally, if the participant's vision process was complete, the participant's

comments as a TXT file and the sketched vision as a PNG file could be downloaded. Throughout the development process, the code for the UST was tested and iteratively modified using a local NodeJS server. According to Tilkov & Vinoski (2010, P. 83), NodeJS is a web-based JavaScript server. It was launched from the computer's console each time. This enabled the web application to be viewed locally via the browser. After completing the code adaptation, the ETH Zurich server was configured to host the subdomain 'Urban-SketchTool'. Finally, the code (see Appendix B) was deployed and the Urban Sketch Tool was made accessible online.

3.6 Reflection on the Urban Sketch Tool Development Process

The describe stages for the development of the UST provide a direct way to a usable tool, but neglect the many detours and hurdles encountered along the process. It included a multitude of minor tasks could not all be remembered in the end. Working with point clouds, a variety of software solutions, and JavaScript was new terrain. Therefore, instructions had to be looked up online. This transformed the development process into a laboratory for experimenting until the outcome was satisfactory. However, at the end, several points emerged that are worth to be mentioned.

At the early stage of the development process, the point clouds needed to be cleaned in order for the point cloud model not to display any errors on the screen. Because point clouds can precisely represent reality, they can also be worked with very accurately. In the course of the development process, for instance, it turned out that the cleaning of the point clouds at the beginning needed not to be done so precisely. Noise in the point cloud model behind the building façades would never have been visible, given the specified viewpoint for the UST user. Thus, it seems worthwhile to determine in advance which areas of the point cloud model will ultimately be visible from the chosen viewpoint in the end, in order to focus the point cloud cleaning specifically on them. Furthermore, daily work with the virtual environment may be absorbing. By iteratively modifying the scenarios, the space might look as though no significant changes have occurred. The own perception adapted to the virtual appearance. This resulted in the 'Scenario Activity' simulating the yearly fair on the car park areas. However, it was realised throughout the process that less is more in this context. The simulated market offer cluttered the image and disturbed the area's overall image due to the increased degree of information. Lastly, it was critical for the visual language across the scenarios to appear consistent. In addition to this, spatial planning requirements needed to be followed. Otherwise, there was a risk that participants would not take the UST and the point cloud visualisations seriously, would be concerned by conditions that could not be realised, or would react negatively.

Another stage of the simulation process included the creation of larger 3D objects, such as buildings. Alongside the precise and realistic point clouds scanned on-site, the simulation process of these objects digitally was challenging. Because their appearances, as determined by their degree of detail in the elaboration, their textures, and their 3D file format, contrasted with the real-world point cloud components. Furthermore, while they are only suggestions for future possibilities, the various looks may impact individual decisions. During the process, it has been shown that cutting out and reusing point cloud components, particularly for parks, from the terrestrially scanned point cloud model provided the best results. Thus, some separately scanned terrestrial objects might be used in preparation for an urban point cloud simulation. These can be scanned at specific locations using a terrestrial laser scanner or by photogrammetry. This would allow for a more realistic representation of large objects, such as buildings with ground floor uses, for example.

Virtual scanning was also challenging as part of the simulation process. Numerous 3D objects in various 3D file formats were downloaded prior to the point cloud modelling of the four scenarios. However, these could not all be imported into C4D and needed to be opened with another software. Because the virtual scanner was included in C4D as part of the LAZPoint 2 plugin, another way of scanning the unreadable objects had to be found. Following that, the scanned 3D objects may have been loaded into C4D as point clouds in the standard LAS format. As a result, to virtually scan the unreadable objects outside C4D, few virtual laser scanners were tested, but the resolution and arrangement of the points were found to be qualitatively incompatible with terrestrial scans or virtual scans created with the C4D plugin. This limited the collected 3D object library and required the creation of own 3D objects. After virtually scanning them in C4D and combining a variety of point cloud components to coherent scenario simulations, their computer-generated visualisations on the screen were deceiving, as the first test renderings indicated different resolutions for the various point cloud components. Thus, consolidating various resolutions into a unified look during the rendering process was challenging. In particular, the iterative process between test rendering and adjusting the resolution of the point cloud components was time-intensive. Because every single test rendering took time, and in addition, a standard resolution had to be determined first to ensure that the software did not crash.

After a certain point, working with C4D became a balancing act. Because working with point clouds requires a significant amount of computer RAM, which became apparent throughout the process. As a prevention, each scenario was created as a separate project from the start. However, the software got slower as more point cloud components were imported into the project and the overall number of points shown increased. An easy approach was to disable non-processed point clouds while working. Furthermore, the virtual scanning of a 3D object was limited to a certain number of points. When scanning large 3D objects, such

as buildings, the virtual scanner stopped after a certain number of points. This created difficulties because, as previously stated, a certain resolution had to be attained. Additionally, rendering was limited to a single camera and its perspective at a time. Further, only point cloud components visible in the camera view had to be activated, as the computer would stop rendering after a certain amount of points. As a consequence, working with point clouds has always been a balancing act between too many or too few points, as well as too high or too low resolution. This resulted in several software crashes and restarts of certain tasks, which was time-consuming. Occasionally, it was essential to save after each step, which took time given the project's size. Eventually, though, it worked, and countless 'trial and error' steps resulted in four scenarios that could be merged into the JavaScript code as panoramic images.

The final hurdle in the UST's development process was figuring out how to work with JavaScript. There was no prior experience with either this programming language or programming in general. However, one advantage of JavaScript is that it is a well-defined programming language about which a lot of knowledge can be found on the internet. Additionally, the pre-existing basic structure of another project's Sketch Tool code helped in JavaScript comprehension. After a while, this basis made it easier to understand the code and make changes, such as modifying the interface or integrating visualisations and icons. Throughout the process, it became clear that the code did not allow for the planned adaptation of pinning comments (or objects) to the sketches. Additionally, the code allowed for only one point of view, which may present difficulties in larger or more contorted urban areas. As a result, the code was adapted as much as necessary. The option to import pre-written code components from the jQuery library, which could then be modified, was advantageous in this case. Changes to the code could be tested locally in a browser. However, it was difficult to locate errors in the code when it was not running. When the Urban Sketch Tool was made accessible online, it became evident that the feature for saving sketches and comments lacked the necessary usability. Additionally, the requirement to save written comments separately undermined the Urban Sketch Tool's commenting functionality, although the ability to submit comments through a participatory process was deemed valuable. As a result, the participants' intended operation manual had to adequately explain the tool's functionality.

Chapter 4

Qualitative Methods: VisLab Lachen

To evaluate the UST, a participatory process called VisLab was initiated, with the design described first. Following that, Section 4.2 explains the research sampling and decision-making processes that resulted in the selection of local stakeholders as participants. Section 4.3 details the data collection process and the data sources used. Furthermore, this chapter's Section 4.4 clarifies the research's method ethics. The data analysis, and the methods used for it, is covered in Section 4.5. Finally, in Section 4.6, the VisLab Lachen participation process will be reflected on.

4.1 VisLab Lachen: Participatory Process

The design of the VisLab Lachen that was inspired by the Delphi method. It is defined as a method that allows structuring a group communication process in such a way as that it enables a set of people to resolve a complex issue (Dalkey & Helmer, 1963, p. 3). This section refers to Linstone & Turoff (1975, 2011) as well as Dalkey & Helmer (1963) to explain the classic Delphi study. Additionally, it discusses the role of consensus or dissensus in a Delphi process and seeks to improve the original concept by including web-based approaches, following Diamond et al. (2014), Coates (1975), as well as spatial case studies conducted by Julsrud & Uteng (2015), Balram & Dragicevic (2003), and Pullar & Tidey (2001). Lastly, the VisLab research design is introduced on the basis of the Delphi concept.

Each application must be tailored to its unique characteristics and to the participating group (Linstone & Turoff, 1975, p. 5). Dalkey & Helmer (1963) developed the Delphi method that entails at least two rounds of data collection. In the first round, experts are questioned about their opinions on a topic using a standardised questionnaire. The experts participate anonymously throughout the iterative process and receive feedback on the findings from a neutral facil-

itator who moderates and structures the Delphi study. In the second round, experts can reconsider and change their mind based on the feedback (Linstone & Turoff, 1975, p. 5). The Delphi method does not specify if consensus or dissent should be found by the end of a process (Diamond et al., 2014, p. 404). While some studies (Balram & Dragicevic, 2003; Pullar & Tidey, 2001) emphasise the importance of consensus, others seek to elicit some degree of agreement among experts (Julsrud & Uteng, 2015) or dissensus as output (Steinert, 2009). Coates (1975) emphasises that the Delphi method is not a technique for achieving consensus; rather, 'more attention should go to the basis of divergence' (p. 194). This allows leeway for this research, which, as mentioned earlier, does not focus on consensus, but also seeks to create space for dissent. This should be achieved by not communicating consensus as a target of the VisLab, by minimising the influence on the participation process, and by addressing issues on which the participants disagree.

As is done in the studies conducted by Julsrud & Uteng (2015), Balram & Dragicevic (2003), as well as Pullar & Tidey (2001), this research's Delphi version enhances the original Delphi concept by transferring the process to the internet, which is achieved by employing the UST. Figure 4.1 illustrates the participatory process conducted in this study.

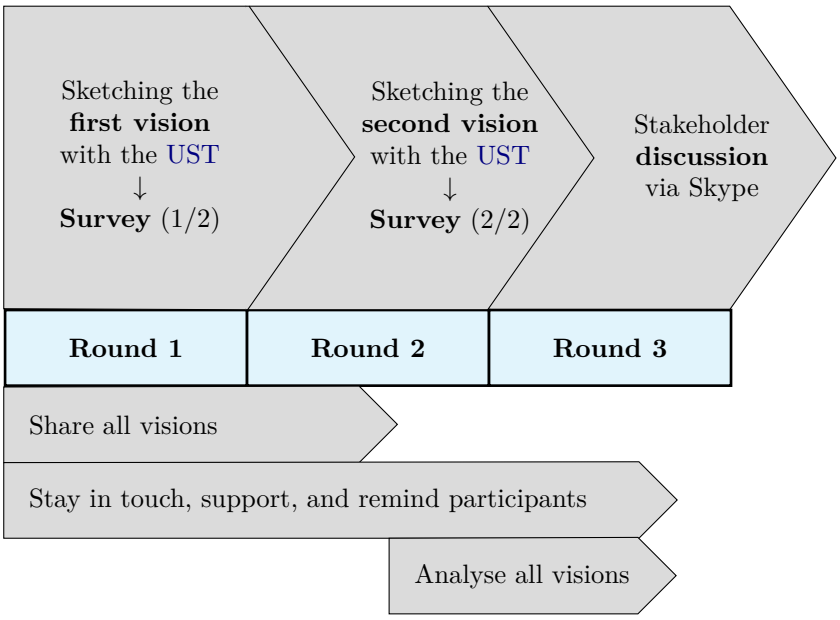


Figure 4.1: Research design of the VisLab Lachen, comprised of three rounds; the top half indicates the tasks assigned to the participants; the lower half refers to the researcher's responsibilities during the participation process.

The web-based VisLab Lachen was divided into three rounds with the objec-

tive of testing the UST and discussing the participants' visions. Participating persons received an information sheet and a user manual for the UST prior to the start of the process. These documents contained information about the participatory process's procedure and purpose of the participatory process, as well as instructions on how to use the UST properly. Additionally, deadlines for submitting the contributions and the date of the discussion were defined. The participatory process began with users sketching their own initial visions using the UST and, if necessary, commenting on them using the available comment function. Following that, participants were required to complete the initial questionnaire (see Appendix Chapter D). After the first round was concluded and the researcher received the visions and surveys, the researcher shared the visions with the participants anonymously, so they could examine one another's. The idea was that this visual stimulus could inspire participants to alter their vision, since, in the second round, participants were required to sketch another vision using the UST and provide feedback. Following that, the task of completing the second questionnaire was assigned. The final round involved a stakeholder discussion of the visions via Skype. Thereby the focus lay on the decisions that led to the creation of the individual visions as well as what others thought of them.

Apart from sharing visions with participants, the researcher had to fulfil additional duties during the participatory process. I was responsible for maintaining contact with individuals, assisting them with questions or concerns, and then reminding them of their tasks and deadlines. This was necessary to ensure the contributions would be handed in timely. Additionally, to guide the final round of discussion, the individual visions had to be analysed beforehand. This was because dierences and similarities between the visions served as the base for the Skype discussion, which was then recorded.

4.2 Research Sampling

According to Flick (2018, p. 173), the basic difficulty with sampling is how the study's participants are recruited from the population, as research conclusions cannot be established only about the study's participants. The selection is made on the basis of a number of factors. Individuals' unique features must be considered while include them in the sample, Flick says (ibid.). The research sampling decisions taken for this study are detailed below and follow Robinson's (2014) four steps for developing a research sample: identifying the sample universe, determining a sample size, selecting a sample strategy, and sourcing samples.

Robinson (2014, p. 25) writes that the first critical task of the four-step is defining the sample universe. This is the total number of individuals from whom a study may sample cases (ibid., p. 26). Due to the fact that this research is concerned with the harbour of Lachen, the focus was on stakeholders with an

interest in the future of this area, since those were more likely to participate in the VisLab. The emphasis was on motivating a politically and functionally heterogeneous group that reflected a range of perspectives and opinions.

The second point of Robinson (2014, p. 29) concerns the sample size determination. He notes that sample specifications should be flexible and suggests an approximate sample size range for undergraduate projects, with a minimum and maximum of three to 16 participants (ibid.). Similarly, this research followed Mason's (1996, p. 96) approach of selecting a sample size taking into account the following factors: The simultaneous management of the participatory process should not exceed the researcher's capacity, resulting from an excessive number of participants. Additionally, each stakeholder created multiple visions and data sets that were to be reviewed later. Furthermore, a stakeholder discussion was to be conducted online during the final round. This entailed recruiting a focus group of, according to Silverman (2020, p. 220), six to eight individuals who share affiliation to the harbour of Lachen. If the group was too large, there might have been a risk that not everyone got their voice frequently enough, or if the group was too small, the dialogue might not have been very lively. Thus, eight participants seemed to be sufficient to conduct the VisLab and give a buffer in the case of participant dropouts or withdrawals.

To select stakeholders, step three of Robinson's (2014, p. 29) four-step process, a purposeful sampling strategy was used. According to Mason (1996, p. 96), this strategy ensures that the final sample of the study reflects certain perspectives and opinions inside the sampling universe. This selection approach is justified because it allows for specific participants with a unique, dierent, or valuable perspective on the harbour of Lachen to be included in the research (ibid.). To begin with, individuals with diverse political backgrounds were chosen to minimise clustering due to a shared political stance. Addition-ally, participants were required to represent adjacent interests, such as the local (restaurant) industry or school. Mason (1996, p. 97) emphasises, however, that a person of a particular type cannot represent all individuals of that type or even must represent the person's presumed characteristics. This constitutes a limitation of this research, which is hard to overcome due to the small sample size. At most, this can be countered with a diverse selection of participants who represent certain opinions.

After the sample universe, sample range, and sample strategy were defined, stakeholders could be recruited by adopting the snowball method. This method includes, as mentioned by Robinson (2014, p. 35), requesting recommendations from participants for acquaintances who might qualify for participation. To find local stakeholders, a contact person of the municipality of Lachen and a contact person from the University of Zurich, who is politically involved in Lachen, helped to compile a list of potential participants. It had to be taken into account that these individuals' recommendations may not have been objective and may have

been motivated by a relationship such as friendship between the recommending and the recommended person. Prior to getting in touch with the stakeholders, the advice of Robinson (2014, p. 35) was considered: all potential interviewees should be informed about the study's goals, what participation entails, which degree of anonymity is ensured, and any other information that may enable them to make an informed, consensual decision to participate. As a result, Table 4.1 shows the final stakeholder selection for VisLab Lachen. For this research, all participants gave their informed consent (see Appendix Chapter C), as proposed by Miller et al. (2012).

Stakeholder List		
Initials, Gender, Age	**Function**	**Involved In**
EA, female, 60-70yr	Party president and Cantonal Council; local resident and shop manager	SP Party and Cantonal Parliament Schwyz
MB, male, 50-60yr	Member	Environmental Council Schwyz; VCS Schwyz
FC, male, 50-60yr	Secondary school headmaster; advisory board	Lachen Secondary School; School building extension project
SK, female, 30-40yr	Head of marketing	Hotel Marina, Lachen
PM, male, 60-70yr	Municipal president until 2020; initiator of the new harbour facility (southern part); party member	Municipality of Lachen; FDP party
WR, male, 50-60yr	Head of the construction and environment department	Municipality of Lachen
AS, male, 80-90yr	Lobbyist against the planned underground car park with an alternative concept; local architect and planner; party member	Stähli Architects; FDP party
CZ, female, 50-60yr	Councillor; party member	Municipality of Lachen; SVP party

Table 4.1: Local stakeholders who participated in the VisLab Lachen

The study recruited stakeholders from across the political spectrum, with the SP representing the left, the FDP representing the liberal centre, and the SVP representing the right. Additionally, several interests were included. On the one hand, stakeholders from the school, hotel and retail industry were present. On

the other side, individuals were invited who previously participated in planning projects for the development of the harbour, regardless if it is from a community side, governing or initiating harbour facilities, or lobbying for the car parks. On the other hand, by inviting stakeholder AB, a focus on environmental issues should be present during the process. With this selection, a heterogeneous group of stakeholders with technical, political, economic or neighbourhood perspectives could be recruited. Hence, one can presume that certain opposing viewpoints were represented, which will become apparent in the section on data collection and during the discussion of the participatory process.

4.3 Data Collection

The data for this research were gathered from visual content (vision sketches), two questionnaires and a focus group (stakeholder) discussion. To begin, with the launch of the VisLab, participants submitted vision sketches for the Lachen harbour via mail, some with accompanying comments as text file. The UST was used to generate the visual content. In adddition to this, data were gathered through a web-based survey. Because this data collection was conducted during the first and second rounds of the participation process, participants submitted two visions and two completed surveys. Finally, the focus group discussion was recorded via Skype. All data were generated and collected online. The individual components of the data set generated during the VisLab are depicted in Figure 4.2.

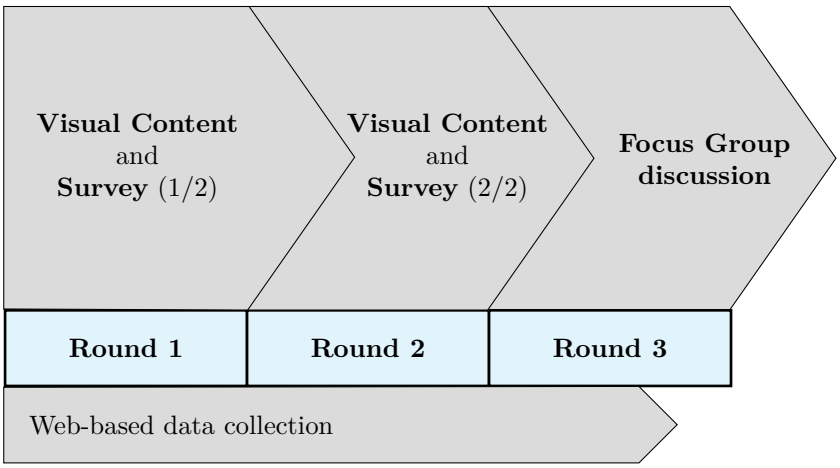


Figure 4.2: Qualitative data that were collected throughout the three rounds of the web-based VisLab Lachen

As illustrated in Figure 4.2, this research drew on a mix of data sources. According to scholars (Flick, 2018, p. 28; Silverman, 2020, p. 402), a mixed

methods approach combines quantitative and qualitative methods. However, the questionnaires, visual contents, and focus group are all qualitative data in this study. The questionnaires could only be assessed qualitatively due to the small number of participants. During the analysis, the data were examined separately, but if, for example, something about the use of the UST was said during the discussion, which was covered by the questionnaires, it was of course not ignored. Ultimately, the aim was that the individual data sources should specifically address the research sub-questions. The questionnaires were intended to elicit responses on the use of the tool and its support for discussion. Whereas the Skype conference should provide insights into the stakeholder discussion and its content.

4.3.1 Data Sources and Implementation

Visual data was collected by using the UST online in the VisLab's first and second rounds. The vision sketches should serve as a catalyst for testing the UST, documentation, and representation of stakeholder perspectives, as well as a springboard for the focus group discussion. To collect visual data, participants sketched their own visions from a set point of view using a 360-degree perspective. Thereby, the stakeholders had the ability to alter the virtual environment with four scenarios. When they were finished, they captured their vision sketch as a panoramic image in the PNG file format and shared it with the researcher via mail. The vision images were then distributed anonymously among the stakeholders. This enabled other participants to compare them with their own vision, which presumably resulted in them having new ideas. However, it must be mentioned that the visual content is limited, since the researcher developed the scenarios, on which the stakeholders' visions were based.

In addition to the sketching of visions, web-based questionnaires (see Appendix Chapter D) were distributed during the VisLab rounds one and two. To conduct the survey mode online, this research followed instructions of Schnell (2019, pp. 12, 277) and used Google Forms (Google, n.d.-b), a free online survey tool. Furthermore, the online survey was standardised. This could minimise the researcher's impact on the responses and enables quantitative presentation of the results (ibid., p. 13). As Schnell (2019, p. 105) notes, tiredness sets in after only 15 minutes of web-based interaction. Thus, it was important that the questionnaires did not take an excessive amount of time to complete. Given the amount of time participants already had to spend sketching their visions on the computer, answering the questionnaires was to take no more than ten minutes.

The formulation of the questions was done in accordance with Schnell's (2019, p. 67) recommendations. Closed questions with given response options were developed to assess the effectiveness of the UST and the point cloud visualisations. The options to answer were spread on a scale denoted by endpoints. This type of

interval scale, which Porst (2014, 75) describes as having equal distances between the scale points, was used as a measuring instrument. For instance, participants could select between the endpoints 'totally agree' and 'disagree entirely' Porst (2014, p. 76) (see Appendix Chapter D). Additionally, some questions were supplemented with open-ended questions to gather additional information or, as Schnell (2019, p. 70) puts it, to investigate unknown responses. Given the author's (ibid.) assertion that a written response could not be taken for granted in the case of web-based surveys and given the possibility that participants would abandon the survey altogether, responding to the open questions was not mandatory.

To adhere to the recommendations of Dillman et al. Dillman et al. (2014, p. 230), the questions were grouped and then posed sequentially. Each questionnaire was structured using two thematic blocks. They each began with an overview of the VisLab's process so far, the survey's content, data protection and instructions on how to respond to the questions. The participants signed up for the survey using their e-mail addresses, which they had previously used to submit their visions. Along with gender and affiliation with the municipality of Lachen, the initial questionnaire asked about the UST content and visualisations. The second round's questionnaire inquired about repeated usage of the UST and digital skills. Additionally, the second questionnaire block addressed point cloud visualisations once again and their potential to support a discussion. Particular attention was paid to the structure of the questions and blocks, as indicated by Schnell (2019, p. 111). This was facilitated by the use of Google Forms.

Prior to the establishment of the VisLab and distribution of the questionnaires, their formulation on the desk could not ensure that the survey's objectives, addressing the second sub-question, would be met. This can, however, be ensured using a pre-test, according to Converse & Presser (1986, p. 54p.). Therefore, a test run was administered prior to the participant's participation to determine the participant's comprehension of the questions, the difficulty of the questions, the survey's continuity, the effect of the questions' order, and the duration of the interview. Subsequently, the following changes were made: The introductions were reworded; several questions were changed without providing the technical terminology 'point cloud'; others were omitted due to being repeated but already included in a different wording; and finally, the second questionnaire's structure was altered.

Due to the small sample size and one-time application of the survey to a single stakeholder group, a reliability check was not necessary (see Schnell, 2019, p. 123). To ensure that the correct variables were measured, the participatory process began with a single participant. For this purpose, the municipality's impartial reference person was consulted, who had previously recommended participants. This was not only to validate the review steps in a subsequent phase,

but also to elicit feedback on the entire first round process, including the communication strategy (information sheet, operation manual, task), the use of the UST, visualisations, and questions. The task was rewritten with a more precise formulation following this exchange.

The final data source for this study was a focus group. Ryan et al. (2014, p. 2) defines a focus group as a subtype of group interview in which the researcher poses a series of questions and the participants interact with one another, aimed to elicit collective viewpoints on a certain subject. Adopting the focus group characterisation Silverman (2020, p. 220), data collecting for the final round of the VisLab involved encouraging the stakeholders to conduct an informal stakeholder discussion focused on the harbour of Lachen. The researcher moderated the group conversation and actively invited participants to engage in interaction. The discussion took place online and in real time. Following Flick (2018, p. 266), this requires that all participants are online concurrently via the conferencing software Skype. On the other side, it was easier to record (ibid., p. 268).

As recommended by Mann & Stewart (2000, p. 108), stakeholders received an information sheet prior to the participation process entailing the discussion date, further instructions, and a link to the Skype conference of the VisLab. The information sheet can be found in the Appendix C, Figure C.2. The provided Skype link eliminated the need for software installation to be able to participate. This mitigated the risk, mentioned by Flick (2018, p. 266), that certain stakeholders would decline to participate in the study. He also highlights a second concern with online focus groups: shy individuals may be hesitant to intervene if they are unfamiliar with the process or issue. However, a digital method gives the researcher more possibilities for tackling this challenge, he argues (ibid.). The digital method, for example, enable the researcher to remind stakeholders via mail of their current tasks and that support was available to them.

Finally, the discussion was held via Skype, as scheduled, using the free online meeting scheduling tool Doodle (n.d.). The stakeholder discussion was recorded and filmed. Prior to the discussion, a discussion guide (see Appendix H) was created based on the vision analysis. It defined the discussion's course and the questions to be asked. After an introduction of all stakeholders, the discussion was to focus on the participants' vision sketches for the Lachen harbour. According to Froschauer & Lueger (2020, p. 61), the dynamic of mutual interaction should be facilitated as much as possible through the stimulation of communicative exchange between stakeholders. To generate interest, the researcher demonstrated the sketched visions to the focus group and invited them to share their diverse perspectives. Additionally, vision sketches that could not be shared with participants during the process were replaced with the participant's verbal description of them. This enabled an examination of the decisions that resulted in the development of each vision. Additionally, it created a space for others to

express their thoughts on what they considered to be positive or negative.

As Flick (2018, p. 260) emphasises, the subsequent direction of a discussion cannot be foreseen, and hence the researcher's interventions and data collection decisions must be made during the situation. As a result, a list of topics and questions was prepared in order to integrate new impulses into the discussion. On the one hand, the most salient characteristics of the vision comparisons were introduced as major topics; on the other hand, supplemental questions to the results of the survey were formulated to generate additional knowledge if necessary. The latter was intended as a stopgap, but during the discussion, all stops had to be pulled. Because Froschauer & Lueger (2020, p. 61) state that the dynamics are highly dependent on the composition of the discussion group, this fact exposes a limitation of the data collection.

4.4 Method Ethics

For the interaction with local stakeholders and the data collection in this study, the implementation of a method ethic is reasonable. Therefore, the methods are linked with six ethical issues such as consent, anonymity, sensitive topics, power, data and data management (Wilson, 2020). Philo & Laurier's (2020, pp. 33-34) explanation of the first ethical concern, 'confirmed consent', was the basic condition to launch the VisLab. This was determined by the researcher's information presented to the participants. Consent for the participatory process was gained through telephone at the starting of the project, and was then confirmed with a signature. The Appendix Chapter C shows the consent form. Throughout the VisLab, information on the participation process was updated and communicated repeatedly to ensure that consent was also obtained during the discussion. The information contained details about the research's aim, the participants' expectations, and the data's use and storage. At all times, participating stakeholders were aware that their engagement was voluntary and that they may withdraw at any time.

The extent of anonymity was communicated to participants to protect them from the negative effects of disclosing information. The level of anonymity, as described by Wilson & Darling (2020, p. 43), was communicated to participants to protect them from the negative impact of disclosing information. However, this second ethical issue was influenced by the research focus narrowed down to the municipal level, for which stakeholders from the neighbourhood with a specific function and, in some cases, political affiliation were consulted. Because, this proximity of the participants to each other may have led to their identification. Furthermore, Hopkins (2007, p. 531) notes that the use of group discussion to collect data includes a public component through which participants can be identified. Therefore, participants consented in advance to the use of their particulars in the research. The first two rounds of the VisLab were conducted

anonymously. Individual visions were then, in the third round, presented to the stakeholders during the group discussion.

Concerning the research's sensitivity, the third ethical issue mentioned by Hopkins (2020, pp. 52-53), it was emphasised that the research was informal and had no bearing on ongoing planning processes. Additionally, because most of the harbour area is common property, knowledge and wishes regarding it could be conveyed without jeopardising private ownership by the disclosure of insider knowledge. The study began by classifying the municipality's information on the Octapharma parcels and the planned headquarters there as confidential. However, it became obvious during the process that this was already known within the municipality and had been published by Grüter (2019).

Fourthly, Swerts (2020, p. 60) states that power pervades all aspects of a study process. This pertains to the researcher's relationship with the participants as well as the relationships among the participants. Each of these relationships contains power differentials that have an effect on the entire process (ibid.). In this study, this starts by the researcher's ability to choose the study location and participants for the participatory process. Additionally, the researcher devised the participation process and moderated the process, which focused on topics determined to be significant by the researcher. This decision-making ability of the researcher also influenced the data analysis, which was shaped by the researcher's subjectivity.

Particularly, the research's visual content was based on visualisations created by the researcher. All methods, starting with stakeholder sketching of their visions, were based on these visual digital realities. Furthermore, the participants were partially influenced during this process by ongoing planning processes concerning the harbour area, which might have influenced the sketching of a vision and the discussion. Considering the relationships between the participants, it appeared as though some stakeholders knew one another beforehand. To be fair, this was inevitable due to the stakeholder recommendations of other participants. However, the researcher was, to a certain extent, unfamiliar with the associated backstories, especially those concerning the harbour. This could have had an eect on the discussion's dynamics as well, for example, if particular topics had been covered already and the motivation for bringing them up again was influenced by this.

Concerning the sixth ethical concern, data in research, Cunningham (2020, p. 83) argues that the data created, and the methods used to process and analyse the data all result in a particular representation of the results. These representations are based on the researcher's subjective decisions on what to include or exclude, which shapes the research (ibid.). This was certainly relevant during the UST's development. This is because the visualisations as visual representations were conditional on the researcher's ability to use various software solutions and digital techniques. Additionally, numerous decisions were made throughout the UST's

linear development process, which was based on the harbour's virtual 3D model, such as how to resolve a technological challenge or which 3D objects should be added or deleted. This had a significant impact on the simulation process of the scenarios. Lastly, the researcher then chose the data sources associated with the various tools used to construct the data set during the subsequent participation process.

Wilson & Darling (2020, p. 91) describes how this data should be managed in the final ethical issue. This study's data were split and stored differently. Passwords were used to protect the data in each case. First, all data generated throughout the development of the UST were saved on the ETH Zurich's internal network, which was accessible only to the researcher. It should be emphasised, however, that this network-based storage did not provide total security, as the researcher did not have complete control over it. As a result, they were also saved on an external hard disc, which was locked. Secondly, qualitative data were stored on the researcher's laptop. It is critical to emphasise that, as a result of the digital access via the various tools such as the UST, Google Forms or Skype, certain data was temporarily cached on external servers: visual data were stored on ETH back-end servers, survey data were preserved on Google servers, and the discussion recording was saved on Microsoft servers.

4.5 Data Analysis

The data for this study comes from a variety of data sources: the stakeholders' visions as visual content, two questionnaires, and a focus group discussion with stakeholders. The analysis of these mixed methods was primarily conducted independently of one another. The discussion was solely based on the analysis of the visions. For the qualitative data analysis, this research necessitated two approaches, which are mentioned by Bernard et al. (2017, p. 2). First, the questionnaires' data was graphed (Burzan, 2015) to help interpret the results. Second, qualitative content analysis (Mayring, 2014; Früh, 2017; Kuckartz, 2014b; Kuckartz & Rädiker, 2019b; Mayring, 2020) was used to analyse text and image data. The recording of the stakeholder discussion was transcribed in text form for this purpose (Fuchs-Heinritz, 2005; Gläser & Laudel, 2010; Kuckartz, 2014a; Fuss & Karbach, 2019).

4.5.1 Graphical Representations and Discussion Transcript

Graphics, as Burzan (2015, p. 151) mentions, are used to quickly convey a message. The visual imagination is tapped and used to elucidate the results (ibid.). For the graphical representation of the survey findings from this study, grouped bar charts were employed. The bar charts made it possible to compare the characteristics spread on the interval scale. A bar chart group was created for

each of the questionnaire blocks to help present the results. The graphics allowed an analysis of the results. The open-ended questions from the questionnaires acted as a textual supplement to these findings.

To address the third sub-question, this study used Skype to facilitate a stakeholder discussion. To analyse the focus group and how they dealt with alternate visions, the recorded video file had to be transcribed. According to Fuss & Karbach (2019, p. 17), a transcription can be used as written data for the analysis. As a result, additional details about the discussion situation are preserved (Fuchs-Heinritz, 2005, p. 286). This preservation allows an analysis with further distance from the spoken words (ibid.). Hence, the scientific transcript of the stakeholder discussion is detailed and allows following the discussion verbatim. The level of detail and the manner in which the spoken word is transcribed are determined by transcription rules (Fuss & Karbach, 2019, p. 20-21). Transcripts are not subject to universal standards. According to Gläser & Laudel (2010, p. 193), each research employs its own set of rules. For this research, the transcription rules of Kuckartz (2014b, p. 136-137) were thus adapted further, which is shown in the Appendix Chapter I. By using these rules, the discussion could be transcribed in text. This completed the analysis's basis that consisted of charts, panoramic images (vision sketches), and written text.

4.5.2 Qualitative Content Analysis

Qualitative content analysis approach was introduced by Mayring (2014). According to him (2020, p. 495), this analysis method is about defining and validating basic forms of interpreting qualitative data using content-analytical rules. The method allows quantification and targets both formal data components and deeper meaning structures (ibid., p. 500). Furthermore, according to Früh (2017, p. 42), the pragmatic goal of qualitative content analysis is to reduce complexity to answer the research questions. To address the second research sub-question, qualitative statements about the graphical representations of the survey results were made. These findings supplement those derived from the stakeholder vision sketches and the discussion transcript, which were analysed to address the third sub-question of this research.

Mayring (2020, p. 495) describes three basic forms, from which the following was developed for this research: summaries should distil visual and written content to their essential components to reveal the underlying meanings. Creating inductive categories is crucial in this process (ibid.). According to Mayring (2020, pp. 498-499), the content analysis categories must be carefully specified and linked to the data circulatory. This was accomplished through the application of a multi-stage technique of category development and coding, as outlined by Kuckartz (2014a, p. 77). The first phase involves a rough classification of the main categories. The following phase refines and differentiates these categories

based on the data. Afterwards, the data material is coded once more in a second run, after which it is reviewed and processed according to its categorisation. These fully differentiated categories already establish a more or less solid system for the research (ibid.).

All data used in this study was digital and digitally stored. Therefore, the computer programme MAXQDA was appropriate for qualitative data analysis. As stated by Kuckartz & Rädiker (2019c, p. 3), it allows the analysis of various qualitative data types. Because the data came from a variety of sources and addressed a variety of sub-questions, they were analysed separately without linkages. First, the vision sketches were examined. This was done to establish a basis for the stakeholder discussion of the participation process. According to Kuckartz & Rädiker (2019a, p. 90), MAXQDA allows for the coding of images by drawing frames with the mouse. Thus, the stakeholder visions were imported and coded as follows: The scenario system defined in the Subsection 3.4.1 provided a basis for categorisation. Based on the system, the visual content could be identified and the corresponding category drawn in. This allowed for the comparison and quantification of the various vision sketches. Additionally, it showed how often, and on which plots, predetermined scenario system content was sketched. These findings enabled the identification of first tendencies in stakeholders' preferences for the harbour of Lachen, which served as a springboard for the discussion.

The focus group analysis could be conducted using either the Skype video recording or the written transcript. The video file was rewatched to take notes prior to beginning any analysis. During the process of watching the recording, it became clear that the video file contains information that the textual transcript does not. Each Skype participant had a window that displayed them in front of the computer. Their presence or absence in front of the camera revealed potentially analysable data. Additionally, a number of technical difficulties occurred throughout the digital conference. These distinctive features of the digital approach were demonstrated solely in the video. On the other hand, the analysis' critical data were derived from the transcript. As a result, both file types were examined.

To address the research's sub-questions during the focus group analysis, five questions aided in framing the discussion and providing structure: how is the discussion evolving (1); how has the UST been received (2), and what are reservations (3); what are the primary subjects (4), and how are they discussed among stakeholders (5); are there viewpoints that consolidate and arguments that dissipate (6); what function do visualisations have in this discussion (7), and would they be changed (8)? Based on these questions, a code system draft was created with five main categories that are shown in Figure 4.3: 'Participation Process' (1) and 'Digital Discussion Process' (2); 'Subjects' (3); 'Discussion' (4); and 'Visualisations' (5). This system was updated as data was further analysed, re-

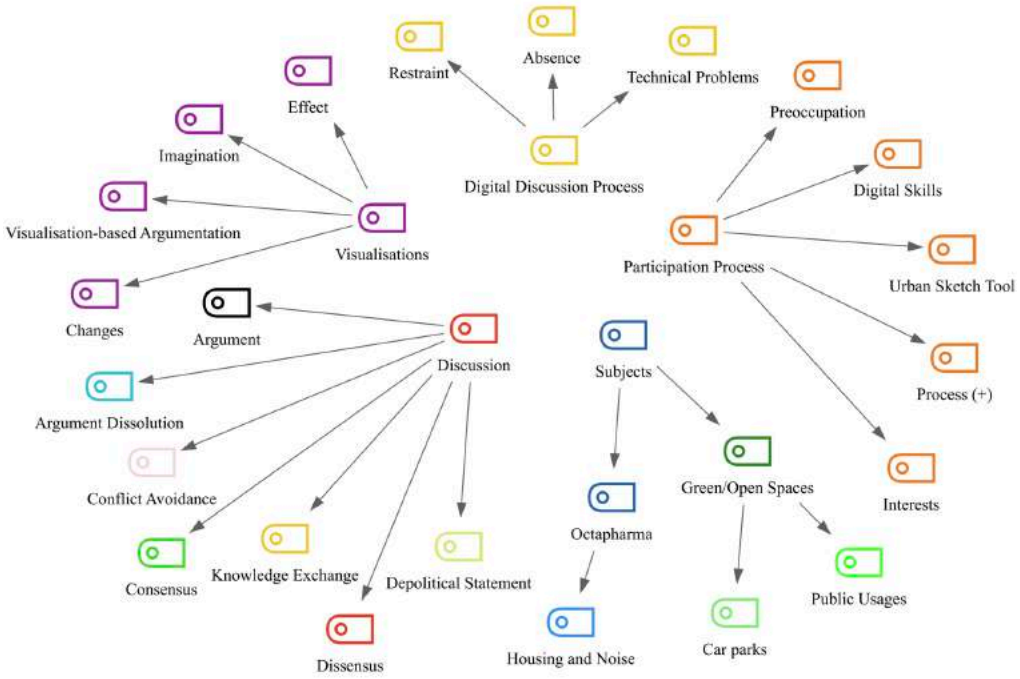


Figure 4.3: Hierarchical code system for the discussion analysis with top-level categories and sub-codes

sulting in the emergence of a 'hierarchical code system' with sub-codes (Kuckartz & Rädiker, 2019b, p. 94). The latter, in particular, were developed inductively and altered through recurrent data analysis. Finally, the code system established the basis for analysing the discussion.

4.6 Reflection on the Digital Participation Approach

The three-part process began with stakeholder invitations, continued with communication about the process and the use of the Urban Sketch Tool, included the completion of digital questionnaires and sketching visions with the UST in the first two rounds, and concluded with stakeholder discussion in the final round. Stakeholders were invited via phone call, which was simple and clear. Each individual contacted provided consent for participation directly to the researcher. Mentioning the University and ETH Zurich was beneficial, as both educational institutions have a favourable reputation. Additionally, those contacted expressed their motivation immediately and frequently linked it to their involvement with the harbour area. Throughout the conversation, it was critical to emphasise that this engagement would be entirely voluntary and would have no impact on current planning processes. Individuals were reassured that

they could engage without reservations. Finally, the engagement was approved through the provision of written informed consent.

Telephone contact was always sought first. This simplified the process of conveying information about the project. The high level of agreement suggests that directly approaching participants increases their likelihood of agreeing, but also their rashness. This may can also be a disadvantage in retrospect, if individuals withdraw unexpectedly or become unavailable during the process, despite the researcher's expectation of their presence. Unfortunately, there have been few instances due to the digital access and distant communication. Additional context information is available in the discussion Chapter 6. The discussion was successfully scheduled by using the web platform Doodle (n.d.). Everybody was familiar with this scheduling tool, which has been checked in advance to avoid complications. As a result of digital access, participation became more flexible, for example, during working hours throughout the day. It was critical to avoid the majority of participants already being on summer holiday. Thus, the stakeholders agreed on a time that was convenient for them during normal business hours. At the time, only one person had already gone on holidays. With this level of planning confidence, the VisLab could be started.

An information sheet and operating manual (see Appendix Chapter C) for the UST were provided prior to the start of the process. These documents could be reviewed whenever anything was not understood, based on participant feedback. However, it was reasonable to assume that not all the stakeholders have read this information. This was the case for one participant who was unaware of the participation objectives and the expectations of him or her. However, it could be possible that the information was simply misunderstood. Thus, to keep the participation threshold as low as possible, it was critical to maintain frequent contact with participants in order to provide the best possible support and to remind them of deadlines. Although reminders and support were appreciated on a regular basis, no one requested additional assistance. However, as demonstrated throughout the process, not everyone comprehended everything completely, and thus a video tutorial would have been probably the best option for digitally informing and instructing participants. It is more engaging to watch and allows for more information to be included. Additionally, vision sketches may have been demonstrated, allowing participants to gain a better understanding of the UST's capabilities.

On the basis of participant consent and effective communication, the VisLab could be launched. The first two rounds required participants to complete digital questionnaires. Even if the questions were leading, this was not an issue. Rather than that, the homogeneity of the questions and response possibilities may have contributed to the findings' confidence, as participants may have lost focus during the completion and any variations in the questions or response alternatives would have gone unnoticed. Moreover, the questions were structured into subject

groups. This structure could be adopted for the results and hence the discussion of this research. However, it became apparent that additional open questions should have been asked. This is because the most insightful comments about the UST's use were obtained through open inquiries. Thus, the open questions were a valuable complement to the closed question.

In the third round of the VisLab Lachen, a stakeholder discussion was included. The researcher's role was to be the moderator, appearing on-screen as a male and a University of Zurich student. The moderator may also be identified as an expert by participants based on the developed Urban Sketch Tool, the research project, and the universities mentioned. The discussion was to be moderated objectively and unbiased. This was challenging, as indicated by an incident in which the researcher unintentionally agreed with one participant. Additionally, it was critical to leave as much of the discussion to the participants as possible and to intervene only if truly necessary. One instance exemplarily demonstrated what happens when the researcher intervenes too early. The discussion guide provided structure for the discussion's start. As a result, after some time at the start of the discussion, a conversation between stakeholders was interrupted to allow others to speak and follow the discussion guide, as well as to resume this point later. Unfortunately, this could not be reiterated. Hence, it appears the moderator should act only after a period of silence of at least several seconds.

As demonstrated by this example, moderating the discussion required striking a balance between allowing individuals to speak and interfering with the subject. The discussion was relatively inactive, which could have been caused by technical difficulties or members temporarily disappearing from the screen. As a result, the moderator was required to ask all prepared questions, including the final auxiliary question. This demonstrates how important questions from the preparation process can be. On the other hand, it exemplifies how frequently the moderator was required to reignite the discussion following a brief period of silence. Nonetheless, sufficient data remained for analysis, which led to the results covered in the subsequent chapter.

Chapter 5

Results

The following chapter provides a more detailed examination of the research findings, structured according to the aforementioned methods section. As such, the results are divided into a technical and a qualitative part. First, the four scenarios that were visualised during the development of the UST are presented and described. Furthermore, the UST interface is displayed in the same way in which it appears on the Internet. Following the tool's development, the UST was then deployed in the first two rounds of the VisLab. Section 5.2 summarises the results of the questionnaires (see Appendix D) that were distributed during those rounds, specifically focusing on the UST and point cloud visualisations. In particular, it was investigated how the UST assists in sketching one's own vision and how it supports stakeholder discussion. The insights gathered from participants' vision sketches (see Appendix F) served as the basis for the subsequent stakeholder discussion outlined in Section 5.3. The results reveal the circumstances under which stakeholders discuss relevant topics, whether they reach consensus or dissent, and the grey tones that were identified in between. Finally, the influence that visualisations can have on participants and the discussion is analysed.

5.1 Four Scenarios for the Lachen Harbour and the Urban Sketch Tool Interface

Four scenarios for the Lachen harbour were simulated using a scenario systematics (see Table 3.1, Subsection 3.4.1), which specified the visual content of the scenarios. This is depicted in Figures 5.1, 5.2, 5.3, and 5.4, showing four panoramic images captured from the same angle, covering a 360° perspective on the entire perimeter. The next paragraphs describe the visual content of the scenarios from left to right.

Figure 5.1: **Scenario Today** for the Lachen harbour area

Figure 5.2: **Scenario Green** for the Lachen harbour area

Figure 5.3: **Scenario Activity** for the Lachen harbour area

Figure 5.4: **Scenario Dense** for the Lachen harbour area

The **Scenario Today** (see Figure 5.1) depicts the current state of the harbour, including its car parks. On the left side of the image, the old school gymnasium can be seen next to the current school ground. The buildings that have remained untouched in all four scenarios are in the image's centre. On the right, one finds the three-storey buildings that are currently owned by Octapharma. Next to this, the Hotel Marina is located at the end of the small car park. The second scenario, Figure 5.2, displays the **Scenario Green**. The green space is achieved by visualising two green parks with meadow grounds. The gymnasium has been replaced by an open space on earthen ground, connecting the green park to the lakeside. Behind the trees of the park, one finds an indication of the planned school building project. Next to the untouched central structures, a four-storey housing estate appears. This ensemble has an open character and features various passages for pedestrians or cyclists.

In the **Scenario Activity** (Figure 5.3), the old school gymnasium has been replaced with an outdoor gym and skate ramps. Once more, the new school project is displayed. The park, on the other hand, is simulated differently than in the previous scenario. There are two gravel spaces, benches beneath trees, and a playground where visitors can linger. On the right side of the image is a building with a closed building alignment and commercial space on the ground floor. The small square in front of this building is simulated in the same way as the large park in this image. The final **Scenario Dense**, shown in Figure 5.4, illustrates the harbour with a high density of buildings. On the left, a building close to the new school building extension is visible. The large square with chairs in red, the colour of Lachen, sunshades, and a water feature is reminiscent of Zurich's 'Sechseläuten' square. Furthermore, this park simulation is inspired by the designed park for the new school construction project. On the right, the Octapharma plots are represented by a business building that serves as the intended Octapharma headquarters. The adjacent car park is likewise being built as a mixed-use structure.

Legend: **1.** Brush **2.** Scenario Green **3.** Scenario Activity **4.** Scenario Dense **5.** Rubber/Current Situation **6.** Brush Size **7.** Save Vision **8.** Save Comments **9.** Comment Function

Figure 5.5: Urban Sketch Tool interface with its functions

These four scenarios were subsequently implemented into the UST, where they served as the foundation for the sketched visions. As indicated in Figure 5.5, the tool is accessible online. Its interface is split into two parts. The upper part of the online platform displays the current state of the Lachen harbour (i.e., Scenario Today). Beneath, a comment function is added. To sketch one's own vision, the present state can be altered by integrating content from the other scenarios using the brush function. Users can thus select their preferred scenario. The rubber function can be used to either reverse progress or return to the initial state. Changing the brush size allows different levels of detail. Once the sketching process is complete, the vision can be saved locally via the save feature. This also applies to any comments stated about the vision. If the user wishes to add another remark to their contribution, they can do so by creating a title and entering a text. This can be responded to or deleted. Overall, these features make up the UST. The tool was evaluated during the participatory part of this research. In the first and second rounds of the VisLab, stakeholders were asked to sketch their visions before completing the VisLab questionnaires.

5.2 VisLab Questionnaires

The VisLab questionnaires were distributed throughout the first and second rounds of the VisLab, intending to explore how the UST aids in sketching one's own vision and how it supports the stakeholder discussion. To address this research question, the questionnaires were divided into thematic sections, particularly focusing on the use of the UST and point cloud visualisations. In total, six of the eight stakeholders participated in the questionnaires, consisted of both closed and open-ended questions. To ensure better readability, the results of the closed questions are provided in bar charts on a scale ranging from 'disagree at all' to 'fully agree'. In addition, some closed-ended questions were supplemented by answers to the open questions, which are attached in Appendix Chapter E.

To succeed in sketching a vision, certain conditions must be met to some extent. These include the ability to access the UST, the comprehension of the UST interface, and its ease of usage. Questions relating to these pre-requirements are covered in the first part of the questionnaire (1/1) (see Figure 5.6). Results show that most participants were able to access the UST via the website and successfully navigated its interface. One person comments that the given instructions for the UST were helpful and simplified its use. In line with this, most participants agree that the UST is easy to use. Consequently, this serves as a good basis for sketching out one's own vision, which the majority of the users are able to accomplish. One individual particularly highlights the 'playful use of visualisations'. Another simply states, 'this is a very good tool'.

In contrast to this, a minority of stakeholders also rated several items in the questionnaire's first thematic block negatively. Although negative responses are

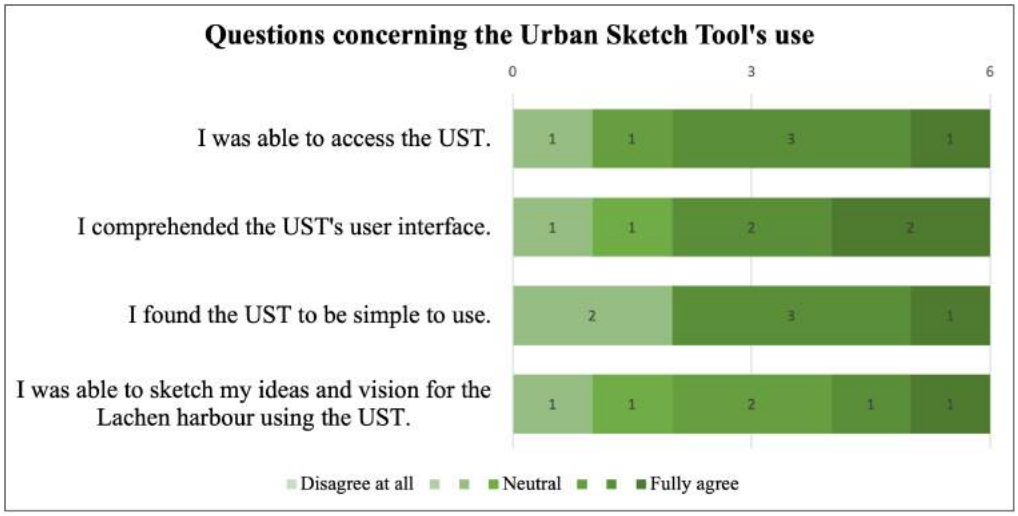


Figure 5.6: Question responses on the Urban Sketch Tool's use.

low, they are relevant since the VisLab pursues the objectives of digital participation (see Subsection 2.2.2), which may not be fully realised. The responses of these specific participants may provide information on why the UST was not easily accessible or simple to use. For example, one respondent suggests that they did not understand what was expected of them. Another person reports that they experienced technical difficulties and were unable to store the vision sketches. Clearly, such struggles complicate the task's completion. A further stakeholder comments that the underlying scenarios were not feasible, which may have further contributed to a negative response. Similarly, certain stakeholders wish for more scenarios for sketching and a higher level of detail. In addition, some would prefer to place objects freely.

Figure 5.7 illustrates the findings of the second part of the first questionnaire (2/1), focusing on the UST's point cloud visualisations. Given that these serve as the visual basis for stakeholders' vision sketches, point cloud visualisations play a critical role in both sketching representative visions and the stakeholder discussion. As a result, it seems beneficial that all participants perceive the visualisations as realistic and are able to recognise the harbour area within them. Some participants are surprised by the simplicity and efficiency of using the visualisations to sketch a vision, while others are impressed by their appearance. As the underlying scenarios seem to play a significant for sketching, it is equally of importance that they are comprehensive. Most of the participants agree with this. Responding stakeholders suggest that visualisations provide a 'quick overview' of possible scenarios and are 'helpful in presenting possible options and communicating them to specific addressees such as planners, buyers or the public. To account for the minor disagreement on this issue, as can be seen in the bar chart below, respective feedback is lacking. However, one person

reiterates that the scenarios are not feasible, which could be interpreted that as a negative influence in this context.

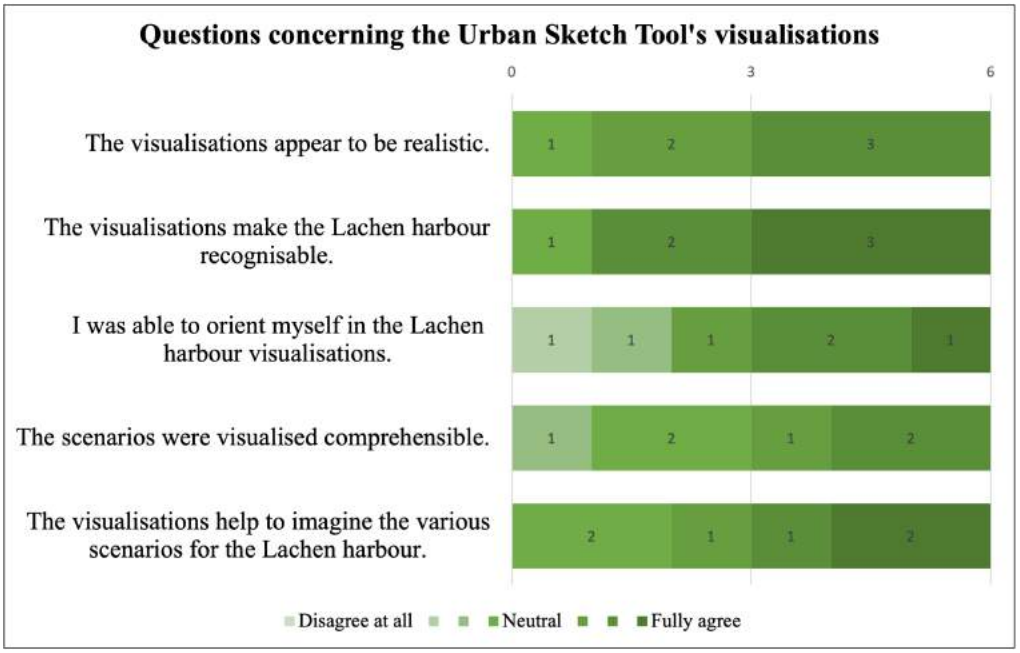


Figure 5.7: Question responses on the Urban Sketch Tool's visualisations.

The second application of the UST and the digital approach to the participation process are covered in the first part of the second questionnaire (1/2), the results of which are shown in Figure 5.8. As expected, stakeholders indicated that the UST became easier to use in the second round. This may have been supported by the anonymous sharing of the vision sketches in the first round and the opportunity to see what more could be created with the UST. However, in light of the reported levels of disagreement on this item, it can be assumed that some pre-existing difficulties with the UST remain unresolved. Furthermore, only two people altered their visions for the harbour following the exchange of the vision sketches among participants. Since this number is low, it can be suggested that the visions offer new ways of communication that can support the sketching process. In addition, the results indicate that the digital access facilitates participation. The majority of participants agrees that the UST increases motivation for participation. These responses highlight the advantages of the UST and provide significant arguments in favour of using the UST in a participatory process. Lastly, sufficient digital skills constitute a precondition for sketching urban visions. While the majority of users have no such concerns, one person stands out, contradicting the overarching aims of this research of participant inclusivity and equality. Unsurprisingly, this is reflected in the responses to the question whether the UST is suitable for a participatory process.

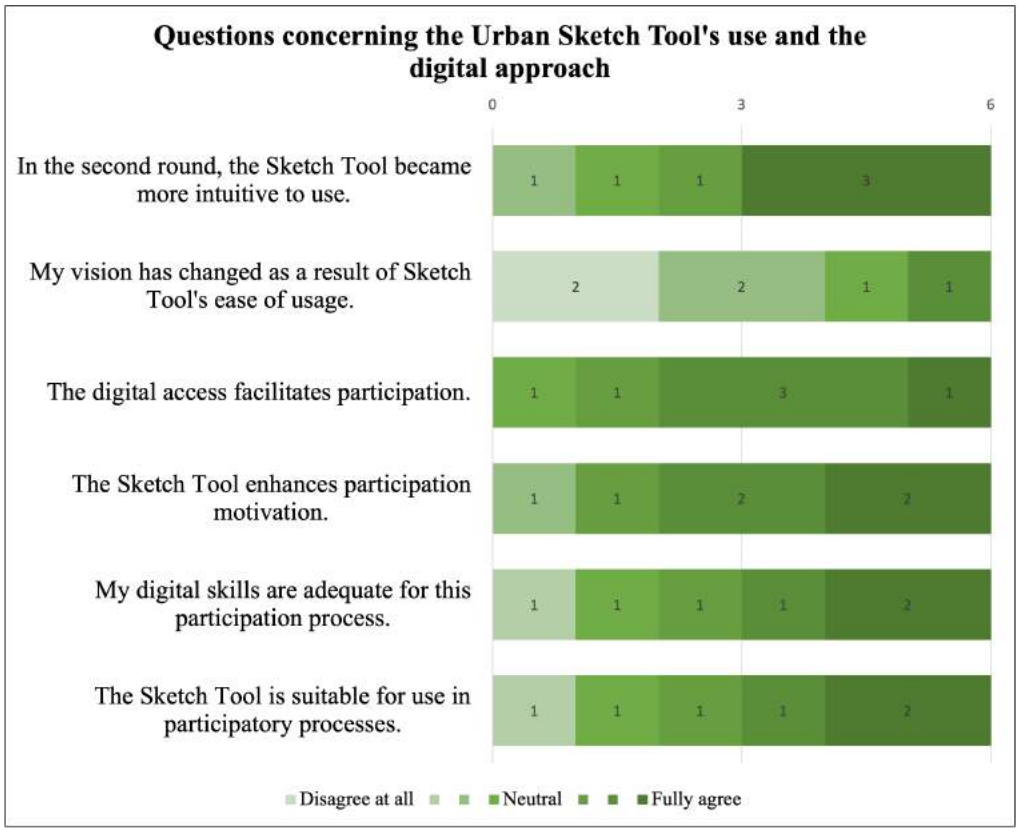


Figure 5.8: Question responses on the Urban Sketch Tool's use and the digital approach

The second part of the second questionnaire (2/2) was again concerned with the point cloud visualisations of the UST. This time, however, the emphasis of the results is on their potential for discussion (see Figure 5.9). In the VisLab, the stakeholders' vision sketches were to be used as a springboard for the discussion. Given that the majority of stakeholders believe that the visualisations assist them in developing their own vision and decision-making, this demonstrates an important benefit in this regard. Furthermore, it may prove useful to form an opinion for the discussion through exchange with others and critical questioning. After sharing the vision sketches between the first and second VisLab rounds, the results demonstrate that visualising one's own vision can serve an alternative form of communication. Only one person disagrees with this, which is probably due to the fact that digital skills were insufficient to develop a representative vision. Nevertheless, all stakeholders agree that the visualisations help to explore other visions, which further strengthens the communication component of the UST. More importantly, the visualisations also assist in critically questioning one's own vision and the decisions that support it, which, as mentioned previously,

can be an excellent prerequisite for the discussion.

In order to express one's opinion in a discussion, the formulation of an argument may be helpful. Therefore, it was investigated whether this can be further translated to the visualisations. The findings show that the visual exchange between rounds only encouraged a few participants to change their vision. In fact, most stakeholders reported to be even less inspired for new ideas. Rather than that, their own vision was strengthened, which could be useful for discussion and may indicate that their own decisions become more solidified as a result of looking at other contributions and reflecting on them. Most of the stakeholders agree that their own vision sketches provide a useful basis for discussion. Furthermore, the results demonstrate that one's own argumentation is reinforced through the sketching process and the reflection on the underlying decisions, which are immediately simulated through the visual content. Again, only one person disagrees with this reasoning. It can not be determined whether the slight disagreements are always initiated by the same individual. If so, it may be repeatedly interpreted that if the vision is not representative for this person, it may not be sufficiently useful as a basis for discussion and formulation of an argument.

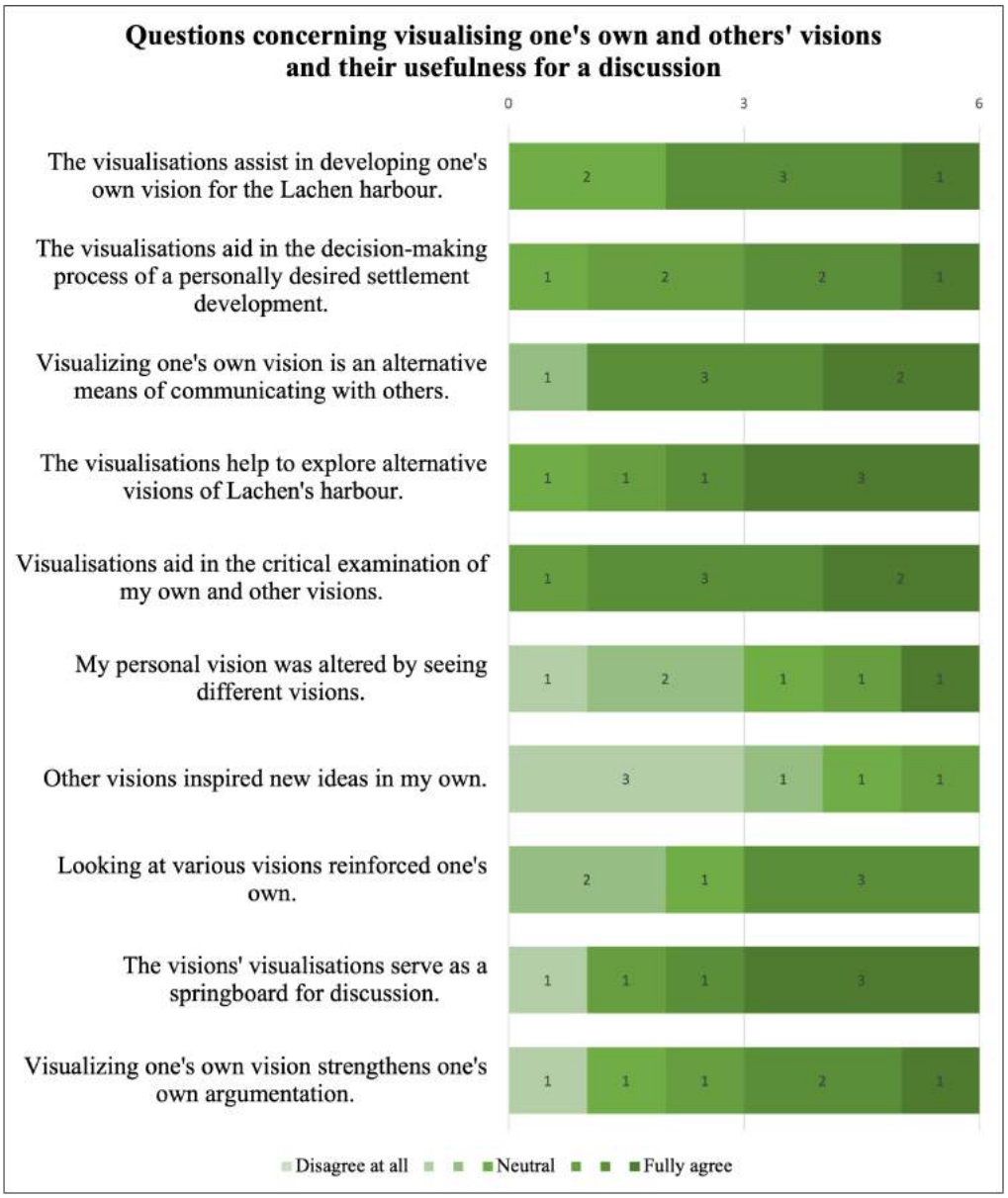


Figure 5.9: Question responses on visualising one's own and others' visions and their usefulness for a discussion

5.3 Vision Sketches and Stakeholder Discussion

Prior to the stakeholder discussion could be conducted vis Skype, the visions from the second and third rounds of the VisLab had to be analysed. Below, Table 5.1 summarises the findings of this vision analyses. It illustrates the contents that the stakeholders sketched for their visions. These results provided guidance for the following discussion. The visions themselves can be found in Chapter F of the Appendix. Four of the six participants who responded to the questionnaires also submitted their visions. In one case, the absence of visions was a result of technical difficulties. The other case is unknown since no reply has been received on demand. Thus, eight visions were obtained in total, as each participant sketched two visions. In addition, two text files were submitted during the first and second rounds regarding comments on the vision sketches. While one file was empty, the other comments refer solely to what is visible within the vision sketches and are thus redundant.

Results of the Visions Analysis					
Stake-holder, Vision	**Little School Park**	**School Area**	**Large Park**	**Small Park**	**Octa-pharma**
CZ, V1					
CZ, V2					
EA, V1					
EA, V2					
SK, V1					
SK, V2					
WR, V1					
WR, V2					

Colour Legend:	**Scenario Green**	**Scenario Activity**	**Scenario Dense**	**New School Project**

Table 5.1: Results of the visions analysis: the plots are listed in the order in which they appear on the panorama images, from left to right. The colours indicate the scenario that was used to alter these areas with the UST.

As can be seen in Table 5.1, stakeholder **CZ** makes no changes to their visions in VisLab round. Stakeholder **EA** replaces the 'Scenario Activity' on the plots 'Little School Park' and 'Large Park' with the 'Scenario Green'. In **SK**'s visions, only the Octapharma plot changes following the first round, and the scenario is altered into 'Scenario Green'. This change is also mirrored in

the text file of **SK**'s vision's comment. In accordance with stakeholder **SK**, **WR**'s second vision changes and turns greener. More specifically, the previously selected scenarios 'Activity' for the area 'Small Park' and 'Dense' for the parcels 'Octapharma' are replaced by the 'Scenario Green'. Additionally, stakeholder **WR** gives further insight on their sketch in their vision comments. They propose that the parks should include 'mobile street furniture' to allow for public events and activities, and that they opt for a 'greener and less dense' scenario. Moreover, the school construction project is present in all stakeholder visions. Notably, nothing from the current state of the harbour has been kept, and everything has been altered following the sketching process using the UST. Overall, it appears that the 'Green' scenario is the most chosen among participants, followed by the 'Activity' scenario. This suggests that stakeholders generally prioritise more open and greener spaces for the Lachen harbour rather than dense development. These findings, in particular, shaped the discussion that followed, as did the circumstances generated by digital access via Skype.

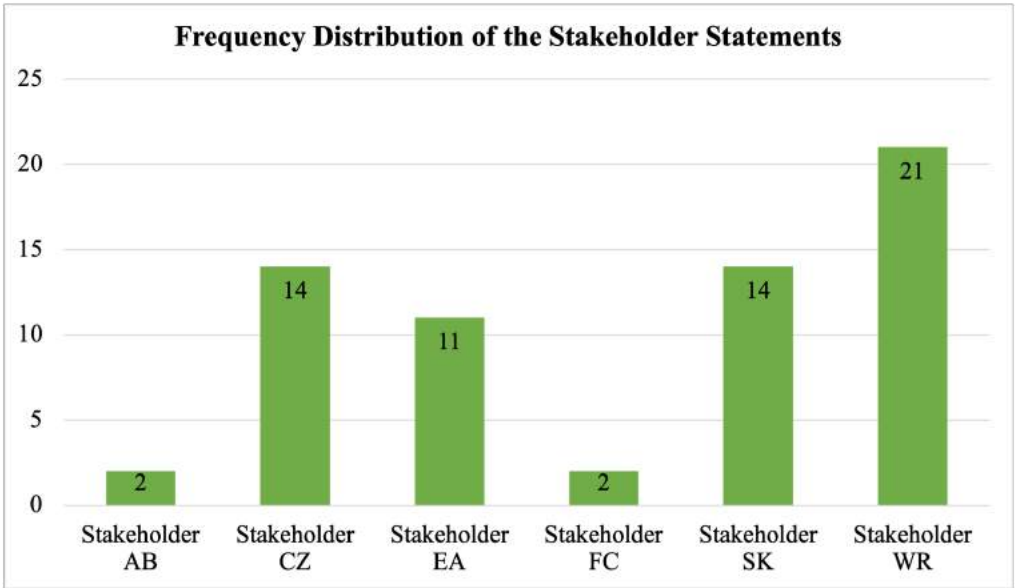
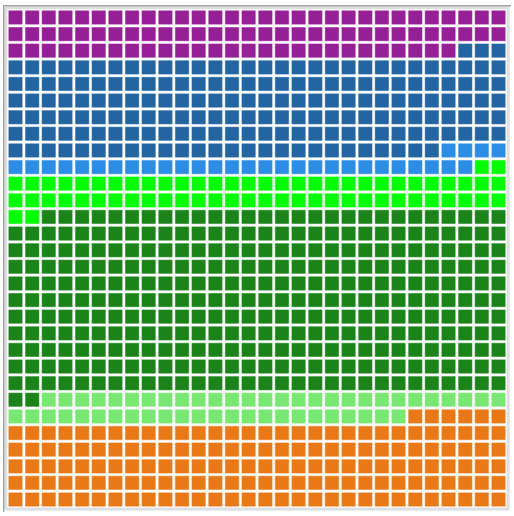


Figure 5.10: Frequency with which stakeholders spoke during the discussion

To elaborate on the aforementioned, two occurrences during the video analysis of the Skype session were identified which also contributed to the discussion, namely 'technical problems' and 'absence'. They are detailed in Chapter J of the Appendix. Disturbing noises, muting, or having difficulty participating in the discussion are all considered 'technical problems'. 'Absence' refers to instances of participants' physical or mental absence due to engaging in another activities. Throughout the 80-minute conference, the event 'technical problem' was detected five times, and the event 'absence' was observed twenty times. A deeper investigation reveals that this accounts for several stakeholders. **WR**,

for example, encounters technical difficulties that disrupt the flow of the discussion. Stakeholder **EA** is absent from the camera four times . While this may have no impact on the discussion directly, it could signalise a certain degree of disinterest. Participant **FC** is absent for around 40 minutes due to engaging in other activities throughout the discussion, although this could be related to their previous technical difficulty in submitting their visions. Participant **AB** experiences technical difficulties with the Skype conference's audio, resulting in them only being able to communicate via the chat function. This significantly disrupts the discussion for this stakeholder and excludes them from the focus group. Furthermore, there appear to be overall restraints impeding the discussion, such as extended pauses in conversation lasting more than seven seconds. This could have resulted in participants withholding their thoughts and opinions on various subjects.



Major Themes:

- **Visualisations, Changes**
- **Octapharma**
- **Green/Open Spaces**
- **Participation Process**

Figure 5.11: Main discussion subjects based on their code colours and relative weight (see code system 4.3)

Ultimately, the reported instances of 'technical problems', 'absence', and 'restraints' may have an unintended impact on the focus group, which must be addressed. They potentially disturb or interrupt the discussion, creating an inconvenient situation for active participants, when experiencing that others leave the screen or make phone calls during their contribution. While the consequences of such instances are difficult to measure during the discussion, they may certainly impede the flow of the discussion or the willingness of active participants to verbally contribute. This could also be the reason why I, as the moderator, must exert more influence on the discussion, which was intended to be avoided in advance and thus poses the risk of distorting the outcome of the discussion. Looking at Figure 5.10 which shows the frequency with which stakeholders spoke, it is evident that the discussion is somewhat unbalanced. Given that the two participants with the highest absence rates contribute the least to the discussion, it is likely that the above-mentioned occurrences also have a negative effect on the balance of the discussion.

Despite these potential obstacles, the received vision sketches served as a springboard for discussion. The stakeholders mainly discussed the participation process, Octapharma, green and open spaces, and any changes to their visions. A glance at Figure 5.11 illustrates the relative weight of their codes (the coding system's categories are omitted for their identification; see Figure 4.3). The category 'Discussion' is excluded since it does not reflect what is discussed about a subject, but rather how it is discussed. Similarly, all subcategories of the category 'Visualisations' except 'Changes' are not included because they simply refer to a topic and do not define it. In sum, the most frequently discussed subjects are 'Green/Open Spaces', followed by 'Octapharma', 'Participation Process', and finally 'Visualisations, Changes'.

Apart from technical difficulties and absences, the findings reveal that the participation process also sets certain framework conditions for how stakeholders interact with each other. Stakeholder **CZ** praises that the organisation of the participation process was 'perfect', and that 'the required effort was kept within limits'. Thus, it can be reasoned that successful digital access to the VisLab allows for more efficient contribution with less time investment than an analogue process. However, if digital access is unsuccessful, the participation experience can be discouraging, as shown by stakeholder **EA**, who misunderstands the procedure. Notably, this participant also shows a lack of digital skills and displays irritation with the UST, resulting in an unrepresentative vision sketch and the statement that the vision content is entirely subjective and irrelevant for discussion. Furthermore, it is particularly noteworthy that all stakeholders, except **EA**, recognise the difficulty of bias when it comes to participation. For example, all of them are aware that the firm Octapharma intends to build a headquarters at the harbour. Additionally, **FC** and **WR** have visualisations of ongoing planning. Consequently, this bias may have an impact on the decisions these participants made during the sketching process. The sketch changes between the first and second rounds support this assumption. Then, it seems as though many sketched the Octapharma first and then replaced it with another idea in the second round. This highlights the fact that the timing of participation can play a significant role. However, the mentioned bias did not influence the discussion on the themes of 'green and open spaces' and 'Octapharma' in this study.

Further findings show that, above all, arguments and knowledge about the central subject of green and open spaces are shared. For example, **WR** argues that given the population's agreement for the school building project, the parking spaces at the harbour should be transformed to a green space. Alternatively, **SK** envisions a green park in front of the hotel as a leisure zone. The exchange of knowledge is demonstrated by **WR**, who states that there are options for green surfaces that may be tested annually without damaging them. As a result of this statement, two stakeholders dissolved their arguments. Another distinctive finding during the discussion relates to statements that have a depoliticising

tendency, such as participant **FC** who discloses their knowledge gained from their participation in commissions. This stakeholder responds to potential disagreeing voices by stressing the importance of open spaces for the neighbourhood and district population. In a similar vein, **CZ** discourages **SK**'s proposal to have sport activities at the harbour, claiming that the municipality is already planning for a more suitable and safer location. As such, sharing inside knowledge about current political processes and planning can be interpreted as an attempt to disempower voices who do not command majority support in the stakeholder discussion and to legitimise plans that have already been made. Overall, the discussion on green and open spaces resulted in a consensus in favour of a greener area without parking but accessibility for public events.

The discussion over the Octapharma main building paints a similar picture. Stakeholders share their ideas mainly by formulating arguments for their own vision, such as stakeholder WR, who refers to the requirement of an inner densification to support his sketched Octapharma office building. On the other hand, **CZ** shares knowledge from conversations with harbour residents, stating that living by the harbour is difficult due to the noise in this area. While stakeholders agree on this specific issue, they disagree on the use and volume of the Octapharma site. Participant SK wishes for a greener option with housing, whereas **EA** favours commercial mixed use. However, the exchange seems to foster mutual understanding, which leads to a convergence of opinions. As stated by **CZ**, change is desirable even when opposing ideas exist. As a result, they agree that 'knowing that mixed use is possible makes this scenario more realistic'.

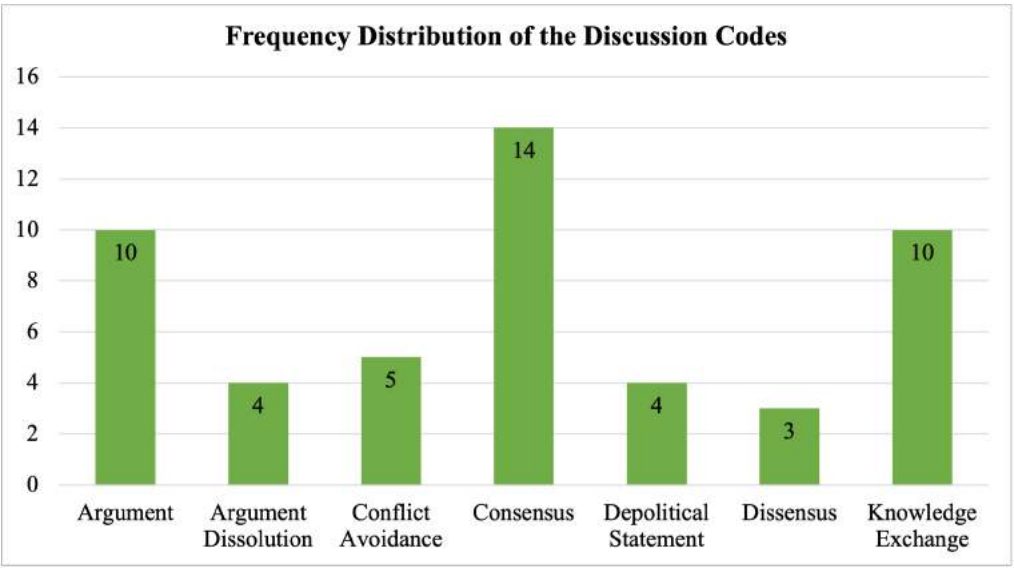


Figure 5.12: Frequency distribution of the discussion category's sub-codes (see code system 4.3)

Figure 5.12 shows a brief overview of the outcomes. The findings indicate that most of the time, consensus emerges during the discussion. Dissent, on the other hand, constitutes the smallest component of the focus group conversation. Overall, the dialogue is used to formulate arguments or exchange knowledge amongst stakeholders, of which only a few have a depoliticising tone. Overall, it can be deduced that the stakeholders strive to find consensus through the shared exchange. This may be further favoured by the dissolution of arguments or avoidance of conflicts, whereby the latter mostly occurs when nothing is said about a specific issue. Furthermore, stakeholders emphasize how the interaction with others resulted in new insights through shared ideas and knowledge. Finally, participants highlighted how using the **UST** led them to rethink their decisions and even change them during the discussion.

The scenario visualisations appear to influence the stakeholders' decisions and hence the discussion. In particular, the findings suggest that they had an effect on stakeholders' discussion relating to the Octapharma building. Stakeholder **EA**, for instance, describes the building as being too massive, resulting in a preference for a different scenario. In comparison, **CZ** perceives the building facade to be light and thus favours this scenario. Furthermore, other examples demonstrate how visualisations aid in the imagination of certain scenario outcomes. For example, participant SK notes that the asphalted square is too harsh, prompting them to advocate for more green spaces instead. In a similar vein, **CZ** is reminded of the Sechseläuten square in Zurich by the visualisation and imagines how hot it may get in such locations during summer. As illustrated in Figure 5.13, point cloud visualisations can influence decision-making in a variety of situations and can even be used to argue for specific decisions. Therefore, it can be concluded that the visualisations contribute significantly to the discussion and thereby aid in determining its outcome, including both consensus or dissensus.

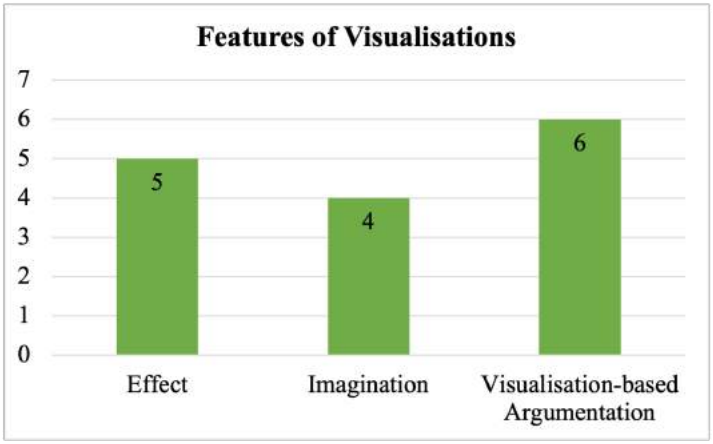


Figure 5.13: Identified visualisations features during the stakeholder discussion

Chapter 6

Discussion

This chapter situates the findings of this study within the context of the literature. First, the thesis' aims and research questions will be reintroduced in order to clarify which research gaps were addressed by this research. The discussion then proceeds in the order of the research questions, attempting to address them in each section. Given that the first sub-question has already been addressed by describing the UST's development process in Chapter 3, Section 6.1 will highlight a few points and creates a link to similar point cloud research projects (Lin et al., 2016; Spielhofer et al., 2017; Urech et al., 2020), as well as investigate the benefits and challenges of using point cloud visualisations in the current research. Furthermore, Section 6.2 delves deeper into the questionnaire findings, discussing how the UST supports the sketching of a vision and discussion. Following that, Section 6.3 discusses the stakeholder discussion and the difficulties encountered as a result of digital access to the participation process, as well as the impact of point cloud visualisations on stakeholders. Additionally, this section discusses whether participants find consensus or dissent, as well as the grey areas that exist between. Finally, Section 6.4 mentions the research's limitations and makes recommendations for future research and application in light of the results.

This study had three main research objectives. The first objective of this research was to use 3D point cloud visualisations to simulate four scenarios for the harbour in Lachen. For this purpose, the Urban Sketch Tool (UST) was programmed by adapting an existing sketch tool (ETHZ PLUS, 2020). This 3D visualisation tool allows the sketching of one's own vision for the Lachen harbour area. The second objective was to evaluate the UST's use and its potential to support discussion within the initial two rounds of the digital participation process VisLab Lachen. The third objective was to conduct a stakeholder discussion online to analyse how the participants discuss their visions and if they find consensus or dissent. Summarizing these objectives, the following research question was developed: How does a digital participation process using the UST shape the co-sketching of urban visions for the harbour of Lachen (Switzerland)? Three sub-questions address the study's objectives even more precisely: how can the UST be technically developed; how can the UST assist in sketching one's own vision and support stakeholder discussion; and how do stakeholders discuss

their urban visions and do they find consensus or dissent?

The study of Wilson et al. (2019) emphasises that although new technical solutions for planning are evolving, there is a gap in knowledge surrounding their exploration and documentation of the usage of 3D visualisation tools. Responding to this call, this thesis aims to contribute to the research field by investigating two key areas of research transdisciplinary (Pettit et al., 2006, p. 14): the development of novel 3D visualisation tools and their application in participatory processes. In addition, to the author's knowledge, there is no study that employs the idea of the sketch tool (ETHZ PLUS, 2020) using point cloud visualisations in an urban context. As such, the benefits and challenges of applying the UST remain largely unknown. Furthermore, as noted by Wissen Hayek (2011), further study is required to determine how 3D visualisation tools and point cloud visualisations satisfy functional needs, and which participatory modalities are suited for collaborative vision exploration. Therefore, by integrating the UST into digital citizen participation, this research may help in establishing the contours of inclusionary and exclusionary processes, and raise awareness towards the use of digital tools (Pettit et al., 2006, p. 14).

As stated previously, one main objective of this research is to develop the UST. The workflow for achieving that goal is further explained in the technical method Chapter 3. It resulted in four scenarios of the 3D point cloud model of the Lachen harbour, simulating the scenarios 'Today', 'Green', 'Activity', and 'Dense'. These were then made accessible online. Following the development of the UST, the tool was incorporated in the VisLab Lachen to explore the perspectives and needs of local stakeholders with regard to the harbour area of Lachen. Furthermore, the UST's ability to facilitate vision sketching and discussion among participants was tested throughout the participatory process. Overall, the findings indicate that the UST is accessible and intuitive to use for the vast majority of participants, and that it facilitates users to sketch their visions for the Lachen harbour. However, a few stakeholders reported having experienced technical difficulties. Additionally, criticisms focus on the sketching being too rough and that objects such as street furniture or a tree cannot be freely placed within an urban vision.

The point cloud visualisations of the four scenarios are important for both the UST, as they serve as the basis for sketching a vision, and the discussion. The stakeholders affirm that the visualisations appear to be a realistic representation of the harbour area in Lachen and that they assist in imagining future scenarios. In particular, they were surprised by how efficiently some scenarios were visualised, which helped to gain a quick overview. Some, on the other hand, were irritated by the hard transitions between scenario visualisations, the blurriness, or the absence of humans depicted in the harbour representations. However, after using the UST for the second time, participants report that the tool already became more intuitive to use. Results also show that some users altered their

own vision after seeing other people's contributions. More generally, participants indicated that they believe that digital access does in fact promote participation. With one exception, they reported that their digital skills are adequate for the UST, and that the tool is suited for a participatory process.

Moreover, users also emphasise that the UST helps them to sketch their own vision and making decisions. In particular, stakeholders state that their vision can be viewed as a tool to communicate with others. The results show that the UST allows participants to explore and critically evaluate other visions in addition to their own. Notably, the participants think that the examination of other visions had little impact on their own perception. In fact, viewing other people's visions, strengthened one's own sketch and its underlying argumentation. Thus, participants agree that the urban visions designed via the UST serve as an excellent starting point for further discussion. Finally, the discussion was then initiated in the third and final round of the VisLab Lachen. The researcher moderated a Skype conference in which each participant shared its vision and received feedback from the others. Additionally, several issues were addressed in light of the visions' similarities and divergences. The third sub-question of the research question inquires about how participants discussed and if they achieved consensus or dissent.

However, digital access to the participation process also seems to pose some challenges. Due to technological difficulties and a lack of digital skills, some stakeholder were excluded from the participation process. Additionally, the discussion may be impacted by the absence of participants and their respective opinions and interests. Thus, a moderator is required to assist in balancing out asymmetries or stimulate the discussion.The major subjects of discussion included the 'participation process', the harbour's 'green and open spaces', the 'Octapharma' parcels, and potential 'vision changes' to stakeholders'. In particular, participants highlighted their general bias against local planning processes, what ultimately influenced their sketching of a vision for the harbour. The discussion's findings further suggest that in addition to other planning processes, point cloud visualisations have an effect on participants as well. It appears on data as though certain arguments are being made as a result of the effects and imagination generated by point cloud visualisations. Additionally, the data suggests that the discussion is mainly used to formulate arguments and to exchange knowledge. According to stakeholders' statements, this leads to some arguments being resolved in the course of the discussion and the formation of consensus amongst the stakeholders. Even when actively encouraging dissent, the discussion generates only few points of disagreement. Thus, one might assume that dissent appears to be mostly avoided, which is difficult to detect.

6.1 Development of the Urban Sketch Tool

To create scenarios using point clouds, on-site 3D data was collected using terrestrial laser scanning. Following data entry and post-processing, the monitor displayed a precise and coloured 3D model of Lachen's harbour. This visualisation greatly contributed in the exploration of the harbour area from a variety of angles, and thus, served as a starting point for developing new scenarios. The descriptive quality of the point cloud model hereby corroborates prior research findings (Lin et al., 2016; Spielhofer et al., 2017) that there is no requirement for modelling a 3D model of the study area, effectively informing the process from the start. Additionally, it was discovered throughout the scenario development process that point cloud collaging, which includes copying point cloud objects from the point cloud model, may produce the most natural appearance with the highest resolution. This collaging and combining of various point cloud objects allows for the incorporation of site-specific features, such as the red oversized flower pots for which the Lachen harbour is known. As such, these flower pots may act as visual cues if they are recognised by the viewer. Similarly, elements from other locations, such as Zurich's Sechseläutenplatz, may be purposefully imitated to establish a connection to that location. These manipulations constitute a critical component of the 'point cloud modelling' technique developed by Lin et al. (2016, pp. 51-53).

The manipulated 3D point cloud model were then used for the digital visualisation of four novel spatial configurations. By examining the four scenarios, it was thus possible to investigate landscape changes, whilst maintaining the integrity of the applied point cloud model. It appears as though the generated visual outputs are akin to those previously described by Urech et al. (2020, p. 6). Furthermore, by integrating the four scenarios into the UST, users can access them online and sketch out a vision from any location or time. All of these UST interface functionalities may be used to elicit the user's perspective on local issues. In so, the digital access and potential output of the UST aligns with Wilson's study objective 2019, who aims to reduce barriers associated with traditional forms of participation. Thus, it can be argued that the UST contributes to the development of new modes of participation Krek (2005, p. 2), by employing new technologies and a web-based application that enable both visual communication and interaction. Moreover, point clouds provide unique representations of the study area, which can be used to test new scenarios abstractly. This is in line with Urech et al. (2020, p. 7) who argue that point cloud modelling can be used as a technique for developing and testing location-specific scenarios.

In contrast to this, the UST development process also presented certain difficulties. As applied during the UST workflow (see Figure 3.3), the integration of point cloud scenarios as panoramic images into the UST interface required a combination of both software and hardware. Therefore, it was crucial to first acquire the necessary know-how, which was challenging and time-consuming, on

how to gather 3D data via terrestrial scanning, process them, and develop scenarios using a variety of software. Furthermore, operating with 3D point clouds generates large amounts of data during the work process, which can overload programmes and complicate tasks such as point cloud modelling and rendering. Additionally, despite the point cloud visualisations' high degree of realism and precision, objects close to the viewpoint seem to have a low resolution in the render output. Also, the resolutions of the different point cloud components, which represent a virtual environment as an ensemble, must be adjusted to each other in order to create a homogeneous point cloud visualisation. These resolution problems can pose a challenge for point cloud visualisations of urban space, where spatial elements are more densely arranged. In accord with this, Spielhofer et al. (2017, pp. 211-212) reveals similar experiences throughout their work process with point clouds. Additionally, there is also some question as to how suitable the UST is for participatory planning applications in terms of cost efficiency. According to Laing (2019, p. 55), the costs of using multiple software programmes and a laser scanner, as well as the required advanced skills, are likely only justifiable through formal than informal participation processes. Given that the UST was developed specifically for the Lachen harbour, one could argue that this participatory process would have been expensive in practise. This is consistent with Lange & Hehl-Lange (2005, p. 180) who assert that 3D visualisation tools are a costly addition to participatory planning processes.

6.2 Urban Sketch Tool Test for Sketching and Discussing Urban Visions

The results suggest that the majority of participants grasped the UST's interface and demonstrated proficiency with it. Positive responses to the additional open-ended questions included the tool being 'simple to use', 'really nice', and allowing for a 'playful approach to visualisations'. However, there were difficulties in utilising the UST as well. According to user criticism, the 'scenario transitions' are irritating, and the tool is 'too rough'. Another point of feedback is that the UST does not allow to put objects freely. Additionally, a person is unaware of what is expected of him or her and what the objective is. Together, the presented negative feedback confirms the assertion of Evans-Cowley (2011, p. 3) that digital participation needs assistance and regular communication to resolve difficulties.

As previously stated, the first questionnaire block (1/1) focuses on the usage of the UST. Findings show that participating stakeholders have access to the UST, which ultimately enables the collection of urban visions for the Lachen harbour. This line of reasoning is consistent with Hasler et al. (2017, p. 235) who claims that digital tools provide access to a broader variety of data formats than with analogue methods. However, two participants were not able

to engage in these rounds of participation, and one person reported difficulties in using the UST. This somewhat undermines the theory (Baker et al., 2007; Conroy & Evans-Cowley, 2006) that digital tools facilitate new forms of participation, thereby overcoming barriers associated with more traditional forms of participation. The next section will further expand on this finding. Overall, the majority of participants understood the UST's interface and were comfortable using it. For instance, some participants answered the open-ended questions that the tool was 'simple to use', 'really nice', and allows for a 'playful approach to visualisations'. However, some reported having experienced difficulties in using the UST. In particular, the 'scenario transitions' appear to be irritating, and the sketching is 'too rough'. Furthermore, participants noted that the UST does not allow to place objects freely. Additionally, a person was entirely unaware of what is expected of them and what the aim of the participation process was. The given feedback confirms the assertion of Evans-Cowley (2011, p. 3) that digital participation needs assistance and regular communication to resolve potential difficulties.

As demonstrated by the findings, the majority of the users were able to sketch their ideas and visions for the Lachen harbour. In doing so, participants provided comments and suggested ways to improve this task: One stakeholder complimented the operation as being 'intuitive' and the pre-operational instructions as being 'perfect'. This statement, together with the majority of successfully submitted outputs, further suggests that the participation instructions were adequate. Notably, some participants acknowledged that they would have hoped to sketch with even more scenarios. Drawing from Klemme et al. (2017, p. 10), who states that developers have a substantial influence on the development of digital tools, this implies that stakeholders' visions were limited to the researcher's simulated scenarios. The inclusion of more scenarios may have allowed participants to specify what they perceive as being needed. Apart from the successfully submitted urban vision, two of the six participating stakeholders during the first two VisLab rounds were unable to share their urban vision due to technical difficulties. One participant indicated technical difficulties with downloading the vision, while the other did not state any reason for not sharing it. However, the questionnaire revealed one individual who commented that none of the scenarios were feasible. Other hints throughout the process also indicated that this may have been the same individual who did not submit their vision. This example demonstrates the critical importance of taking local and spatial planning constraints into account when developing scenarios to avoid data refusal. However, even if they are appropriately considered, as in this study, it is possible for it to occur. Furthermore, this coincides with the observation of Wissen Hayek, Spielhofer, & Grêt-Regamey (2019, p. 252) that 3D point cloud models may be deemed unfeasible, despite or perhaps because of their high precision in representing reality.

The second part of the first questionnaire (2/1) covers questions about the

UST and its point cloud visualisations. The visualisations are critical for the UST's use since they serve as the foundation for the vision sketches and stakeholder discussions. The results of the second questionnaire are reported below. Participants found the point cloud visualisations to look realistic, which is consistent with previous research demonstrating that point cloud visualisations precisely represent the real world (Spielhofer et al., 2017, p. 207; Wissen Hayek, Spielhofer, & Grêt-Regamey, 2019, p. 252; Urech et al., 2020, p. 2). In response to the question of what is surprising about the visualisations, participants highlighted their 'simplicity'; the 'efficiency' with which they can be sketched; the 'appearance' that changes according to the scenario; and the 'square size' that surprises via its visual representation. These findings imply that the UST delivers an understandable and quick overview of potential scenarios. Additionally, the harbour in Lachen seems to be easily identifiable to all users. Conversely, other remarks pointed out what is irritating about the point cloud visualisations, such as the 'blurriness', the 'imprecise interfaces between the scenario', and the 'absence of humans' within the scenarios. As stated by Lange (2001, p. 165), a digital simulation is always an abstraction of reality. The fact that participants recognised the harbour in the scenarios reinforces his notion that a virtual environment comprised of an orthophoto and 3D objects may accurately portray the area. Nevertheless, the stakeholder remark 'where are the people' further underscores that point cloud visualisations, can only capture a single point in time without place-based dynamics (ibid., p. 180).

Based on their responses, the majority of participants can locate themselves in the virtual representation of the Lachen harbour. This is not the case for two out of six people. Similarly, the majority of respondents believe that the scenarios are presented in a comprehensible manner. However, two out of six people express a neutral or negative opinion on this matter. According to Baker et al. (2007, p. 80), planning is difficult for non-planners to comprehend and interact with. According to Laing (2019, p. 80), point cloud visualisations, however, have the potential to convey and contain information. Additionally, 3D visualisation tools are effective at communicating information (Al-Kodmany, 2001, p. 13; Wissen et al., 2008, p. 184; Laing, 2019, p. 179). As previously stated, the findings indicate that the imagery is authentic and depicts the Lachen harbour accurately. On the other hand, the findings indicate that some individuals struggle with the UST. As a result, the responses of participants regarding their comprehension of point cloud visualisations support the aforementioned potentials (ibid.) only partially. Because, as some participants indicated, if the UST's functionality or digital access is limited, the full potential of 3D visualisation tools (ibid.) will not be realised for affected participants. Following that, the findings demonstrate how point cloud visualisations assist users in imagining various scenarios. According to one participant, the UST provides a 'quick overview'. This corroborates the theory of Conroy & Evans-Cowley (2006, p. 374) theory that digital tools enhance participants' planning experiences by appealingly presenting one-

way information flow. On the other hand, another stakeholder stated that 'the visualisations are beneficial for presenting appropriate project options and thus optimally delivering them to stakeholders'. As a result of the data, it appears as though the UST supports two-way communication.

According to Baker et al. (2007, p. 80)Baker et al. (2007, p. 80), planning can be difficult for lay people to comprehend and interact with. For this reason, 3D visualisation tools in particular have potential because they are effective as interactive communication tools (Al-Kodmany, 2001, p. 13; Wissen et al., 2008, p. 184; Laing, 2019, p. 179) with point clouds conveying and containing information Laing (2019, p. 80). However, participant responses regarding their comprehension of point cloud visualisations support the aforementioned potential partially. Because two of six participants were unable to fully understand and orient themselves within the virtual harbour environment, the UST's functionality and digital access were limited to them. This is unfortunate, as the findings also demonstrate that point cloud visualisations do indeed aid users in imagining various scenarios. One participant, in particular, stated that the UST provides a 'quick overview' of potential transformation possibilities for the harbour of Lachen. This supports the argument of Conroy & Evans-Cowley (2006, p. 374) that digital tools enhance participants' planning experiences by making one-way information flow more appealing. Additionally, a stakeholder noted that 'the visualisations are beneficial for presenting appropriate project options, and thus optimally delivering them to stakeholders'. This further implies that the UST does not only support one-way information flow, but also two-way communication.

The second questionnaire of the participatory process's second round includes questions about the UST's reusing and digital approach. Moreover, the questionnaire's second section sheds light on how visions are visualised and may serve for subsequent discussion. Results show that users found the second round of using the UST to be more intuitive, except from one individual. Prior to the second round of participation, stakeholders were invited to view vision sketches of other users. However, the majority of participants had not changed their personal vision after seeing the sketches of others. Of those few individuals that did, they mostly drew inspiration from the other visions, with one participant specifically commenting that 'the new vision changed after seeing the visions of the other participants'. The current evidence also indicates agreement of users that having digital access facilitates participation. Additionally, except for one user, participants suggest that the UST boosts the incentive for participation. The fact that these questions have been mostly agreed upon indicates that the UST is beneficial, especially in terms of facilitating participation. Simultaneously, this lends support to the notion that 3D visualisation tools can encourage participation by motivating people and increasing their awareness and attention to a subject (Wissen Hayek, 2011, p. 934; Laing, 2019, p. 80). However, while the majority of users were comfortably able to sketch their visions, not all participants felt

that they possess the necessary digital skills to use the UST. One individual in particular stood out in this context. Klug et al. (2010, p. 22) and Wilson et al. (2019, p. 4) have previously underlined the importance of creating user-friendly and accessible digital tools for those who face the highest hurdles. Concerning the tool's suitability for participatory processes, the findings are consistent with those regarding digital skills. Therefore, it can be concluded that using the UST in a participatory process is contingent upon the users' digital skills. The next section will continue this discussion, focusing on the participants' digital skills and capabilities.

The second section of the second questionnaire (2/2) covers the visions and their use as a starting point for discussion. Drawing from Seltzer & Mahmoudi (2013), digital tools assist in the development of novel ideas and visions. In line with this, the present findings indicate that the UST and its point cloud visualisations contribute to the development of a vision for the Lachen harbour based on the provided scenarios. The higher level of agreement in this round, when compared to the first, could be attributed to participants' exposure to other visions and realisation of what is possible with the UST. Furthermore, the second round visions are more diverse, rather than being bound to a single scenario. One possible explanation for this is that the UST was used for the second time in this round, which may have increased intuitiveness. However, this also implies that a single round of sketching may not produce a sufficient level of representation. Concerning the UST's ability to assist participants in their personal decision-making processes, all participants responded positively. This reasoning is in accordance with Al-Kodmany (1999, p. 45) who argues that 3D visualisations enable more rational and informed decision-making, which is a critical component of the participatory planning process Healey (1993, p. 242). Therefore, this thesis argues that the UST can be considered a planning tool. Moreover, the findings indicate that the majority of participants viewed visual communication as an additional mode of communication. This demonstrates how sketching a vision on the same basis can help stakeholders develop a common language, which is in line with evidence from past research (Al-Kodmany, 1999, p. 45; Wissen et al., 2008, p. 194; Wissen Hayek, 2011, p. 921). The current findings also highlight that visualisations can inspire participants to explore alternative visions. According to Wissen et al. (2008, p. 185), this may be because interactive visualisations enable various individuals to not only see and combine geodata, but also to explore it. Additionally, point cloud visualisations seem to assist users in critically examining their own and others' visions, which is consistent with Wissen et al. (ibid., p. 194) who found that 3D visualisations encourage critical comparison to one's own perspective.

Several researchers (Stratigea et al., 2015; Wilson et al., 2019) have shown that digital tools facilitate communication, collaboration, and consultation, as well as data collection, analysis, and interpretation. Consistent with this, current findings indicate that the UST allows for the the collection of visions, and

that this can serve as a common language and basis for consultation. Furthermore, the second round of visions reveals that only a few stakeholders' visions significantly changed after exploring the visions of other stakeholders. Thus, these results imply that other visions are unlikely to inspire change. However, a main finding is that point cloud visualisations serve as a starting point for discussion. This corroborates the theory that 3D visualisation tools facilitate participation and encourage stakeholders to discuss scenarios from a variety of perspectives (Al-Kodmany, 1999, p. 45; Wissen et al., 2008, p. 194; Wissen Hayek, 2011, p. 921; Urech et al., 2020, p. 7). The benefits of the UST in terms of providing a common language and supporting discussion further support the argument of Lange & Hehl-Lange (2005, p. 849) that visualisations increase opportunities for participation, improve communication, and facilitate discussion among stakeholders. Moreover, the data suggest that sketching one's own vision strengthens the majority of participants' arguments for their decisions. Similarly, past research has established that visualisations can aid in decision-making and critical thinking. With regard to the current findings, this could mean that interactive engagement with the scenarios can assist in the creation of arguments, and serve as a visual foundation for them. The following section will address the stakeholder discussion, whether they result in consensus or dissent, as well as the shades of grey that exist in between these two poles.

6.3 Stakeholder Discussion towards Consensus?

During the tripartite participation process, two individuals were consistently absent and did not participate. As a result, six out of eight invited participants completed the VisLab first two rounds. The same amount of participants were involved during the discussion. However, one person joined newly (**AB**) for the discussion, while another (**PM**) left because of being in holidays. Regarding the reasons for the absence of these stakeholders during the first two rounds, **AB** always assured to engage when being confronted. The other participant (**AS**) left shortly before the process started. This person emphasised the overwhelming complexity of computer programmes. A look at the participant list reveals (see Table 4.1) that this participant is the oldest one, ranging in age from 80 to 90. This situation relates to an often stated criticism concerning the equality of digital participation processes in the face of the digital divide and social exclusion (Norris, 2001; Graham, 2002; Dezuanni et al., 2018; Kuder, 2018; Pham & Massey, 2018; Seifert et al., 2018). Pham & Massey (2018, p. 316) identifies a lack of digital skills or technical difficulties as main obstacles for digital participation. Especially, elderly persons are particularly vulnerable to digital exclusion (Seifert et al., 2018, p. 775). Based on the aforementioned incidents, it should be clarified that certain participants were also excluded from the VisLab's digital process. Furthermore, in addition to the complete exclusion of one stake-

holder, other events occurred that resulted in a degree of exclusion for affected participants. These are addressed in the next paragraphs.

According to participant statements, the UST poses obstacles to users due to a lack of digital skills: for example, stakeholder **FC** states that they were unable to download the visions. Additionally, stakeholder **EA** mentions they were irritated by the UST and misunderstood the purpose of the participation process and what was expected from them. This individual was also unsuccessful in sketching their preferred visual content with the UST, resulting in unrepresentative visions for this respective stakeholder. For instance, they stated that they were unaware of the adjustable brush size until the second round of participation. Other statements of stakeholders noted that they were not capable to see or sketch certain details within the scenarios. The overlooked scenario elements thereby underscore the assertion of Wissen Hayek (2011, p. 928) that not all stakeholders can be expected to comprehend abstract visual content, because the quantity of information it contains may be too much to understand. The various technical difficulties encountered during the VisLab, such as the missing visions in the case of **FC**, or incorrect visions in the case of **EA**, resulted in disparate initial positions for the discussion that followed. The moderator attempted to compensate these imbalances by inviting these stakeholders to verbally describe their desired vision, but this did not appear to be a sufficient compensation. This was especially true for participant **EA**, who argued at the beginning of the discussion that the vision content is entirely subjective and irrelevant to the discussion. Moreover, **EA** hardly spoke for most of the discussion and only when prompted by the moderator. These indications support the notion of O'Hara et al. (2007, p. 68), that technological issues disclosed during the discussion may undermine argumentation and self-confidence towards other participants, or elicit an embarrassment response.

Technical difficulties were another obstacle to the stakeholder discussion. The digital approach of the VisLab resulted in technical difficulties with hardware, or participants being absent during the videoconference (see Appendix Chapter J. For example, the stakeholders **WR** and **AB** encountered technical problems while trying to connect with the Skype videoconference, which halted the flow of the discussion. In particular, **AB** had difficulties with the microphone, making it impossible for this person to verbally participate in the discussion. Switching to the chat function was also not a viable option, as **AB**'s text inputs were misunderstood and mostly ignored by other participants. Not receiving the same level of attention as stakeholders with sound and vision exemplifies, that this circumstance led to a certain degree of exclusion for stakeholder **AB**. This may also account for **AB**'s long absence during the rest of the discussion. Stakeholder FC, on the other hand, experienced no technical difficulties during the discussion but did not provide any visions beforehand. Nevertheless, this person often seemed to be occupied with other tasks throughout the discussion, such as talking to other persons in the room or taking a phone call. In this context, digital access

to the discussion allowed stakeholder FC to be absent without being sanctioned by the other participants. In comparison, this participant would have needed to leave the room to take a phone call when participating analogue. This on-camera activity is consistent with Selle (2017, p. 18), who states that digital access can result in boredom, tiredness, and disinterest rather than motivation to participate. This reason may also explain why stakeholder EA, who this participant struggled with using the UST and thus was limited in contributing a desired urban vision, left the computer so frequently. As such, the lack of equal basic conditions for individual **EA** may be another reason for not being fully present during the discussion. Taken together, these findings indicate that stakeholders lack a common ground for discussion when they do not possess the same digital skills, which might result in their passivity and disengagement.

The identified obstacles to participation during the VisLab, namely technical difficulties with software or hardware and a lack of digital skills, as a cause for participant exclusion are consistent with the study of Pham & Massey (2018, p. 316). Accordingly, this supports Klemme et al. (2017, p. 4) who state that digital tools do not necessarily increase participation, and that marginalised sections of society, such as elderly people (Seifert et al., 2018), remain invisible. These findings also contradict past research (Baker et al., 2007; Conroy & Evans-Cowley, 2006), that suggested that digital participation overcomes barriers associated with traditional forms of participation, and establishes new links between community perceptions of urban issues and new planning methods. In fact, this study discovered that digital means rather seem to create new barriers for participants. Evidently, this does not meet the objectives of digital participation as formulated by Macintosh (2004, p. 2) and Albrecht et al. (2008, pp. 17-18): to increase access to participation for more people through improved and more comprehensive participation; and to expand opportunities for participation through expanded involvement, thus promoting equality. The present findings indicate that a lack of digital skills impairs participants' ability to use the UST, which establishes unequal basic conditions for subsequent discussion. Thus, it may be argued that the digital participation process, which was designed to be as equitable as possible, may be unbalanced by the digital approach. To elaborate, stakeholders' opinions and needs regarding the Lachen harbour were not taken into account during the discussion if they were unable to use the tool or contribute their visions and inputs. This absence of opposition, which is also reflected in the frequency distribution of stakeholder statements (see Figure 5.10), may have resulted in a one-sided discussion. This supports the critique of Graham (2002, p. 36) that digital tools contribute to unbalanced discussions and decisions.

The participants had the opportunity to submit their sketches and questionnaires at any time within two weeks. It appears that the unbalanced and asynchronous participation, in particular, necessitates the presence of a moderator (Nanz & Fritsche, 2012, p. 91), who supports the process and acts as a bridge

between participants and facilitates dialogue (Laing, 2019, p. 51). However, the moderator should exert as little influence on the stakeholder discussion as possible in order to increase transparency and to better understand participants' decisions and perspectives. Furthermore, the moderator should not interfere with the formation of certain dynamics between the stakeholders. In the moderated discussion of this study, the four major topics 'green and open spaces', 'Octapharma', 'participation process', and 'vision changes' were discussed. More context on the stakeholder discussion is provided in Chapter 5, Section 6.3. Concerning the participation process itself, stakeholder CZ describes it as well-organised and that the time commitment required was reasonable, as promised by the researcher prior to the study. This supports the assertion Randolph (2004, p. 74) that digital tools enable process participants to exercise flexibility and overcome time and financial constraints, by being accessible at any time and from any location. Notably, all stakeholders describe some form of bias, reporting that they are informed of ongoing planning for the Lachen harbour to a certain extent. They further state that this had an impact on their visions. These findings support the argument of Al-Kodmany (1999, p. 43) that 3D visualisation tools are particularly effective during the early stages, and when the objective is to focus participants' awareness and attention on a particular issue (Wissen Hayek, 2011, p. 934). Nonetheless, the diversity of visions and associated comments show that the stakeholders explore alternative scenarios for the harbour of Lachen, despite their personal biases.

The stakeholder discussion also established that point cloud visualisations may have helped participants in envisioning the scenarios and formulating arguments to express their personal perspective on certain topics. For example, stakeholder **EA** considers the Octapharma building as too massive. In contrast, the Octapharma building's façade appears to be light for **CZ**. To address another topic during the discussion, **SK** perceives the sunshades of the 'Scenario Activity' to be cute. Given the number of similar remarks made during the discussion and the vision sketches, it is reasonable to suggest that such visual perceptions had an effect on the decisions made during the sketching process. In a similar vein, Sheppard (2014, p. 244) emphasises the importance of being aware of the impact of realistic 3D visualisations and their ability to influence the viewer's emotions and attitudes. The remarks of stakeholder **EA** and **CZ** on the Octapharma building of the 'Scenario Dense' support this by showing that the realism of point cloud visualisations might suddenly make the aesthetics of the simulated buildings relevant, even if the visualisations are merely intended to suggest possible scenarios. In so, the participants' contributions demonstrate that the point cloud visualisations aid them in imagining the scenarios and their potential implications. **CZ**, for instance, envisions the asphalted Zurich's Sechseläuten square based on the 'Scenario Dense', and comments on the heat that can develop there in the summer. Participant **EA**, on the other hand, refers to water retention as ecosystem service of the green areas for 'Scenario Green'. These comments seem

to convey the degree of imagination evoked using UST visualisations. The latter additionally seem to assist in more efficient decision-making and argumentation for their viewpoints. An example of this is stakeholder **WR**, who emphasises his preference for a more open version of the Octapharma plots instead of a compact. As previously stated, the asphalted square of the 'Scenario Dense', may become too hot in summer, according to participant **CZ**. Likewise, **SK** expresses dissatisfaction with the asphalted surface of the square and advocates for additional green space as a leisure zone. Thus, these findings reaffirm the notion that using visualisations as a common language encourages stakeholders to consider scenarios from a variety of perspectives (Al-Kodmany, 1999, p. 45; Wissen et al., 2008, p. 194; Wissen Hayek, 2011, p. 921). Additionally, they are consistent with the assertion of Conroy & Evans-Cowley (2006, p. 372) that digital tools enable new forms of interaction. The next paragraphs detail evidence on the stakeholder discussion, focusing on whether they find consensus or dissent during mutual interaction, as well as gray areas in between.

As evidenced by frequency distribution of discussion features based on the stakeholder discussion (see Figure 5.12), the primary purpose of the discussion is to reach 'consensus', driven by the exchange of arguments and knowledge between the stakeholders. The avoidance of conflict, the dissolution of arguments or depoliticising situations occur less frequently, with 'dissent' receiving the least emphasis during the discussion. The above-average exchange of arguments and knowledge bolsters key objectives for digital participation (Albrecht et al., 2008, pp. 17-18; Macintosh, 2004, p. 4), that is to increase the transparency of decision-making processes. Additionally, the visions appear to enhance the collection of local knowledge and needs on urban issues, which fosters the process of learning from other participants (Afzalan et al., 2014, p. 155; Wissen Hayek, 2011, p. 934). Moreover, the exploration of alternatives despite biases against ongoing planning processes, as well as the convergence or even change of opinions, imply that the stakeholder exchange has an effect on future decision-making. Interacting with scenarios and stakeholders appears to enable comprehension and reconsideration of realities and decisions. This may be brought in the context of communicative planning (Healey, 1993, pp. 242-244), in which participants gain knowledge of others through interaction towards mutual understanding. Furthermore, the dissolution of arguments implies that engaging with scenarios and other inputs may assist in critically challenging one's own and others' perspectives. This reasoning corroborates the assertion of Wissen et al. (2008, p. 194) that 3D visualisations used in participatory processes can promote critical comparisons with one's own views or even act as a mediating tool Lange & Hehl-Lange (2005, p. 833). Finally, the findings regarding the frequency distribution of discussion features indicate that the majority of exchanges result in mutual understanding and that the discussion evolves towards consensus. Likewise, this is consistent with communicative planning theory (Forester, 1989; Healey, 1993) and the literature's objectives for digital participation (Afza-

lan et al., 2014; Albrecht et al., 2008; Hampton & Wellman, 2003; Macintosh, 2004).

Participants tend to avoid conflict and make remarks to preserve consensus and disempower any conflicting voices. In this study, the latter are referred to as depolitical statements. While these discussion features (i.e., conflict avoidances; argument dissolutions; depolitical statements; dissent) are scarce throughout the discussion, this does not mean they should be overlooked. They may indicate that consensus-building is an unconscious component of participatory processes, as stakeholders appear to seek it out instinctively during the discussion. One explanation for this finding could be that consensus is viewed as the desired outcome and ultimate success for participative processes in past literature on communicative planning (Healey, 1993; Forester, 1989) and participation (Afzalan et al., 2014; Albrecht et al., 2008; Hampton & Wellman, 2003; Macintosh, 2004; Potapchuk, 1996). However, other researchers have criticised the constant search for consensus in planning processes (Gunder, 2010; Purcell, 2009) and highlighted the valuable insights of dissent (Allmendinger, 2017; Miessen, 2012). For instance, Miessen (2012, p. 80) claims that new insights on certain issues especially may be gained through dissent in a participation process. The stakeholder discussion process in the present study reveals that this can sometimes be avoided unconsciously through depolitical stakeholder statements or conflict avoidances. For example, when stakeholder **SK** expresses a desire for a skate park, **CZ** responds that one is already in planning for another location, which is 'more suitable and safer' than the harbour area. Additionally, during the discussion about open spaces, participant **FC** disempowers potential counterarguments by sharing information from commission meetings and highlighting that accessibility is a top priority and that the issue is currently being addressed. Notably, such statements seem to be made exclusively by stakeholders who, as members, represent political decision-making. Furthermore, a pattern appears to be evolving in which stakeholders disempower conflicting voices and seek to legitimise made decisions by, for instance, sharing insider knowledge and claiming that the subject under debate is already regulated. This can be interpreted as actions with a depoliticising tendency through the avoidance of conflict (Allmendinger, 2017, p. 191). In addition to depolitical statements, conflict avoidances occur throughout the discussion as well. This is demonstrated by stakeholder **WR**'s efforts to avoid mentioning ongoing plans and names in connection with the Octapharma project. Other instances include participant **SK**, who refused to specify how the individual's vision would change at the end following the discussion. Yet, one might suggest that conflict avoidance is more likely to occur in the absence of verbal communication. Particularly when the facilitator solicits its dissident views or points out subjects of disagreement and the participants remain silent. This occurred multiple times during the stakeholder discussion, which led to some lengthy pauses. Even if no statements were made, silence does not necessarily indicate no disagreement. Rather than that, it may imply that

dissenting opinions are being held back, or that they are actually absent. This underlines the critical need of promoting diverse minority voices, rather than solely relying on consensus-building (Purcell, 2009, p. 80).

6.4 Limitations and Future Research

During the development process of the UST, it became apparent that the simulated scenarios are entirely dependent on the researcher's simulation choices. Thus, the researcher decided alone on how the scenarios 'Green', 'Activity', and 'Dense' should be developed. As a consequence, the user's ability to sketch their vision is inherently limited within those scenarios. In addition, the point cloud visualisations were found to lack humans and site-specific dynamics, possibly because the visualisations provided by the UST depict only a single point in time. Furthermore, the UST's source code did not support changing the viewpoint or flexibly pin objects or comments within the virtual environment. In addition, due to a lack of direct access to the backend server, the feature for storing visions and comments was limited. This may have made it more difficult for stakeholders to submit their urban visions and respective comments, as they had to download them first, to then send them via email. With regard to qualitative methods, this study relied on a small sample of stakeholders chosen at the researcher's discretion, which did not include all areas of society, such as young or disabled people. Another limitation of this study concerns the UST and the digital participation process VisLab Lachen that were solely limited to the Lachen harbour's specific location. Moreover, the small sample size and site-specific implementation limit generalisable conclusions to other demographic groups and locations. Furthermore, the study's narrow geographic scope may be viewed as both an advantage and a disadvantage. For instance, stakeholders may have been acquainted with one another, which, when combined with the informal and possibly more blithe participation method, could have resulted in more robust findings. Alternatively, if specific topics have been discussed previously, or if disagreements are unwilling to be addressed for fear of sanctions, the local proximity of stakeholders may pose an additional risk. Finally, the digital approach employed in this study limits data collection, resulting in the exclusion of some individuals or greater barriers to participating in the VisLab. Nonetheless, one might argue that web-based participation provides additional flexibility for those who are more familiar with digital technologies.

The digital approach of this study and the application of the UST with point cloud visualisations in the VisLab Lachen contribute to a greater understanding of digital participation processes. However, two areas that have emerged during this research and require future scientific investigation are to be mentioned. Technically, future researchers should aim to develop new, efficient methods that simulate point cloud visualisations. Qualitatively, future research should continue

applying the tool in redesigned participation processes, to better understand its potentials, and continue search for best practise with the UST. To elaborate, the technological methods of this research have demonstrated that point cloud visualisations provide a quick and precise representation. However, in addition to scanning, the simulation and rendering of the scenarios may be challenging and time-consuming. This reduces the time advantage over more conventional 3D visualisation techniques. Therefore, future research should focus on applying more efficient techniques for dealing with point clouds. For example, the open-source JavaScript library 'Cesium' (Cesium, 2021), which enables the loading of various datasets and results from geographic modelling into a 3D digital globe, could offer a new approach to explore. In line with this, the study of Wissen Hayek & Grêt-Regamey (2021) uses 'Cesium' collaboratively with stakeholders to investigate desired urban transformation pathways. Additionally, 'CesiumJS' allows for the development of interactive web applications that facilitate the exchange of dynamic geographical data with users (Cesium, 2021). For instance, (Discher et al., 2019) demonstrate the ability of 'CesiumJS' to visualise and explore massive point cloud data via the web. According to these studies (Discher et al., 2019; Wissen Hayek & Grêt-Regamey, 2021), 'CesiumJS' seems to open up promising efficient ways for modelling and rendering point clouds. In addition to the aforementioned technical recommendations, this research further proposes directions for qualitative research, hereby focusing on the participation process of this study. As previously mentioned, the UST was developed with the goal of providing a 3D visualisation tool for users to sketch an urban vision, which then would serve as a starting point for discussion. As the research findings have shown, stakeholders seem to bring a heterogeneous set of digital skills and hardware to the table, which can result in the exclusion of participants. As a result, the digital divide may contribute to imbalanced and one-sided digital participation processes. To ensure that all invited individuals can participate and that enough assistance in dealing with the UST is provided, future research might initiate an on-site participation workshop with the UST. Finally, demographic groups that have not been evaluated in this study, could be included in future participatory processes to further evaluate the UST and generalise its application.

The findings of this study also provide practical implications for planners. As previously stated, working with point clouds in this study enabled creating several scenario simulations. However, combining multiple point cloud components to form a 3D point cloud model that depicts a specific scenario generates enormous volumes of data. This necessitates the use of a powerful computer equipped with a diverse set of data processing software and a large amount of memory. Furthermore, it is recommended to avoid working too precisely when operating with point clouds, since viewers' perceptual capabilities can be limited when viewing point cloud visualisations. Notably, practitioners should keep in mind that point cloud visualisations can have the potential to influence the user's perception of the visual content. This effect can be used to replicate spe-

cific locations and their spatial features. As demonstrated by the stakeholder discussion, site-specific components are indeed recognised by participants and therefore contribute to the scenario's imagination. In addition, copying and rearranging point cloud objects from the TLS virtual environment results in the most natural appearance and highest resolution rendering. Furthermore, it was found that, larger objects near the viewpoint, such as buildings, pose an additional challenge for the rendering process due to their lower resolution. Thus, if the required resolution cannot be achieved in the render output, it is recommended to improve the results by using TLS or photogrammetry data from selected building façades. Finally, it is worth noting that developing the UST is not a cheap process. In practise, additional costs for hardware and software, as well as the developer's time and skills, would incur. Then, for the implementation of the UST in a participatory planning process, it is recommended to do so at an early stage. That is because participants may already have a preoccupation towards local planning processes as a result of previously viewed visualisations or other information. As indicated by stakeholder feedback, this bias may influence sketching of one's own vision. Ultimately, the UST application offers valuable visual data on user perceptions and perspectives on urban issues. However, when utilising a digital approach for participation, practitioners should consider providing time-flexible support. Furthermore, given that participants are likely to possess a variety of different digital skills and hardware, planners must be aware of the risk of participants and thus data being excluded along the process. In the case of such events, they could undermine the very purpose of digital participation by resulting in biased decisions and plans. Therefore, this study recommends inviting a larger group of people to a digital consultation than to a comparable analogue participation process, to achieve more equal and balanced digital participation in practise.

Chapter 7

Conclusion

The main purpose of this research was to investigate how the Urban Sketch Tool (UST) shapes the co-creation of urban visions with local stakeholders for the harbour in Lachen (Switzerland). Three research sub-questions were derived from this, which illustrate the study's objectives: 1) how can the UST technically be developed? 2) how does the UST help in the sketching of one's own urban vision and support stakeholder discussion? and 3) how do stakeholders discuss their urban visions, find consensus or dissent, and what grey areas exist between? To accomplish the latter two objectives, this study initiated the digital participation process VisLab Lachen.

The first goal of this study was to develop and then test the UST during the participation process VisLab Lachen. The current research describes a workflow for simulating scenarios for the Lachen harbour using point cloud visualisations. Additionally, the adaption and programming of the UST are explained. As a result of the development process, the UST was deployed and made accessible online. This tool allows users to sketch an urban vision online based on four distinct scenarios, and provide associated comments. Secondly, the UST was evaluated and determined its utility for facilitating discussion. Findings of the qualitative content analysis of questionnaires from the first two rounds of the VisLab reveal that the UST is simple to use and enables rough sketching of urban visions. Furthermore, stakeholders report that the UST motivates for participation playfully, thereby enables the critical reflection of ones own and other perspectives, as well as supports interaction between stakeholders towards mutual understanding. Based on this, the UST serves as a basis for stakeholder discussion, which was conducted during the third VisLab round. In which, however, it became particularly apparent that the digital access to the VisLab led to technical difficulties for some participants, which have led, in the worst case, to their exclusion due to a lack of digital skills.

The third objective of this research was to conduct a stakeholder discussion in the final round of the participation process, focusing on how stakeholders discuss their urban visions, whether they reach consensus or dissent, and disclose the shades of grey that exist in between. As was found in the first two rounds,

technical difficulties and absence of participants occurred during the stakeholder discussion via Skype as well. Furthermore, the discussion analysis suggests that point cloud visualisations have an influence on the stakeholders' perception of the scenarios. As previously established, point cloud visualisations are likely to benefit stakeholders in their imagination and development of discussion arguments. As it turned out, the discussion itself was primarily about exchanging perspectives and knowledge in order to reach consensus. A few statements had a depoliticising tendency, seeking to legitimise already made political decisions and thereby increase the likelihood of majority agreement. Further, it can be concluded that dissent rarely occurs during the discussion, and when it does, participants tend to avoid conflict or resolve disagreements in favour of consensus.

This work contributes to the field by adapting the idea of the sketch tool (ETHZ PLUS, 2020), which was solely used in rural landscapes settings so far, and testing the adapted UST in an urban context for the first time. Additionally, the UST uses point cloud visualisations, which greatly expand the possibilities for 3D landscape visualisations (Laing, 2019, p. 55). The findings of this study confirm prior research (Spielhofer et al., 2017; Lin et al., 2016; Wissen Hayek, Müller, et al., 2019; Urech et al., 2020) by demonstrating that point clouds provide a quick and precise 3D representation of reality, which can be further manipulated to envision future landscape transformations. However, the UST workflow reveals certain challenges consistent with those reported by Spielhofer et al. (2017, pp. 211-212), including resolution and rendering difficulties, as well as massive data volumes to manage. Nevertheless, the sharing of urban visions and perspectives based on the point cloud visualisations during the VisLab emphasises the notion that point clouds can serve as a common language for discussion and facilitate interaction amongst stakeholders (Al-Kodmany, 1999, p. 45; Wissen Hayek, 2011, p. 921). The findings of the stakeholder discussion further corroborate previous research (Sheppard, 2014; Kuliga et al., 2015; Wissen Hayek, Müller, et al., 2019) by demonstrating that point cloud visualisations can influence users in their decisions through having an effect on them or helping them to imagine certain scenarios.

The implementation of the UST into the digital participation process VisLab connects to research that investigates novel approaches to participatory planning processes through the use of digital tools. In this respect, the present study shows that the UST appears to enhance the exploration of local needs and perspectives in a flexible way, which is a commonly highlighted benefit of digital participation (Seltzer & Mahmoudi, 2013; Wissen Hayek, 2011; Hasler et al., 2017; Afzalan & Muller, 2018; Wilson et al., 2019). Furthermore, the UST follows the stated objective for digital participation (Macintosh, 2004, p. 2; Albrecht et al., 2008, pp. 17-18) and facilitates two-way communication between stakeholders, resulting in an increase in knowledge exchange and transparency. As the participation process indicated, interaction between stakeholder during the VisLab tends to

result in consensus, which follows a key aspect of the concept of communicative planning (Healey, 1993; Forester, 1989). To elaborate, dissent rarely occurred during the discussion, partly resulting from participants' efforts to avoid conflict and preserve consensus. This could imply that certain objectives of digital participation are being undermined. For instance, the digital participation process resulted in the exclusion of some participants and their perspectives. This supports widespread criticism regarding digital divide and social exclusion associated with digital participation (Graham, 2002; Dezuanni et al., 2018; Norris, 2001; Kuder, 2018; Pham & Massey, 2018; Seifert et al., 2018). Therefore, this study posits that digital participation processes can rapidly deteriorate into inequity and one-sidedness. This, however, contradicts essential goals for digital participation (Macintosh, 2004, p. 2; Albrecht et al., 2008, pp. 17-18), including increasing participants' accessibility and hence equality.

Looking at the digital participation process VisLab using the UST from a higher level of consideration, the findings shed further light on the benefits and drawbacks of using digital tools in participative planning processes. This can illustrate why the controversial debate around digital participation in urban planning persists. On the one hand, the UST and VisLab facilitate new, more flexible modes of participation and collaboration, which has the potential to overcome barriers associated with more traditional forms of participation (Baker et al., 2007; Conroy & Evans-Cowley, 2006). However, digital access to participation introduces new technical barriers, which require digital skills and hardware from participants, and more efficient mechanisms to avoid conflict. As suggested by Miessen (2012, p. 78), dissent is particularly valuable for gathering new insights during participation processes. Consequently, it appears crucial to design digital participation processes and tools in such a way that they enable participation by the most marginalised individuals and empower conflicting voices. Finally, the barriers to digital participation may be overcome most effectively by combining traditional forms of participation with digital tools to realise their full potential.

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Appendix A

Selection of Digital Formats and/or Digital Tools

This chapter covers a selection of digital formats and/or digital tools as partly mentioned in Albrecht et al. (2008, pp. 19-21). To the list, the formats public participation geographic information systems (PPGIS) (Sieber, 2006) and augmented reality (AR) (Azuma, 1997) are added.

Formats and/or Digital Tools for Citizen Participation	
Kiosk systems	Computer-based multimedia terminals used as information systems with or without Internet connection.
Websites	Websites are often used for one-way communication. But they can also incorporate others.
Online simulations	Simulations allow people to interact with a topic playfully. In addition, they may simulate a real (decision) situation and demonstrate what kind of actions may potentially result from these decisions.
E-mail lists	Text and files can be exchanged asynchronously through email. Emails may be sent between individuals, to many recipients or used to exchange messages inside restricted user groups (mailing lists).
Interactive maps	Internet-based applications for displaying geographic data. The data representation may usually be changed by the user. Users may contribute information (text or images) to the apps.
Online surveys	Online surveys intended to collect more diverse opinions. The data is recorded electronically, making evaluation easier and faster.
Videoconferences	Videoconferences allow two or more geographically distant parties to discuss simultaneously through moving images and sound, allowing all participants to hear and see each other. Some conferencing systems also allow document sharing and editing.
Virtual worlds	Virtual 3D environments where users move and interact with others via digital profiles (avatars). Virtual worlds allow users to generate their own content and items. Short messages, chats, and forums are used to communicate. Participants may also form user groups to collaborate on virtual projects together (Albrecht et al., 2008, pp. 19-21).
Public participation geographic information systems (PPGIS)	PPGIS facilitates collaborative planning by distributing information online, increasing the number of stakeholders involved, visualising analysis, and weighing options using graphical user interfaces (see Sieber, 2006).
Augmented reality (AR)	AR 'allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. Therefore, AR supplements reality' (Azuma, 1997, p. 2). It combines real and virtual elements registered in 3D, in interactive real-time (ibid.).

Table A.1: Selection of digital formats and/or digital tools for citizen participation in planning

Appendix B

Urban Sketch Tool Code Adaptions

This chapter of the Appendix contains excerpts from the Urban Sketch Tool's repository. The repository provides all the files required for the UST to function properly and contains visualisations, icons, and codes. The repository is generally digital, however the following codes were particularly relevant for the Sketch Tool adaptation and therefore converted to text for this study. They are derived from the repository's files 'index.pug', 'comment.css', and 'admin.pug'. This order specifies the following code listing. To specify, the 'index.pug' code contains the comment function, while the 'comment.css' code sets the comment function's style.

Index.pug

```
1  doctype html
2  html
3      head
4          title Sketch Tool
5          meta(charset="utf-8")
6          meta(http-equiv='Content-Type', content='text/html;
               charset=utf-8')
7          meta(name='viewport', content='width = device-width,
               initial-scale = 1.0, minimum-scale = 1, maximum-
               scale = 1, user-scalable = no')
8          meta(name='apple-mobile-web-app-title', content='LP+')
9          meta(name='apple-mobile-web-app-capable', content='yes'
               )
10         script(type='text/javascript', src='/js/jquery-3.3.1.
               min.js')
11         script(type='text/javascript', src='/js/
               jquery.textcomplete.js')
12         link(rel="stylesheet" type="text/css" href="css/jquery-
               comments.css")
13         link(rel="stylesheet" type="text/css" href="css/
               comments.css")
```

```
14          link(rel="stylesheet" type="text/css" href="/js/
                jquery.textcomplete.js")
15          link(rel="stylesheet" type="text/css" href="css/
                visualization.css")
16          link(rel="stylesheet" type="text/css" href="css/app.css
                ")
17          script(type='text/javascript', src='/js/jquery-
                comments.js')
18          script(type='text/javascript', src='/js/
                jquery.mousewheel.js')
19          script(type='text/javascript', src='/js/app.js')
20
21      body
22
23          script.
24              var commentsArray = [
25              ]
26
27              var usersArray = [
28                  {
29                      id: 1,
30                      fullname: "Du",
31                      email: "current.user@viima.com",
32                      profile_picture_url: "/pics/icons/pin.png"
33                  },
34
35              ]
36
37              $(function () {
38                  var test = "";
39                  var saveComment = function (data) {
40                      data.fullname = $('#comment-title').val();
41                      $('#comment-title').val("");
42                      return data;
43                  }
44                  var editComment = function (data) {
45                      return data;
46                  }
47                  $('#comments-container').comments({
48                      profilePictureURL: '/pics/icons/pin.png',
49                      currentUserId: 99,
50                      roundProfilePictures: true,
51                      textareaRows: 2,
52                      enableAttachments: false,
53                      enableHashtags: false,
54                      enablePinging: false,
55                      newestText: 'Kommentare',
56                      textareaPlaceholderText: 'Kommentieren Sie
                            ihre Skizze... (Beispiel: Das Gras muss
                             gr{\"u}ner sein.)',
57                      sendText: 'Kommentieren',
58                      editText: 'Bearbeiten',
59                      replyText: 'Antworten',
60                      editedText: 'Bearbeited',
```

```
61                      youText: test,
62                      scrollContainer: $(window),
63                      function(time) {
64                          return new Date(time).
                                toLocaleTimeString();
65                      },
66                      searchUsers: function (term, success, error
                            ) {
67                          setTimeout(function () {
68                              success(usersArray.filter(function
                                    (user) {
69                                  var containsSearchTerm =
                                        user.fullname.toLowerCase()
                                        .indexOf(term.toLowerCase()
                                        ) != -1;
70                                  var isNotSelf = user.id != 1;
71                                  return containsSearchTerm &&
                                        isNotSelf;
72                              }));
73                          }, 500);
74                      },
75                      getComments: function (success, error) {
76                          setTimeout(function () {
77                              success(commentsArray);
78                          }, 500);
79                      },
80                      postComment: function (data, success, error
                            ) {
81                          setTimeout(function () {
82                              success(saveComment(data));
83                          }, 500);
84                      },
85                      putComment: function (data, success, error)
                             {
86                          setTimeout(function () {
87                              success(editComment(data));
88                          }, 500);
89                      },
90                      deleteComment: function (data, success,
                            error) {
91                          setTimeout(function () {
92                              success();
93                          }, 500);
94                      },
95                  });
96
97                  function download(filename, text) {
98                      var element = document.createElement('a');
99                      element.setAttribute('href', 'data:text/
                            plain;charset=utf-8,' +
                            encodeURIComponent(text));
100                     element.setAttribute('download', filename);
101
102                     element.style.display = 'none';
```

```
103                     document.body.appendChild(element);
104
105                     element.click();
106
107                     document.body.removeChild(element);
108                 }
109
110                 $("#save_comments").click(function () {
111                     let comments_text = "";
112                     $(".comment.by-current-user").each(function
                            (index) {
113                         if(index > 0) {
114                             comments_text += "\n";
115                         }
116                         if($(this).find(".comment-header .name"
                                ).first().text() !== "") {
117                             if (index > 0) {
118                                 comments_text += "\n\n";
119                             }
120                             comments_text += $(this).find(".
                                    comment-header .name").first().
                                    clone()    //clone the element
121                                 .children() //select all the
                                        children
122                                 .remove()   //remove all the
                                        children
123                                 .end()  //again go back to
                                        selected element
124                                 .text()
125                             comments_text += "\n
                                    ----------------------------------------------
                                    n";
126                         }else {
127                             comments_text += "\t"
128                         }
129                         comments_text += $(this).find(".content
                                ").first().clone()    //clone the
                                element
130                             .children() //select all the
                                    children
131                             .remove()   //remove all the
                                    children
132                             .end()  //again go back to selected
                                     element
133                             .text();
134                     });
135                     download("kommentare.txt", comments_text);
136                 })
137
138
139             });
140
141         #vis.fullscreen_able.displayed!= visualization
142             #toolbar
```

```
143                 button#Morges_intensiv.brush.intensiv.active(
                        title='brush_intensive_title')
144                 button#Morges_extensiv.brush.extensiv(title='
                        brush_extensive_title')
145                 button#Morges_Obst.brush.fruit(title='
                        brush_village_title')
146                 button#Morges_heutigerStand.brush.eraser.brush(
                        title='brush_eraser_title')
147
148                 .brush_switch#brush_size(title='
                        brush_size_title')
149                     button#size_1(data-size=0,data-px=14)
150                     button#size_2.active(data-size=2,data-px
                            =70)
151                     button#size_3(data-size=4,data-px=126)
152
153                 button#save_vis_btn(title='vis_save_title')
154
155             #vis_scroller_bar
156                 #vis_scroller_pivot
157
158             button#save_comments(title='vis_comments')
159             div#comments-title-container
160                 input(type="text" name="title" id="comment-
                        title" placeholder="Thema (Beispiel:
                        Grosser Platz)")
161             div#comments-container
162
163         form#saveForm(action='saveVis')
164             input#visname(type="text" placeholder="Enter
                    visualization name..." required)
165             button#submitVis(type="Submit") Save
166             button.cancelBtn(type="Button") Cancel
167             #loadingDiv
168                 img(src="pics/loading.gif")
```

Comment.css

```
1  #comments-container {
2      min-height: 100px;
3      margin-top: 20px;
4
5  }
6
7  .navigation-wrapper li:not(:first-child){
8      display:none!important
9  }
10
11 .jquery-comments ul.main li.comment .actions .action.upvote {
12     display: none!important;
13 }
14
```

```
15 .jquery-comments ul.main li.comment .actions .separator{
16     display:none!important;
17 }
18
19 #comment-title{
20     margin-top: 20px;
21     margin-left: 65px;
22     outline: 0;
23     overflow-y: auto;
24     overflow-x: hidden;
25     cursor: text;
26     border: 1px solid #CCC;
27     background: #FFF;
28     font-size: 1em;
29     line-height: 1.45em;
30     padding: .25em .8em;
31     padding-right: 2em;
32     width: calc(100% - 113px);
33 }
34
35 .comment-header .name:empty {
36     display: none;
37 }
38
39 #save_comments {
40     float: right;
41     height: 30px;
42     width: 40px;
43     margin-top: 10px;
44     background-image: url(../pics/icons/save.png);
45     background-color: #fff;
46     background-position: center;
47     background-repeat: no-repeat;
48     background-size: contain;
49     cursor: pointer;
50 }
```

Admin.pug

```
1 doctype html
2 html
3     head
4         title Sketch Tool Admin
5         meta(charset="utf-8")
6         meta(http-equiv='Content-Type', content='text/html;
              charset=utf-8')
7         meta(name='viewport', content='width = device-width,
              initial-scale = 1.0, minimum-scale = 1, maximum-
              scale = 1, user-scalable = no')
8         meta(name='apple-mobile-web-app-title', content='LP+')
9         meta(name='apple-mobile-web-app-capable', content='yes'
              )
```

```
10          script(type='text/javascript', src='/js/jquery-3.3.1.
                min.js')
11          link(rel="stylesheet" type="text/css" href="css/
                admin.css")
12          link(rel="stylesheet" type="text/css" href="css/app.css
                ")
13          script(type='text/javascript', src='/js/
                jquery.mousewheel.js')
14          script(type='text/javascript', src='/js/admin.js')
15
16      script.
17
18
19      body
20
21          #container
22              h3 Visualizations should be in JPG format with
                    dimensions: 3000 x 586
23              table
24                  tr
25                      td
26                          button#
                                Morges_intensiv.brush.intensiv.active
                                (title='brush_intensive_title')
27                      td
28                          img.vis_preview(src="visualizations/
                                Morges_intensiv.jpg")
29                      td
30                          form(method="post" enctype="multipart/
                                form-data" action="
                                uploadVisualization")
31                              input(type="file" name="
                                    Morges_intensiv" accept="image/
                                    jpg, image/jpeg")
32                              button(type="submit") Submit
33                          .loadingDiv
34                              img(src="pics/loading.gif")
35                  tr
36                      td
37                          button#
                                Morges_extensiv.brush.extensiv.active
                                (title='brush_extensiv_title')
38                      td
39                          img.vis_preview(src="visualizations/
                                Morges_extensiv.jpg")
40                      td
41                          form(method="post" enctype="multipart/
                                form-data" action="
                                uploadVisualization")
42                              input(type="file" name="
                                    Morges_extensiv" accept="image/
                                    jpg, image/jpeg")
43                              button(type="submit") Submit
44                          .loadingDiv
```

```
45                                  img(src="pics/loading.gif")
46                      tr
47                          td
48                              button#Morges_Obst.brush.fruit.active(
                                    title='brush_village_title')
49                          td
50                              img.vis_preview(src="visualizations/
                                    Morges_Obst.jpg")
51                          td
52                              form(method="post" enctype="multipart/
                                    form-data" action="
                                    uploadVisualization")
53                                  input(type="file" name="Morges_Obst
                                        " accept="image/jpg, image/jpeg
                                        ")
54                                  button(type="submit") Submit
55                              .loadingDiv
56                                  img(src="pics/loading.gif")
57                      tr
58                          td
59                              button#Morges_Gemuese.brush.vegi.active
                                    (title='brush_urban_title')
60                          td
61                              img.vis_preview(src="visualizations/
                                    Morges_Gemuese.jpg")
62                          td
63                              form(method="post" enctype="multipart/
                                    form-data" action="
                                    uploadVisualization")
64                                  input(type="file" name="
                                        Morges_Gemuese" accept="image/
                                        jpg, image/jpeg")
65                                  button(type="submit") Submit
66                              .loadingDiv
67                                  img(src="pics/loading.gif")
68                      tr
69                          td
70                              button#Morges_Kuh.brush.cows.active(
                                    title='brush_cows_title')
71                          td
72                              img.vis_preview(src="visualizations/
                                    Morges_Kuh.jpg")
73                          td
74                              form(method="post" enctype="multipart/
                                    form-data" action="
                                    uploadVisualization")
75                                  input(type="file" name="Morges_Kuh"
                                       accept="image/jpg, image/jpeg"
                                      )
76                                  button(type="submit") Submit
77                              .loadingDiv
78                                  img(src="pics/loading.gif")
79                      tr
80                          td
```

```
81                          button#
                                Morges_heutigerStand.brush.eraser.active
                                (title='brush_eraser_title')
82                      td
83                          img.vis_preview(src="visualizations/
                                Morges_heutigerStand.jpg")
84                      td
85                          form(method="post" enctype="multipart/
                                form-data" action="
                                uploadVisualization")
86                              input(type="file" name="
                                    Morges_heutigerStand" accept="
                                    image/jpg, image/jpeg")
87                              button(type="submit") Submit
88                          .loadingDiv
89                              img(src="pics/loading.gif")
90              hr
91              hr
92              hr
93              h3 User saved visualizations:
94              each vis_url in visualizations
95                  img.vis_preview(src=user_visdir+'/'+vis_url)
```

Appendix C

VisLab Lachen Participation Documents

This Appendix chapter comprises the documents sent to participants prior to the participation process, which is described in Chapter 4 Section 4.1. The first paper detail the informed consent form that was sent to participants. The participants signed this agreement, assuring the researcher that the data obtained might be utilised for the study purpose. This is followed by an information sheet instructing participants about the three-part participatory process. Finally, there is the UST's operation manual, which explains how to utilise the digital tool.

ETH zürich

Einverständniserklärung für das Mitwirkungsverfahren

Forschungsprojekt: Masterarbeit von Pascal Richard Hofer
Durchführende Institution: Universität Zürich, Humangeografie / ETH Zürich PLUS
Projektleitung: Pascal Richard Hofer
Projektbegleitung: Prof. Dr. Hanna Hilbrandt / Dr. Ulrike Wissen-Hayek

Name der mitwirkenden Person: _____

Ich erkläre mich dazu bereit, im Rahmen des genannten Forschungsprojekts am Mitwirkungsprozess teilzunehmen. Ich bestätige, dass ich über das Ziel, die verschiedenen Mitwirkungsmethoden (Vision skizzieren, Fragebogen und Diskussion) und den Ablauf des Forschungsprojektes informiert wurde.

Ich bin damit einverstanden, dass die Daten meiner Mitwirkung durch das Skizzieren der Visionen, die Beantwortung der Fragebogen und die Teilnahme an der Diskussion gespeichert, aufgezeichnet und zum Zweck der Analyse verschriftlicht (Transkription) und abgebildet (Visionen) werden. Die wissenschaftliche Bearbeitung der Daten erfolgt durch Pascal Richard Hofer. Ich bin informiert und akzeptiere, dass mein Name mit meiner Funktion innerhalb der Masterarbeit von Pascal Richard Hofer publiziert werden.

Ich bin damit einverstanden, dass meine Daten für wissenschaftliche Zwecke verwendet werden dürfen. Des Weiteren stimme ich zu, dass nach Projektende in darauf aufbauenden Forschungsprojekten die Daten verwendet werden können.

Meine Mitwirkung an der Erhebung und meine Zustimmung zur Verwendung der Daten, wie oben beschrieben, sind freiwillig. Ich habe jederzeit die Möglichkeit, meine Zustimmung zu widerrufen.

Unter diesen Bedingungen erkläre ich mich bereit mitzuwirken und erkläre mich mit der Speicherung, Verschriftlichung, Abbildung, Auswertung und akademischen Publikation meiner Daten einverstanden.

_____ _____
Vor- und Name (Druckbuchstaben) Ort, Datum

_____
Unterschrift der mitwirkenden Person

Figure C.1: Informed consent for the participation process

Informationsblatt für Mitwirkende

Willkommen zu diesem Forschungsprojekt! Vielen Dank für Ihre Mitwirkung.

Getestet wird ein Prototyp einer Masterarbeit an der Universität und ETH Zürich. Auf Basis verschiedener Szenarien werden mit einem Sketchtool Ideen und Visionen für den Hafen in Lachen skizziert. Ziel ist es herausfinden, wie das Sketchtool ein Mitwirkungsverfahren für den gemeinsamen Entwurf einer Siedlungsentwicklung unterstützen kann.
Wichtig: Die Studie ist Teil einer Masterarbeit. Sämtliche Inhalte wurden von Pascal Hofer visualisiert. Der Ausgang von diesem Beteiligungsverfahren hat keinen Einfluss auf Planungsprozesse. Die persönlichen Daten und Beiträge werden anonymisiert und bleiben geschützt.

Was kann das Sketchtool?

Mit dem Sketchtool können die Benutzer*innen auf Basis des Stands von heute Visionen für das Hafenareal in Lachen (Schwyz) skizzieren. Dabei kann die bedienende Person zwischen verschiedenen Szenarien auswählen, die hier kurz erklärt sind:

Szenario Grün: Dieses Szenario bietet die Möglichkeit Grünräume zu zeichnen und fördert Raum für Wohnen.

Szenario Aktivität: Mit der Benennung «Aktivität» ergibt sich mit dieser Variante die Möglichkeit, Einkaufsmöglichkeiten und Wohnen abzubilden sowie die Einbettung verschiedener Freizeitnutzungen und Begegnungsorte im Freiraum.

Szenario Dichtes Bauen: Das Szenario «Dichtes Bauen» sieht innerhalb des Hafenareals eine Verdichtung nach innen vor und bietet innerhalb der Freiflächen Raum für diverse Bespielungen. Zwischen den Veranstaltungen im öffentlichen Raum befinden sich auf dem Platz modular verstellbare Stühle und abbaubare Sonnenschirme mit einem Wasserspiel.

Die geplante **Schulhauserweiterung** ist in allen Szenarien und auf Basis der öffentlich zugänglichen Pläne nach eigenem Ermessen visuell angedeutet.

Ablauf des Mitwirkungsprozesses

In folgendem Abschnitt finden Sie den Ablauf der Studie und Anweisungen. Die Beteiligung teilt sich auf drei Runden auf, in welchen unterschiedliche Aufgaben am eigenen Computer bearbeitet werden. Hier ein kurzer Überblick:

1. Erste Vision skizzieren und Einsendung der Vision und Kommentare
2. Fragebogen (1/2) beantworten
3. Vision der anderen Teilnehmenden betrachten
4. Zweite Vision skizzieren und Einsendung der Vision und Kommentare
5. Fragebogen (2/2) beantworten
6. Diskussionsrunde

Eine Beschreibung zum Aufbau und zur Bedienung des Sketchtools finden Sie in der Bedienungsanleitung. Zugang zum Sketchtool finden Sie unter diesem Link: **https://urban-sketchtool.ethz.ch/**

1. Runde (Woche 24): Vision und Fragebogen (1/2)

In der ersten Runde skizziert jede teilnehmende Person eine eigene Vision für das Hafenareal in Lachen. Es besteht die Möglichkeit die Skizze zu kommentieren.

Wenn Sie Ihre Vision skizziert und kommentiert haben, speichern Sie Ihre Visualisierung und Kommentare ab. Bitte senden Sie die Bild- und Textdatei an folgende Mailadresse: **pascal.hofer@uzh.ch.**

Nach der Visualisierung werden Sie gebeten den ersten Fragebogen auszufüllen.

(1/2) Fragebogen: **https://forms.gle/V1Rwyo4cnqkzoFRHA**

2. Runde (Woche 25): Vision und Fragebogen (2/2)

Vor der zweiten Runde erhalten Sie die Visionen der anderen Teilnehmer*innen ohne Namensangabe. Bitte schauen Sie sich diese an, bevor Sie erneut eine Vision skizzieren.
Bitte wiederholen Sie den Speichervorgang und versenden Sie das Bild und die Kommentare wiederum per Mail.

Im Anschluss folgt der zweite Fragebogen.

(2/2) Fragebogen: **https://forms.gle/ah4VR9uLPQLyKuBz5**

3. Runde (Woche 26 o. 27): Diskussion

In der letzten Runde treffen sich alle teilnehmenden Personen virtuell zur Diskussion. Diese Runde findet gemeinsam und online auf Zoom statt. Um einen gemeinsamen Termin zu finden, füllen Sie bitte diesen Doodle Terminkalender aus:

https://doodle.com/poll/tpz4m42d4eauep6k?utm_source=poll&utm_medium=link
Der definitive Termin wird allen Beteiligten bald als möglich mitgeteilt.

Mit diesem Link können Sie an der Diskussion teilnehmen, auch wenn Sie Skype nicht installiert haben: **https://join.skype.com/Drh44hc4CJBR**

Bei Fragen oder Anliegen wenden Sie sich an Pascal Hofer mit der Nummer +41 79 586 90 24 oder schreiben Sie eine Mail an **pascal.hofer@uzh.ch.**

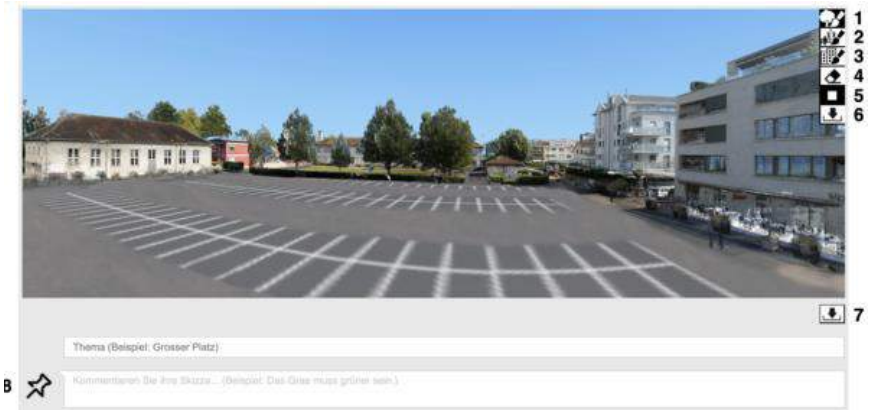
Figure C.2: VisLab information sheet

Anleitung für das digitale Sketchtool

In dieser Anleitung wird die Bedienung des Sketchtools erklärt. Das Tool ist ein Prototyp und Ergebnis einer Masterarbeit im Bereich der Geografie und Raumentwicklung der Universität und ETH Zürich. Mit Hilfe des Sketchtools können Ideen und Visionen für den Hafen in Lachen skizziert werden. Dabei versucht die Studie zu zeigen, wie das Sketchtool Mitwirkungsprozesse für den gemeinsamen Entwurf einer Siedlungsentwicklung unterstützen kann. Diese Untersuchung hat keinen Einfluss auf Planungsprozesse.

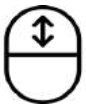
Aufbau und Funktionen des Sketchtools

Im folgenden Abschnitt ist die Oberfläche des Sketchtools abgebildet, wie sie im Browser erscheint. Mittels einer Legende sind die einzelnen Auswahlfelder beschriftet. Nebenbei ist die Maussteuerung erklärt.



1: Auswahl Szenario Grün
2: Auswahl Szenario Aktivität
3: Auswahl Szenario Dichtes Bauen
5: Pinselgrösse
4: Radiergummi, Ist-Zustand
6: Bild Speichern
7: Kommentare Speichern
8: Kommentarfeld

Linker Mausklick:
Auswählen und Skizzieren



Scrollen:
Blickwinkel ändern

Speichern der Visualisierung

Um die Visualisierung als Bilddatei abzuspeichern, klicken Sie mit der linken Maustaste auf das Symbol «**Speichern**» **am Bildrand oben rechts** (siehe rote Umrandung):

Es erscheint auf dem Bild ein kleines Fenster. Bitte geben Sie dort den Titel der Visualisierung mit ihrem Namen ein:

Klicken Sie anschliessend auf «Save» (dt. «Speichern»), um die Visualisierung abzuspeichern:

Die Visualisierung öffnet sich nun als Panoramabild in einem neuen Tab. Wichtig: Falls sich kein neuer Tab öffnet, deaktivieren sie die Pop-ups und wiederholen sie den Vorgang. Klicken Sie anschliessend mit der rechten Maustaste auf das Bild, um es auf dem Computer abzuspeichern:

Es erscheint ein neues Fenster. Wählen Sie den gewünschten Ordner aus, in welchem Sie das Bild abspeichern wollen und klicken Sie auf «Speichern».

Speichern der Kommentare

Um die Kommentare als Textdatei abzuspeichern, klicken Sie mit der linken Maustaste auf das Symbol «**Speichern**» **am Bildrand unten rechts**:

Es erscheint ein neues Fenster. Wählen Sie den gewünschten Ordner aus, in welchem Sie die Kommentare abspeichern wollen und klicken Sie auf «Speichern».

Eingabe der Vision und Kommentare

Senden Sie das Bild zusammen mit den Kommentaren an diese Mailadresse: pascal.hofer@uzh.ch.

Fragen und Unterstützung

Bei Fragen oder für Unterstützung schreiben Sie bitte eine Mail an pascal.hofer@uzh.ch oder rufen Sie an unter der Nummer +41 79 586 90 24.

Figure C.3: Urban Sketch Tool operation manual

Appendix D

VisLab Lachen Questionnaires

For the VisLab Lachen, three rounds of participation were planned. Two questionnaires were sent online for completion in the first two rounds. These are shown below in the figures D.1 and D.2 in this Appendix chapter. The questionnaire was created in German using Google's Survey Tool. This enabled online data collection. Additional information on the process is given in Chapter 4, Section 4.1.

(1/2) Fragebogen zum Forschungsprojekt für den Hafen in Lachen - Runde 1

Willkommen zum ersten Fragebogen!

In der ersten Runde des Forschungsprojekts haben Sie Ihre Vision für den Hafen in Lachen skizziert. Grundlage dafür waren drei Szenarien.

Bitte geben Sie ihre bisher genutzte Mailadresse an, so dass die Angaben miteinander in Verbindung gebracht werden können.

Im ersten Fragebogen ist es für die Studie von Interesse, wie Sie das Sketchtool und die Visualisierungen wahrnehmen. Bitte nehmen Sie sich Zeit und beantworten Sie alle Fragen. Geben Sie bitte im ersten Teil Angaben zu Ihrer Person, gefolgt von Fragen zur Anwendung des Sketchtools und zu den Visualisierungen im letzten Abschnitt.

Sämtliche Angaben werden vertraulich behandelt. Bei Fragen senden Sie eine Mail an Pascal Hofer: pascal.hofer@uzh.ch

Vielen Dank für Ihr Mitwirken.

* Erforderlich

1. E-Mail-Adresse *

2. Was ist Ihr Geschlecht? *

Markieren Sie nur ein Oval.

- ◯ Weiblich
- ◯ Männlich
- ◯ Weitere
- ◯ Keine Angabe

3. Was ist Ihr Bezug zum Hafen in Lachen? *

Wählen Sie Zutreffendes aus.

Markieren Sie nur ein Oval.

- ◯ Ich wohne in Lachen.
- ◯ Ich arbeite in Lachen.
- ◯ Sonstiges: _____

Fragen zur Anwendung des Sketchtool

In diesem Abschnitt erhalten Sie Fragen zum Sketchtool. Bitte klicken Sie Zutreffendes an und kommentieren Sie, falls nötig. Abschliessend haben Sie ergänzend die Möglichkeit Anmerkungen anzubringen.

4. Das Sketchtool war für mich zugänglich. *

Kicken Sie bitte das Zutreffende zwischen null und sechs an, wenn null "trifft überhaupt nicht zu" und sechs "trifft voll und ganz zu" bedeutet.

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

5. Ich habe die Oberfläche des Sketchtools verstanden. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

6. Die Bedienung des Sketchtools ist mir leicht gefallen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

7. Hat Ihnen etwas bei der Bedienung des Sketchtools Mühe bereitet?

8. Mit dem Sketchtool konnte ich meine Ideen und Vision für den Hafen in Lachen skizzieren. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

9. Bitte begründen Sie Ihre Angabe:

10. Wie kann das Sketchtool verbessert werden?

11. Was gefällt Ihnen beim Sketchtool?

12. Gibt es weitere Anmerkungen?

Die vier Szenarien für den Hafen in Lachen

Hier sehen Sie nochmals die vier Szenarien für den Hafen von Lachen. Bitte betrachten Sie die Bilder noch einmal.

Falls Ihnen die Bilder zu klein sind können Sie näher ranzoomen: Klicken Sie dafür oben in der Leiste auf "Ansicht" und anschliessend auf "Vergrössern" respektive "Verkleinern", um wieder die Originalgrösse des Fragebogens herzustellen.

Szenario "Heute"

Szenario "Grün"

Szenario "Dichtes Bauen"

Szenario "Aktivität"

Fragen zu den Visualisierungen

Dieser Abschnitt befasst sich mit dem visuellen Inhalt des Sketchtools, den Visualisierungen. Bitte kreuzen Sie Zutreffendes an und kommentieren Sie. Abschliessend haben Sie ergänzend die Möglichkeit Anmerkungen anzubringen.

13. Haben Sie Erfahrung mit Visualisierungen, wie sie im Sketchtool zur Anwendung kommen? *

Markieren Sie nur ein Oval.

- ◯ Ja
- ◯ Nein

14. Die Visualisierungen wirken realistisch. *

Kicken Sie bitte das Zutreffende zwischen null und sechs an, wenn null "trifft überhaupt nicht zu" und sechs "trifft voll und ganz zu" bedeutet.

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

15. Was hat Sie bei den Visualisierungen im Sketchtool überrascht?

16. Was stört Sie an den Visualisierungen?

17. Der Hafen in Lachen war durch die Visualisierungen wiedererkennbar. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

18. Ich konnte mich in den Punktwolken Visualisierungen vom Hafen in Lachen orientieren. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

19. Die Szenarien waren nachvollziehbar dargestellt. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
Überhaupt nicht zufrieden	◯	◯	◯	◯	◯	◯	◯	Voll und ganz zufrieden

20. Die Visualisierungen unterstützen die Vorstellung der verschiedenen Szenarien für den Hafen von Lachen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

21. Bitte begründen Sie Ihre Angabe:

22. Gibt es weitere Anmerkungen?

Figure D.1: VisLab Lachen questionnaire for round one

(2/2) Fragebogen zum Forschungsprojekt für den Hafen in Lachen - Runde 2

Willkommen zum zweiten Fragebogen!

In der zweiten Runde des Forschungsprojekts haben sie andere Visionen zum Hafen in Lachen gesehen. Anschliessend skizzierten Sie erneut eine Vision mit den bekannten Szenarien auf Basis von Punktwolken Visualisierungen.

Bitte beginnen Sie mit Ihrer Mailadresse, so dass die Angaben miteinander in Verbindung gebracht werden können.

Im zweiten Fragebogen rückt der Mitwirkungsprozess mit dem Sketchtool und den Visualisierungen in den Fokus. Ausserdem sind Fragen zu Ihrer Vision und den Visionen von anderen teilnehmenden Personen formuliert. Abschliessend nimmt diese zweite Runde die bevorstehende Diskussion ins Gedankenfeld. Bitte nehmen Sie sich Zeit und beantworten Sie alle Fragen.

Sämtliche Angaben werden vertraulich behandelt. Bei Fragen senden Sie eine Mail an Pascal Hofer: pascal.hofer@uzh.ch.

Vielen Dank für Ihr Mitwirken.

* Erforderlich

1. E-Mail-Adresse *

Fragen zum Sketchtool

In diesem ersten Abschnitt finden Sie Fragen zum Sketchtool formuliert. Bitte kreuzen Sie Zutreffendes an. Abschliessend haben Sie ergänzend die Möglichkeit Anmerkungen anzubringen.

2. Die Bedienung des Sketchtools ist in der zweiten Runde leichter gefallen. *

Kicken Sie bitte das Zutreffende zwischen null und sechs an, wenn null "trifft überhaupt nicht zu" und sechs "trifft voll und ganz zu" bedeutet.

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

3. Durch die leichtere Bedienung des Sketchtools hat sich meine Vision verändert. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

4. Wie zufrieden sind Sie mit dem digitalen Zugang für den Mitwirkungsprozess. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
Überhaupt nicht zufrieden	◯	◯	◯	◯	◯	◯	◯	Voll und ganz zufrieden

5. Durch das Sketchtool mit den Visualisierungen steigt die Motivation an einem Mitwirkungsprozess teilzunehmen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

6. Wie ausreichend schätzen Sie Ihre digitalen Fähigkeiten für diesen Mitwirkungsverfahren ein. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
Überhaupt nicht ausreichend	◯	◯	◯	◯	◯	◯	◯	Voll und ganz ausreichend

7. Gibt es weitere Anmerkungen?

Fragen zur Visualisierung einer eigenen Vision und zu Visionen anderer sowie dem Nutzen als Grundlage für eine Diskussion

Dieser mittlere Teil des Fragebogens beschäftigt sich mit Fragen zu ihrer Vision, den Visionen anderer und den Nutzen dieser visuellen Skizzen als Grundlage für eine Diskussion. Bitte kreuzen Sie Zutreffendes an. Abschliessend haben Sie ergänzend die Möglichkeit Anmerkungen anzubringen.

8. Die Visualisierungen helfen, eine eigene Vision für den Hafen von Lachen zu skizzieren. *

Kicken Sie bitte das Zutreffende zwischen null und sechs an, wenn null "trifft überhaupt nicht zu" und sechs "trifft voll und ganz zu" bedeutet.

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

9. Die Visualisierungen helfen, Entscheidungen über eine persönlich gewünschte Siedlungsentwicklung zu treffen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

10. Die Visualisierung einer eigenen Vision ist eine Alternative, um mit anderen zu kommunizieren. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

11. Die Visualisierungen helfen, andere Visionen für den Hafen von Lachen besser zu verstehen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

12. Die Visualisierungen helfen, meine und andere Visionen kritisch zu hinterfragen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

13. Durch die Betrachtung von anderen Visionen wurde die eigene angepasst. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

14. Durch die Betrachtung von anderen Visionen wurden andere Ideen in der eigenen Vision übernommen. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

15. Die Betrachtung anderer Visionen hat die eigene Vision bestärkt. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

16. Die Visualisierungen der Visionen dienen als Grundlage für eine Diskussion. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

17. Die Visualisierung einer eigenen Vision stärkt die eigene Argumentation in einer Diskussion. *

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

18. Gibt es weitere Anmerkungen?

Abschliessende Frage zur Mitwirkung

19. Würden Sie die Teilnahme an einem solchen Mitwirkungsverfahren weiterempfehlen? *

Kicken Sie bitte das Zutreffende zwischen null und sechs an, wenn null "trifft überhaupt nicht zu" und sechs "trifft voll und ganz zu" bedeutet.

Markieren Sie nur ein Oval.

	0	1	2	3	4	5	6	
trifft überhaupt nicht zu	◯	◯	◯	◯	◯	◯	◯	trifft voll und ganz zu

20. Gibt es weitere Anmerkungen?

Figure D.2: VisLab Lachen questionnaire for round two

Appendix E

Detailed Results of the Open Survey Questions

This chapter details the open questions and their responses from the VisLab survey. The findings are based on the structure of the two questionnaires used in the participation process's first and second rounds. They address the tool's usability, the visualisations, the tool's usability after repeated usage with digital access, and the visualisations as an argument for discussion.

Open questions concerning the Urban Sketch Tool's use

Did you have any issues with the Sketch Tool?

- "Hat eher damit zu tun, dass ich nicht genau weiss, was von mir verlangt wird." (engl. *It has more to do with the fact that I am unsure of what will be expected of me.*)
- "Genaue Platzierung und Schnittstellen zu den anderen "Layouts". (engl. *Exact placement and links to other layouts.*)
- "Der Wechsel zwischen den Szenarien." (engl. *The transition between scenarios.*)
- "Ohne nochmals nachzulesen in der Anleitung war es nicht intuitiv, dass mit Scrollen der Blickwinkel geändert werden kann. Der grobe Pinsel, ich wollte "zu schön malen". Aber man kann ihn ja verkleinern, dann kann man die Abgrenzungen mehr berücksichtigen." (engl. *Even after reading the directions again, it was not intuitive that the view angle could be altered by scrolling. The big brush, I wanted to pain 'too beautifully". It can, however, be narrowed to a more manageable size, allowing for more careful consideration of the boundaries.*)
- "Nichts." (engl. *Nothing.*)

- "Ich konnte die Möblierung nicht frei platzieren." (engl. *I could not free-place the furniture.*)

I was able to sketch my ideas and vision for the Lachen harbour using the Sketch Tool. Kindly provide justifications for your statement to this question:

- "Ich war bei der Projektierung stark involviert, daher gibt es für mich keine Alternativen." (engl. *I was heavily involved in the project planning, so there are no alternatives for me.*)
- "Visualisierung müsste sehr detailgetreu sein." (engl. *Visualisation would have to be very detailed.*)
- "Im Grossen und Ganzen konnte ich meine Vision eintragen, wobei wünschenswert wäre, allenfalls noch weitere Szenarien und Funktionen zur Auswahl "anzubieten." (engl. *On the whole, I was able to sketch my vision, although it would be desirable to "offer" more scenarios and functions for selection.*)
- "Man kann ganz grob seine Visionen skizzieren, die 3 Szenarien sind halt relativ beschränkt, wenn man detaillierte Ideen einbringen möchte." (engl. *One can roughly sketch one's visions, but the 3 scenarios are relatively limited if one wants to introduce detailed ideas.*)
- "Intuitive Bedienung und gute Anleitung." (engl. *Intuitive operation and good instructions.*)

What can be done to improve the Sketch Tool?

- "Kann ich nicht beantworten, da ich die Zielsetzung nicht kenne." (engl. *I cannot answer this question, as I do not know the objective*
- "Mehr 'Layoutmöglichkeiten' und präzise Positionierung." (engl. *More 'layout possibilities' and precise positioning.*)
- "Kann sicherlich noch verfeinert/detailliert werden, sodass der Nutzer selbst auch Elemente (Sitzbänke, Bäume etc.) eintragen kann." (engl. *Can certainly be refined/detailed so that the user himself can also enter elements (benches, trees, etc.).*)
- "Mehr/verfeinerte Szenarien." (engl. *More/refined scenarios.*)
- "Konnte das Bild nicht speichern, trotz PopUp Deaktivierung." (engl. *Could not save the image, despite PopUp deactivation.*)

- "Wahrscheinlich eine Verfeinerung, die das Handling dann aber komplizierter macht." (engl. *Probably a refinement, but it makes the handling more difficult.*)

What features do you find appealing about the Sketch Tool?

- "Werde ich wahrscheinlich nie mehr brauchen." (engl. *I will probably never use it again.*)
- "Einfache Bedienung." (engl. *Simple to use.*)
- "Nach kurzem Studium der Anleitung relativ einfache Anwendung. Sehr gutes tool zur Darstellung/Visualisierung von verschiedenen Szenarien. Dadurch können verschiedenste Gestaltungsvarianten dargestellt werden, was für entsprechende Projektentwicklungen sehr hilfreich ist." (engl. *After briefly studying the instructions, it is relatively easy to use. Very good tool for the representation/visualisation of different scenarios. This allows a wide range of design variants to be displayed, which is very helpful for corresponding project developments.*)
- "Einfache Bedienung - schnell einsetzbar für grobe Skizzierung von Ideen." (engl. *Easy to use - can be used quickly for rough sketching of ideas.*)
- "Spielerischer Umgang mit Visualiserung." (engl. *Playful use of visualisation.*)
- "Grundsätzlich das Visualieren einer örtlichkeit." (engl. *Basically the visualisation of a place.*)

Are there any other remarks?

- "Im Grundsatz jedoch ein sehr gutes Instrument; Kompliment!" (engl. *In principle, however, a very good instrument; congratulations!*)

Open questions concerning the Urban Sketch Tool's visualisations

What about the Sketchtool's visualisations surprised you?

- "Wie rasch eine Visualisierung erfolgen kann." (engl. *How quickly a visualisation can be done.*)
- "Die schlussendliche Darstellung über die ganze Situation in einem Panoramabild." (engl. *The final representation of the whole situation*

in a panoramic image.)

- "Dass sich je nach Szenario auch Gebäude Art/Aussehen verändern." (engl. *That building type/appearance also change depending on the scenario.*)
- "Einfachheit." (engl. *Simplicity.*)
- "Die Grösse des Platzes." (engl. *The size of the square.*)

What aspect of the visualisations irritates you?

- "Unschärfe." (engl. *Blur.*)
- "Ein Mix von den Visualisierungen wäre wünschenswert." (engl. *A mix of the visualisations would be desirable.*)
- "Die ungenauen übergänge/Schnittlinien der verschiedenen Szenarien. Ansonsten eigentlich nichts Spezielles." (engl. *The imprecise transitions/cut lines of the different scenarios. Other than that, nothing specific really.*)
- "Wo sind die Menschen?" (engl. *Where are the people?*)

The visualisations help to imagine the various scenarios for the Lachen harbour. Kindly provide justifications for your statement to this question:

- "Die Varianten sind nicht wirklich möglich - aber ansonsten in Ordnung." (engl. *The variants are not really possible - but otherwise okay.*)
- "Eine Visualisierung 'entweder oder' ist eher schwierig; ein Mix wäre realistischer." (engl. *A visualisation of 'either or' is rather difficult; a mix would be more realistic.*)
- "Auf alle Fälle helfen die Visualisierungen sehr, entsprechende Projektszenarien darzustellen und so optimal an die Adressaten (Planer, Käufer, Bevölkerung etc.) zu bringen." (engl. *In any case the visualisations are highly helpful for presenting appropriate project options and thus delivering them to the addressees optimally (planners, buyers, and the public, for example).*)
- "Man erhält schnell einen ersten überblick - eine Skizze halt, die so mit dem Tool aber sicher schneller skizziert werden kann als z.B. von Hand." (engl. *You quickly get a first overview - simply a sketch, which*

can certainly be sketched faster with the tool than, for example, by hand.)

- "Konzepte sind ersichtlich." (engl. *Concepts are visible.*)
- "Die Visualisierung Aktivität sollte Menschen enthalten." (engl. *The visualisation Activity should contain people.*)

Are there any other remarks?

- "Cooles Tools!" (engl. *Cool tool!*)

Open question concerning the Urban Sketch Tool's use and the digital approach

Are there any other remarks?

- "Meine neue Vision hat sich verändert aufgrund der Betrachtung der Visionen von den anderen Teilnehmenden." (engl. *My new vision changed after seeing the other participants' visions.*)

Questions concerning visualising one's own and others' visions and their usefulness for a discussion

Are there any other remarks?

- "100% Alternative zur Kommunikation finde ich, ist eine Vision nicht. Aber sie unterstützt die Kommunikation." (engl. *I don't think a vision is a 100% alternative to communication. But it supports communication.*)

Appendix F

Vision Sketches of Local Stakeholders

This chapter of the Appendix contains images of the stakeholders' visions. Four of six participants submitted a total of eight vision contributions. In the first and second rounds of the VisLab four people sketched two visions each. Other contributions are not existent due to technical difficulties in one case. The other case is unknown. Thus, the following images depict the visions of CZ (see figures F.1a and F.1a), EA (see figures F.2a and F.2b), SK (see figures F.3a and F.3b), and WR (see figures F.4a and F.4b). These contributions are summarised in Table 5.1 of section 1234567. The findings were used to guide the focus group discussion of the participatory process. The discussion transcript is provided in the next chapter.

(a)

(b)

Figure F.1: Stakeholder CZ's Vision 1 (a) and Vision 2 (b) from the VisLab Lachen

(a)

(b)

Figure F.2: Stakeholder EA's Vision 1 (a) and Vision 2 (b) from the VisLab Lachen

(a)

(b)

Figure F.3: Stakeholder SK's Vision 1 (a) and Vision 2 (b) from the VisLab Lachen

(a)

(b)

Figure F.4: Stakeholder WR's Vision 1 (a) and Vision 2 (b) from the VisLab Lachen

Appendix G

Discussion Transcription Rules

For the transcription of the web-based stakeholder discussion, the transcription rules of Kuckartz (2014b, p. 136-137) were adapted further for this research. The following list details the transcription system for the online discussion:

1. It is verbatim transcribed and translated from Swiss German into High German as accurately as possible.
2. The language is written in a manner similar to written German, with verbal abbreviations written out.
3. Pauses are denoted by bracketed dots. Each second of the pause is denoted by a point. If the pause is longer, the duration in seconds is recorded.
4. Underscores are used to indicate stressed words.
5. Affirmative utterances are not included in the transcription.
6. Other person's interjections are enclosed in brackets.
7. In brackets, vocal utterances which support the statement, such as laughter or sighing, are denoted.
8. The moderator's passages are denoted with an 'M', while the participants' are denoted by an abbreviation of their first and last names.
9. Each speaker's contribution is summarised in a separate paragraph. For readability, speaker changes are separated by a blank line.
10. Interruptions are denoted by parentheses and complemented by an explanation.
11. The information displayed on the screen is denoted by brackets.
12. In double brackets, non-verbal activities or expressions such as gestures are noted.
13. Incomprehensible words are denoted by (unv.).
14. The statements are not anonymous in accordance with informed consent (see Kuckartz, 2014b, p. 136-137).

Appendix H

Stakeholder Discussion Guide

It was necessary to prepare in advance for the stakeholder discussion. Therefore, a discussion guide was formulated following an analysis of the stakeholder's visions, which were sent via mail. The following framed text shows the German-language origin discussion guide. The discussion began with an introduction of the participants. The round then started with each participant presenting their vision for the intent of eliciting responses. As a result of the vision analysis, several major topics have been identified, which were discussed next. Additional questions were created as needed in case the conversation stagnated. Throughout the discussion, the researcher should act as moderator in an unobtrusive manner, preferably without interfering with the flow of the discussion.

Ablauf Diskussion

Zeit, Datum: 10.30-12.00 Uhr, 9. Juli 2021

Teilnehmer:innen: CZ, WR, SK, FC, EA, MB

Eigene Position: zurückhaltende Moderation mit kleinstmöglicher Einflussnahme

Sich von den Teilnehmer:innen begründen lassen, warum sie sich für ihre Vision entschieden haben bzw. andere Entscheidungen problematisch finden.

Die Teilnehmer sollen nur kurz über ihre Version sprechen, der Fokus soll darauf liegen, was andere davon halten, um die Diskussion anzuregen.

Beginn:

1. Anfrage für Recording, Wiederholen auf Band (1 Min)
2. Vorstellungsrunde, Personen entschuldigen (AS, PM) (9 Min) 10.40 Uhr
3. Recap: was wir bisher gemacht haben und nochmals die Szenarien zeigen (4 Min)

4. Ziele der Diskussion definieren (1 Min) 10.45 Uhr
5. Präsentation der Visionen der Runde 1 & 2 (vier Präsentationen & Stellungnahmen a 10 Min) 10.55 / 11.05 / 11.15 / 11.25 Uhr

   (a) Präsentieren der eigenen Vision.
   (b) Warum haben Sie sich für diese Vision entschieden?
   (c) Was haben Sie bei anderen problematisch gefunden?

   Anschliessend: Stellungnahmen der anderen Personen, was finden sie problematisch oder gut?
6. Verbaler Beitrag von den Teilnehmer*innen, die keine Vision eingereicht haben: (5 Min) 11.30

   (a) Präsentieren wie die eigene Vision skizziert wurde?
   (b) Warum haben Sie sich für diese Vision entschieden?
   (c) Was haben Sie bei anderen problematisch gefunden?

   Haupttthemen:
7. Parzellen Grosser Platz: Für den grossen Platz hat keine Person in der Skizze die aktuelle Planung wiedergegeben, die durch das Szenario "DichteBauen" visualisiert ist.

   Grüner Platz vs. Aktivität mit kleinen Kiesflächen, Bänken, Bäumen, Spielplatz (10 Min) 11.40 Uhr

   (a) Welche Argumente sprechen für Grün
   (b) Welche für Aktivität ausdiskutieren
8. Parzellen Kleiner Platz vis à vis Steinerbeck: Business vs. Wohnsiedlung (10 Min) 11.50 Uhr

   (a) Welche Argumente sprechen für Business
   (b) Welche für Wohnsiedlung ausdiskutieren
9. In jeder Vision hat sich nach der erste Runde was verändert, ausser in einer (Zunkel). Würden Sie nach dieser Diskussion nochmals was ändern? Warum? 12.00 Uhr

   Zusatzfragen:
10. (Kleiner Platz: Grün vs. Aktivität)

11. Keine Person hat in ihrer Skizze etwas aus dem aktuellen Stand bewahrt. Warum ist das so? Gibt es Kommentare dazu?

12. (Frage, um das Wissen aus dem Fragebogen zu erweitern) Im Fragebogen wurde mehrmals erwähnt, dass mehr Details gewünscht sind. Auf den Szenarien sind kleinere Elemente wie die Ourdoorsportanlage, Skatepark oder die Fahrradständer. Wurden diese Elemente erkannt und gesehen? Hat sich niemand überlegt, nur die Velosständer zu visualisieren, um den Langsamverkehr an diesem Ort zu stärken?

Appendix I

Stakeholder Discussion Transcript

The following transcript is the output of a discussion which took place on the 9th of July 2021 through Skype between 10.30am and 12am. The discussion was held in Swiss German and later transcribed in German according to the defined rules (see Subsection 4.5.1). The moderator is denoted by the letter M. In the Table 4.1 the participants are defined.

M: Dann beginnen wir mit der Diskussionsrunde zu diesem Mitwirkungsprozess. (unv.) (unbeabsichtigte Geräusche durch Nichtstummschalten des Mikrofons) (8) Gut, also, fangen wir an mit der Diskussion. Ich habe das Okay erhalten, dass ich die Diskussion aufnehmen darf. Die Aufzeichnung ist gestartet. Und ich würde sagen, fangen wir an mit einer Vorstellungsrunde. Wer möchte anfangen von euch? Frau Zunkel?

CZ: Ja gerne, mein Name ist Christina Zunkel. Ich bin Gemeinderätin in Lachen. Ich habe das Ressort Soziales und Alter und habe mit dem Thema Bautätigkeit oder Entwicklung im Dorf nur am Rande zu tun. Aber als Bewohnerin von Lachen interessiert es mich natürlich blendend, was da alles gebaut wird und was es da für Möglichkeiten gibt. Wie man das visualisieren kann. Und, ich habe es also auch geschafft dieses Tool zu bedienen. (WR stösst nach technischen Schwierigkeiten zur Diskussion) (**WR:** Merci vielmals Erich) (..)

M: Vielen (**WR:** Hallo) Dank Frau Zunkel (**WR:** zusammen) schnell in der Zwisch(.) (**WR:** Lacht) Guten Tag Wolfgang (**WR:** Also) es funktioniert alles (**WR:** (unv.) hier funktioniert alles nicht.) Sehr gut. (EA stösst verspätet dazu) (**WR:** Gut, okay. (unv.)) Guten Morgen auch Frau Elsbeth Anderegg Marty (**EA:** Guten Morgen, ja, ich habe es auch geschafft) Schön sind sie alle hier. Ich bin diese Aufzeichnung am Aufnehmen, also das Skype Gespräch bin ich am Aufnehmen. Ist das für euch auch in Ordnung. ((**EA:** Nickt)) (**WR:** Okay) Okay, wir haben soeben begonnen mit der Vorstel-

lungsrunde. Frau Christina Zunkel hat sich vorgestellt. Wolfgang willst du weiterfahren?

WR: Ja, mein Name ist Reumer Wolfgang. Ich bin hier bei der Gemeinde Lachen Abteilungsleiter Bau und Umwelt seit knapp neun Jahren. (...) Hört man und sieht man mich? Ist gut? (**M:** Jawohl, perfekt.) Okay. (5)

M: Wer als nächstes? (..)

SK: Sonst mache ich weiter (**M:** Ja, gerne) Ich bin Marketingleiterin in der Marina Lachen (.) und ich selbst wohne auch in der Gegend. Ich bin aufgewachsen in Pfäffikon im Kanton Schwyz und wohne jetzt in Altendorf oberhalb von Lachen. Das heisst, ich habe auch immer ein Auge darauf, was hier am Hafen läuft. Bin hier selber viel unterwegs. Und mit Bezug zu der Marina Lachen interessiert es uns, was am Hafen passiert. Weil es bei uns vor der Haustüre ist. (.) Genau. (..)

M: Dankeschön. (...) Herr Cott? (**EA:** Soll ich?) Oder Sie, ja, gerne.

EA: Also ich bin, ich habe eine Buchhandlung (**AB:** Stösst verspätet zur Diskussion) im Zentrum von Lachen und wohne seit zwei Jahren selbst in Lachen und habe vorher in Altendorf gewohnt. Und bin als Kantonsrätin politisch aktiv. Darum auch immer interessiert, was mit dem öffentlichen Raum passiert.

M: Vielen Dank. Herr Cott?

FC: Ja, ich stelle mich gerne vor. Mein Name ist Francestg Cott. Ich bin Schulleiter an der Oberstufe an diesem wunderschön langgezogenen Gebäude direkt am See. Und darf wahrscheinlich eines der schönsten Büros am Zürichsee bewohnen. (lacht) Und ich bin natürlich extrem in die ganze Bautätigkeit eingebunden. (störende Geräusche) Ich habe beim Wettbewerb mitmachen dürfen respektive beisitzen und beraten. Ich darf jetzt bei der Baukommission für die Projektierung teilnehmen für das Oberstufenschulhaus, also für den Erweiterungsbau. Der jetzt im (störende Geräusche) Mai genehmigt worden ist von der Bezirksbevölkerung und bin natürlich interessiert, was gibt es hier für Möglichkeiten. Ich habe natürlich schon viele Visualisierungen gesehen in Bezug auf die Wettbewerbseingaben, die es gegeben hat. Ich habe es spannend gefunden mit dem Tool zu arbeiten, obwohl nicht alles geklappt hat.

M: Vielen Dank und herzlich willkommen noch Herr Bamert. Schön sind Sie hier. Wollen Sie sich auch noch gleich vorstellen?

AB: (unverständlich hohe Stimme durch den Computer von AB) ((WR hält sich ein Ohr zu, FC verzieht das Gesicht und lächelt)) (**M:** Okay, lacht) (..) (AB versucht zu sprechen, aber es ist nicht verständlich)

M: Man hört euch nicht. Die Stimme ist zu hoch. ((AB nervt sich

gestikulierend mit einem Lächeln)) (..)

AB: (spricht mit unverständlicher hoher Stimme und gestikuliert) (WR lacht) ((die anderen Teilnehmer*innen lächeln)) (..)

M: Sonst fahren wir fort. Danke vielmals für die Vorstellungsrunde. Vielleicht funktioniert das ja noch. Ehm, eh, vielleicht kann er ja noch einen Versuch starten und meldet sich sicher, wenn es soweit ist. Ehm, ganz kurz schnell, starte ich eine Präsentation und teile den Bildschirm. (.) Und zwar will ich nur nochmals (...) (der Bildschirm wird geteilt) sagen, was wir bisher gemacht haben, eine kleine Rekapitulation. Ehm, sehen sie alle den Bildschirm?

SK: Ja.

WR: Ja.

M: Wunderbar. Es ist etwas langsam. (.) Ehm, wir haben, in zwei Runden hat jeder für sich eine Vision skizziert. In der ersten Runde und dann hatte man nochmals die Möglichkeit das in der zweiten Runde nochmals zu machen, nachdem man die Vision der anderen gesehen hat. Hier nochmals die vier Szenarien (Bildschirm zeigt die vier Szenarien), dass dies jeder nochmals gesehen hat. Das ist das Szenario von heute. Man sieht hier den grossen Parkplatz, das alte Schulhaus, irgendwo hier hinten sitzt Herr Cott, ((die Teilnehmer*innen schmunzeln)) die alte Turnhalle, der kleinere Parkplatz, Hotel Marina und hier die angrenzenden Parzellen zum kleinen Parkplatz. Dann im Szenario Grün sind beide Plätze zu Grün-, eh, Parkanlagen gestaltet worden. Die Parzelle hier wurde zu einer Wohnsiedlung umgewandelt. Und hier sieht man auch die aktuelle Planung betreffend dem neuen Schulhauserweiterungsprojekt. Hier hinten ist ein übergang gestaltet zum jetzigen Park, der am Seeufer liegt. Hier haben wir das Szenario Aktivität. Hier sehen wir wiederum das jetzige Schulhausprojekt angedeutet mit Aussensportanlagen, Skatepark. Dann haben wir hier auf dem grossen Platz kleine Kiesflächen mit Bäumen, Sitzmöglichkeiten und einem Spielplatz. Auf dem kleinen Platz genau dasselbe, wo man sich hinsetzen kann unter den Bäumen. Und hier haben wir auf diesen Parzellen dieses Mal Erdgeschossnutzung, Mischnutzung, wo man auch wohnen kann. Und dann im Szenario Dichtes Bauen ist alles sehr dicht bebaut. Wir haben hier auf diesen Parzellen ein grosses Büro-, Businessgebäude. Hier haben wir auch ein Gebäude mit Erdgeschossnutzung, Mischnutzung. Auf dem grossen Platz haben wir eigentlich auch visualisiert die aktuelle Planung angedeutet, die auch zum Schulhauserweiterungsprojekt angedacht ist. Und hier könnte man sich auch nochmals eine Erweiterung des Schulhauses vorstellen mit einer Aula im obersten Geschoss beispielsweise. Genau. Warum die Fokusgruppe? Was sind die Ziele davon? Also wir haben, jeder und jede hat für sich eine Vision skizziert. Und jetzt in dieser Diskussion geht es darum,

dass man gemeinsam diskutiert, dass man gemeinsam die Visionen bespricht. Zum einen um herauszufinden, was die Gründe waren, die zu den Entscheidungen geführt haben. Zum anderen aber auch um Stellungnahmen von anderen einzuholen, das ist sehr wichtig. Was finden andere problematisch an den Visionen der anderen Personen. Dann gibt es sicherlich auch noch Hauptthemen, die diskutiert werden können, die auffällig waren in den Visionen. Und dann, wenn die Zeit noch reicht, könnte man noch bestehendes Wissen aus den Fragebogen erweitern. Und dann fangen wir doch an mit Wolfgang. Könntest du, also sehen noch alle die Präsentation? (.) (**SK:** Ja, ist gut) (**WR:** Ja, ist gut) Wolfgang könntest du, also jetzt kommt der Teil, wo jeder seine Vision, ehm, präsentieren, also die, welche ich bildlich erhalten habe. Das hat leider nicht bei allen funktioniert. Und dann präsentiert diese Person, warum man sich für diese Vision entschieden hat. Das beantworten, und was man bei anderen problematisch gefunden hat. Und dann anschliessend auch immer Stellungnahmen der anderen, was sie an dieser Vision gut finden, was sie problematisch finden. Bitte Wolfgang.

WR: Ja, eh, hallo miteinander, ich möchte kurz meine Vision (..) Skizzen erläutern. Also, in der Runde eins habe ich klar, eh, eine Mischung zwischen den begrünten Teil vom grossen Parkplatz in der "äusseren Haab", wo ich gedacht habe, es soll eine Parkgestaltung werden zusammen mit dem Ensemble, wo ja die Lachener und Bezirksbürger*innen wissen, was passiert dort unten. Also die Projektierungskredite wurden ja erteilt im Juni, an der Urne. Hinten wo du ja visualisiert hast, Pascal, diese Dreifachturnhalle. Plus die Erweiterung, wo die (WR ist plötzlich stummgeschalten) (6)

M: Wolfgang jetzt bist du auf "mute". (4) Wolfgang du musst kurz das Mikro einstellen. Irgendwie (**WR:** Ah, (unv.)) bist du auf "mute" gekommen.

WR: Jawohl. Also, eh, ich erläutere kurz meine Skizzen hierzu. Also im Bereich vom grossen Parkplatz "äussere Haab" habe ich Begrünung respektive Parkgestaltung reingenommen, weil, ja, (.) die Lachener und Bezirksbürger*innen wissen ja, da sind im Juni die Projektierungskredite hinten für die Dreifachturnhalle, die du ja bereits rein skizziert hast, genehmigt worden, Pascal. Plus, ist die Erweiterung des, eh, Schulraumes vom Bezirk, Sekundarstufe reingekommen. Und, und die Gemeinde beabsichtigt ja zusammen mit dieser Dreifachturnhalle auch eine unterirdische Parkierung, wo es aber auch Diskussionen gibt für eine Parkierung, allenfalls im Zentrum oben, erschlossen von der Seidenstrasse her. Aber aufgrund von dem habe ich einmal den grossen Parkplatz als Parkbegrünung effektiv reingenommen, aber auch geschrieben, dass dieser Platz wieder benutzt werden kann für öffentliche Nutzungen wie "Chilbi", Seenachtsfest, Weihnachtszauber etc. etc., wo ja auch sehr traditionelle Anlässe in Lachen stattfinden. Und dazu müssen Begrünung usw. in, in (.) mobilen Formen dort platziert werden können.

Dass man diese auch bei entsprechenden, eh, Anlässe entfernen kann. Auf der anderen Seite der "äusseren Haab" auf dem kleinen Parkplatz hätte ich mir jetzt eher eine urbanere, ja, Nutzung vorgestellt, auch (.) natürlich für den Aufenthaltsbereich, doch auch mit Bepflanzung. Aber auch dort, dass das natürlich wieder, eh, für Anlässe genutzt werden kann. Begrünt, also teilbegrünt, aber sicher eine urbanere Gestaltung. Und im Bereich von, von, eh, (.) dort genau, wo heutige, ältere Gebäude stehen, sind ja auch bekannte Vorhaben, eh, (.) in Planung, wo ja der Sitz einer international tätigen Firma verwirklicht werden möchte. Darum habe ich dort eine Mischung vom Ganzen zwischen Begrünung und verdichtete Bauweise klar, eh, an diesem Standort, eh, hinterlegt. Wo auch diese Parkierung gemeinsam, allenfalls zusammen mit der Gemeinde, unterirdisch natürlich, nutzen zu können. (.) Eh, ja, ich (unv.) darum auch diese Mischung, es ist auch klar vom RPG1 her, Verdichtung nach innen ist natürlich auch die Vorgabe des Bundes. Und heute, die Kantone, dass man diese Verdichtung nach innen lenkt. In der zweiten Runde, ich habe andere angeschaut und, und, ja, es sind verschiedene Aspekte da auch rein geflossen, wo ich mir auch klar vorstellen kann, jetzt ohne Vorwissen, was alles lauft, dass das Ganze natürlich in der "äusseren Haab" oben begrünt werden könnte. Auch unter dem Aspekt, dass öffentliche Veranstaltungen weiterhin stattfinden können. Ich könnte mir auch vorstellen, dass im Bereich, eh, (.) statt ganz verdichteter Verbauung eine gelockerte Verbauung stattfinden könnte mit Durchwegen rauf ins Dorfzentrum. Die anderen Dinge, Gestaltungen auf dem grossen Parkplatz "äussere Haab", das würde ich so beibehalten. Aber ich könnte mir absolut auch vorstellen, das Szenario von der Runde zwei vorstellen, wo sicherlich auch eine gelockerte Gestaltung wäre mit, wie gesagt, mit diesen Durchwegen zwischendurch in den Dorfkern auf den Kreuzplatz hoch. Das sind einmal grob meine Erläuterungen zu den beiden Szenarien, wo ich skizziert habe. Ich weiss nicht, Pascal, ist das soweit für dich okay? (.)

M: Ja, vielen Dank, eh, mich interessiert natürlich auch sehr fest, was die anderen dazu denken? Was ihre Meinungen dazu sind? Was, was findet ihr problematisch, was findet ihr gut an dem, was Wolfgang skizziert hat? (11)

CZ: Darf ich sprechen?

M: Klar, nur zu.

CZ: Okay (lacht), ehm, also, wenn ich das richtig, eh, verstehe Wolfgang, hast du auf der zweiten Visualisierung an Wohnungen gedacht? Oder was heisst das da, nicht ganz so verdichtet, das weisse Gebäude?

WR: Ja, eh, genau, also, das sind ja Ding, wo Pascal rein gemacht hat, zum Skizzieren. Das könnten Wohnungen sein, kann aber auch eine Mischnutzung sein. Was mir natürlich wäre (unv.), im Szenario zwei, dass

natürlich im EG unten, eine eh, eine eh, Gewerbenutzung passieren würde. Also, (**CZ:** Ah, ja) sprich, das ist ja reglementarisch zwingend. Das unten eine Gewerbenutzung passieren würde.

CZ: Also ich habe einfach festgestellt und höre es auch immer wieder, im Austausch mit den Leuten, dass Wohnen am Seeplatz ein, eh, zweischneidendes Schwert ist. Es ist wunderbar mit der Aussicht auf den See, herrlicher Sonnenuntergang, aber es sind ja auch öffentliche Plätze und die werden auch genutzt und wir wollen ja auch als Gemeinde, dass dort unter dem Jahr Anlässe stattfinden. Es sind sicherlich nicht mehr so viele wie es vor 50 Jahren waren, aber dort hat es aber auch noch nicht so viele Wohnungen gehabt. Aber das gibt immer Lärm und diese Thematik. Und ich denke Wohnen, wir haben Wohnungen da unten, doch das wird jetzt eher etwas schwierig. Das ist jetzt so mein Input. (.)

WR: Ja, das ist richtig, Christina. Das sind auch wirklich Themen, die ich in anderen Gemeinden zusammen mit Espace Suisse, also frühere, also dieser Raumplanungsverband der Schweiz, zum Beispiel auch mit unserer Kernerneuerung, die wir ja machen und weiter, weiter realisieren, in Sursee gewesen. Und Sursee hat ja auch noch ein wenig eine grösserer, (.) schönerer Ortskern und haben diesen saniert und erneuert. Und es ist genau so weit gekommen, dass dieser zu einer Partymeile verkommen ist. Und genau diese Problematiken, also, eh, und da hatte der Stadtrat Gegenmassnahmen ergreifen müssen, weil Leute sogar weggezogen sind, deswegen. Und, eh, in Sachen Lärm, das ist wirklich eine schwierige Gratwanderung, wo, da gebe ich dir Recht. Natürlich für Wohnen sind genau diese Aspekte, die du erwähnst, viele Veranstaltungen und ja, das ist sicherlich nicht ausser Acht zu lassen. (...)

M: Wenn ich jetzt hier wechsle, gehen wir einmal zu der nächsten Vision, die von Sonia Kümin gestaltet wurde. Frau Sonia Kümin, ich hoffe, dass sehen alle (Vision von SK wird gezeigt). Vielleicht auch schnell ein paar Worte von euch zu euren Visionen. Und dann können wir auch diese Diskussion weiterführen, weil sie hier auch Wohngebäude gebaut hat. Und sicherlich auch spannend ihre Perspektive zum Thema Lärm, weil sie ja auch viele Hotelgäste bewirtet.

SK: Genau, also ich habe auch am Anfang einfach mal losgelegt und ausprobiert. Ich muss ehrlich sagen, ich habe es schwer gefunden in diesem Projekt, weil man schon so viel gewusst hat, was kommen wird. Das heisst, ich war sehr belastet, vorbelastet von diesem Wissen: Es kommt von Octapharma ein Gebäude oder es gibt Veränderungen, was den grösseren Parkplatz "äussere Haab" betrifft, auch mit dem Mehrzweckgebäude, das kommt. Also, ich weiss nicht, ob das so eins zu eins ist, wie das angedacht ist mit dem Tool, weil man mal später wirklich frisch ab der Leber was ausdenken

würde und ich habe gemerkt, ich bin schon auch vorbelastet mit dem Wissen. Ehm, ich habe aber trotzdem einmal gedacht, es wäre schön, es gäbe auf dem kleineren Parkplatz ein wenig mehr Grünfläche oder auch so Begegnungszonen, wo halt direkt am Ufer ist. Darum das auch mit dem Grünbereich eingezeichnet. Dann das dichte Bauen auch auf dem Gebäude, wo man weiss, wo Octapharma bauen wird. Und auf dem grösseren Parkplatz auch so diese Begegnungszone mehr mit Aktivität, wo man mit dem Skateboard fahren kann, Spielplatz, wo man sich trifft. Und auch mit dem Denken, dass wenn "Chilbi" stattfindet oder Weihnachtsmarkt, so Geschichten, dass dort immer noch Platz ist. Und nicht, wenn ich jetzt an grün und grüne Wiese denke, dass das dann belastet würde oder im Weg ist, wenn man so etwas durchführen würde. Ich habe in der zweiten Runde, die Gedanken zu kleinem und grossem Parkplatz sind eigentlich gleichgeblieben, wenn ich das aufteilen würde. Das Einzige, was ich gemerkt habe, wo ich alle Visualisierungen angeschaut habe, ehm, und gesehen habe, dass jeder "Dichtes Bauen" ausgewählt hat bei dem Octapharma Gebäude. Hat es schon sehr pompös ausgesehen, sehr imposant, und habe gedacht, vielleicht wäre das gar nicht schlecht, es wäre gar nicht ganz so extrem dicht bebaut und habe dann die andere Variante gewählt. Wobei ich habe nicht so fest überlegt, ob dies Gewerbe- oder Wohngebäude, sondern habe es mehr aufgrund der Optik genommen, reduziert, nicht ganz so imposant. Und, ehm, mit den Kommentaren dazu, dass dies bedingt, dass Parkplätze irgendwo anders sind, vielleicht unterirdisch oder allenfalls, wie es überlegt wird, im Dorf. Wobei, für uns, für die Marina, wäre es sicher schön, wenn die Parkplätze in der Nähe wären, unterirdisch. Weil, heutzutage ist es leider so, dass Gäste keine fünf Meter gehen wollen. Also am liebsten das Auto hinstellen, einmal hinfallen und man ist da, wo man sein will. Und, ehm, zu der Grünfläche, habe ich das noch spannend gefunden, neben dem Hotel, das man sagt, man kann zum Hotel hinaus und man hätte diese Ruhezone, wo man sich hinsetzen kann und den See geniessen kann mit Grünfläche um sich. (6)

M: Andere Meinungen zu der Vision von Frau Sonia Kümin? (17) Was ich spannend finde, ist, aber vielleicht kommen wir zu dem später, nein, kommen wir zu dem später und wechseln hier. Also dann, weil jetzt nichts gekommen ist, stimmt ihr dem zu? Wir hatten vorher die Diskussion wegen Lärm und Wohnen, um das weiterzuführen, ich wollte dies natürlich nicht unterbrechen. Ihr habt darüber gesprochen, über Lärm und Octapharma. Ehm, dass ihr vorbelastet seid. Habt ihr gewusst von dem, das dies passieren wird?

WR: Also, ich kann vielleicht, ja, ich weiss es ja eh. In Lachen weiss es sicher die Mehrheit, eh, (.) klar schon für die Dreifachturnhalle und alles haben Abstimmungen und Sachen stattgefunden, Informationsveranstaltungen. Diese Thematik mit dem Gewerbegebäude, sprich Octapharma, ist

meiner Meinung nach auch schon sehr verbreitet nach meinem Wissen. (.) Vielleicht können die anderen noch mehr dazu sagen, ja, oder auch ihre Ding dazu sagen. (..)

M: Ja, gut, sonst gehen wir einfach mal weiter. Ehm, zu Frau Christina Zunkel und ihrer Visionen, bitte.

CZ: Ja genau, diese Vorbelastung ist natürlich bei mir auch da. Es ist ja eigentlich wie schon klar, dass dort das verdichtete Bauen kommt von einer privaten Investor-, von einer Firma. Darum ist das für mich schon gegeben, dass dort gar nichts anderes sein kann. Was für mich aber klar ist, dass die Parkplätze am See wegmüssen, in welcher Form auch immer. Aber es ist zu schade, dass man diese Oberfläche, der Teer, weiterhin als Teer lässt, sondern das müsste aus meiner Sicht begrünt werden. Ich habe dann vor allem den Sommer vor Augen gehabt. Ich bin am See aufgewachsen und weiss, was es heisst, wenn es heiss ist, so Wiese, grün, das ist etwas, dass ich, dass ich sehr entspannend finde. Auch im Hinblick darauf, was Sonia Kümin meint, das ist so ein schönes Hotel und diese Leute, wo dort übernachten sind eben nicht nur Geschäftsreisende, sondern auch, wir wollen ja auch in Lachen Touristen, die in Lachen vielleicht auch Urlaub machen oder sich aufhalten, dass das für sie, wenn es dort grün ist vor dem Hotel gerade direkt vor dem Hafen zu ein Mehrwert ist. Was ich auch, eh, vor allem in der ersten Visualisierung habe ich ist diese Mehrzweckhalle, die ist doch recht dominant. (.) Auch im Hinblick darauf, dass vor dieser Halle Platz für Veranstaltungen machen kann, habe ich trotzdem gedacht, alles so asphaltiert, das wirkt dann doch sehr, ja, nicht so einladend und ein wenig hart. Und dann im Sommer ist es sehr heiss, wenn man alles asphaltiert hat und dann habe ich gedacht, man müsste das irgendwie versuchen zu begrünen. In welcher Form auch immer, das muss ja dann auch "chilbitauglich" sein, weihnachtszaubertauglich und sonst auch festzelttauglich sein. (.) Ja, ehm, (.) das sind so ein wenig meine Ausführungen. Ich habe am Anfang auch noch gedacht, dass man irgendwie noch so eine Skatepark machen soll am See, aber da kann ich auch sagen, dass die Gemeinde einen anderen Platz dafür vorsieht, wo man sich vergnügen kann, sag ich mal. Also für verschiedene Generationen, wo man ungestört und ungefährlich skaten kann, biken, sporttreiben. Und darum habe ich das dort, obwohl es einen Platz für alles ist am See, habe ich es etwas ausgeschlossen. Aber halt einfach mit dem Wissen, dass da noch etwas angedacht ist. (.) Ja.

M: Vielen Dank. (5) Sieht irgendjemand eine Problematik zu dem was Frau Zunkel gesagt hat oder zu dem, was sie vorhat? Oder irgendwie eine Meinung dazu?

WR: Nein, also das erste, was ich sagen kann ist, ich bin hier absolut der gleichen Meinung, dass man eigentlich die schönsten Plätze für alles, das ist

nicht nur in Lachen, sondern auch in Küsnacht, dass die schönsten Plätze mit Parkplätzen belegt sind. Also ich glaube, das sollte in der heutigen Zeit schon so weit sein, dass man die Parkplätze wegbringt, da stimme ich zu, (unv.) ob unterirdisch da oder an einem anderen Ort. Also, die Grünflächen, es ist heute möglich, dass man Grünflächen auch multifunktional machen kann. Ein gutes Beispiel sehe ich an der Schützenstrasse, wo man den Parkplatz mit sogenannten Rasenliner gemacht hat, wo der Untergrund gleich fest und das Gras unten raufspriesst. Heute morgen hat man es ganz schön gesehen, wie grün dies auf diesen Flächen daher kommt. Also da ist heute, denke ich, vieles möglich. (7)

M: Andere Kommentare? (9) Sonst gehen wir doch weiter zu den Visualisierungen von Frau Elsbeth Anderegg Marty, bitte. (..)

EA: Also ich, ehm, kann eigentlich wiederholen, was meine Vorredner*innen gesagt haben: Parkplätze weg und eine Begrünung würde auch von mir sehr favorisiert. Also vor allem eine Nichtversiegelung, also dass der Boden nicht zu sein soll und auch Atmen kann, was man bei diesen Starkregen, die wir in letzter Zeit auch wieder mehr sehen, dass dies wichtig wäre, dass wir unsere Böden nicht komplett zumachen. Ehm, dann habe ich, ich, also, für mich ist das Gebäude, das zur Auswahl gestanden hat, das ist für mich viel zu massiv. Ich finde, das ist, eh, total überdimensioniert, darum habe ich mich für das andere entschieden. Und dann muss ich jetzt aber sagen, ich bin jetzt etwas irritiert, ich dachte, es ginge darum herauszufinden, ob jetzt dieses Programm, wie man jetzt mit dem Programm arbeiten kann. Also, wie dann das aussieht, das, das ist ja jedem sein persönlicher Geschmack. Ich habe mich mehr mit dem Programm beschäftigt, ehrlich gesagt, also, mit, eh, (.) kommt das in einer nächsten Runde noch oder soll ich das jetzt anbringen? (lacht)

M: Das mit dem Programm oder was, eh, oder was meinen sie?

EA: Ja, wie man damit arbeiten konnte. Sie haben ja mehrfach erwähnt, dass es nicht darum geht, dass man dieses Dorf gestaltet, sondern das man ihnen ein Feedback gibt, wie man mit dem Visualisierungsprogramm arbeitet. Habe ich das falsch verstanden? (lacht)

M: Ehm, nein, das haben sie richtig verstanden, aber das habe ich eigentlich schon mit den Fragebögen erhalten. Diese haben sie ja auch ausgefüllt, genau.

EA: Okay.

M: Und jetzt habe ich eigentlich in der Diskussion, ehm, in der Diskussion wollte ich vor allem jetzt auch ein wenig darauf eingehen, ehm, eben was sind die Visionen? Wie sind gestaltet worden? Welche Entscheidungen sind da getroffen worden und warum? Und eben, was denken vor allem die

anderen über die Visionen der anderen? Das ist jetzt vor allem, ehm, ehm, ein wenig das Thema oder was interessieren würde. Weil, es geht ja wirklich auch um einen sehr schönen Raum. Das ist natürlich alles informell, natürlich, aber es ist trotzdem ein spannendes Thema, um darüber zu diskutieren. Weil, das ist ein Herzstück von Lachen, wenn man so will.

EA: Also dann kann ich abschliessend noch sagen, dass der grosse Parkplatz auch in der Runde zwei grün hätte sein sollen. (CZ lacht) Ich bin offenbar gescheitert an der, an der Visualisierung, wie ich sie wollte. (lacht)

CZ: (lacht) Das hat mich richtig irritiert, Elsbeth, das hat mich irritiert, da habe ich gedacht, uh. (lacht)

EA: Ja, ich bin, ich bin etwas überfordert gewesen mit der Umsetzung oder mit der Nutzung dieses Programms. (lacht) (...)

M: Gibt es Kommentare zu der Vision oder irgendwelche Problematiken, die hier gesehen werden von anderen? (4) Der Herr Bamert hat noch etwas (im Chat) gefragt, und zwar: "Was mir zu wenig klar ist. Gibt es Freiräume, die frei bleiben sollten und wenn ja, wo?" (8) Hat jemand eine Antwort dazu? (10)

WR: Kannst du das nochmals wiederholen Pascal? Was waren noch gleich die Fragen von Herrn Bamert? (.) (neue Nachricht von Herr Bamert im Chat, die WR vorliest) "Freiräume sollten als erstes definiert werden und nicht am Schluss übrigbleiben." (...) Ja. (...)

M: Also, ich glaube, er meint. (**CZ:** (unv.) ist ja frei.) (**WR:** Ist ja frei, ja) (CZ lacht) Ja. (Blick auf den Chat) (7)

WR: Also ich glaube, die Freiraumfläche ist ja riesig gross da unten, wenn man das so auch behalten kann. Also das wäre ja dann das andere Szenario, welches du skizziert hast, mit weiteren überbauungen auf dem Platz und das habe ich bis jetzt von niemanden gesehen, der das effektiv so will. Also ich glaube (lacht), der Konsens, dass der bestehende grosse Platz so frei bleiben soll, der ist ja gefunden unter diesen Dingen, die ich gesehen habe.

M: Das ist so. Kommen wir vielleicht gerade zu dem, zu den Hauptthemen, wenn man so will. Die sind vor allem halt auch beeinflusst durch diese Auffälligkeiten, oder. Es zeigt sich, wie du dies jetzt auch angesprochen hast, Wolfgang, zeigt sich schon auch einen gewissen Konsens, was die beiden Parkplätze betrifft. Aber vielleicht nur noch schnell vorneweg. Herr Cott? Ehm, (...) hören sie mich. (FC zeigt den Daumen nach oben) Ich wollte nur schnell fragen, ich habe von ihnen keine Vision visuell erhalten. Hätten sie noch etwas anderes skizziert, als sie bisher jetzt gesehen haben? Ich nehme an, sie hätten sich sonst gemeldet. (EA verlässt den Computer) Sie müssen schnell das Mikrofon (**FC:** Es ist ja eigentlich noch typisch, dass

der Mann von der Bildung das nicht hinbekommt). (Alle lachen)

FC: Die Antwort ist relativ einfach, wir arbeiten auf einem virtuellen Desktop. Ich habe dies mit der IT abgeklärt und dann bringen wir es mit dem Programm nicht auf die lokalen Ebenen, um es ihnen zu schicken. Wir konnten es nicht speichern. (**M:** Genau, und ich wollte nur schnell fragen, ob) Nein, nein, nur schnell zur Erklärung, warum ich das nicht hinbekommen habe. Und zweitens, ich hatte eine ähnliche Schwierigkeit wie die meisten von euch, weil wir schon viel gesehen haben. Weil ich schon viele Pläne, Entwürfe und Vorschläge gesehen habe. Und das Dritte, wo ich jetzt schon in diesen Kommissionen, in welchen ich aktiv war, ist überall genau das grosse Thema, dass der Raum mindestens die gleiche Aufmerksamkeit braucht wie Gebäude, wo man hinstellt. Die Bespielbarkeit von dem Raum, das ist eines von den zentralen Anliegen von der Gemeinde, aber auch von der Bezirksbevölkerung. Und das heisst, dieser Raum muss einfach, muss für viele mögliche Anlässe und viele Gelegenheiten bespielbar und muss Raum bleiben und darf nicht zu gehen; muss aber auch atmen können (.) und, und man ist sich weitestgehend einig, dass diese "Parkiererei", ehm, an einem anderen Ort stattfinden muss als in diesem Raum, in welche Form auch immer und wie der zugeführte Verkehr dann zu regeln ist, das ist dann wie das weitere Thema. Sonst Stimme ich eigentlich weitestgehend diesen Modellen zu. Es soll offenbleiben, (EA setzt sich wieder vor den Computer) es soll begrünt werden, es soll (.) frei zugänglich sein und eben es soll vor allem bespielbar sein für Anlässe. (..)

M: Vielen Dank. Das ist eben so, auch um das nochmals aufzugreifen, was ich vorher festgestellt habe, dass diese beiden Parkplätze frei bleiben sollen, Freiflächen bleiben sollen. Es war in keiner Vision irgendwo auf gewissen Flächen der Fall, dass der heutige Stand bewahrt werden wollte. überall ist etwas verändert worden. Ehm, also gehe ich davon aus, dass alle wollen, dass sich etwas tut und sich verändert. Jetzt, was eben der grosse Platz betrifft, was mir vor allem aufgefallen ist und ich interessant gefunden habe: Was ich im Szenario Dichtes Bauen dort umgesetzt habe, das ist ja eigentlich eine grosse, ehm, auch asphaltierte Fläche mit modularem Strasseninventar, mit Stühlen. Man kann es referenzieren zum Sechseläutenplatz und auch mit diesen Schirmen, die man rausnehmen könnte und dem Wasserspiel. Das ist so auch in der aktuellen Planung drin. Ich habe es interessant gefunden, dass dies trotzdem niemand übernommen hat. Da gibt eigentlich doch auch Unstimmigkeiten, eigentlich bei allen, und da wollte ich fragen, was sind da die Gründe dafür? Was ist hier die Problematik, dass das, wo jetzt geplant ist, doch ein wenig anders daher kommen soll? (8)

SK: Ich muss jetzt ehrlich sagen, ich habe nicht mehr im Kopf, wie das aussehen würde, wenn dieser Platz mit dichtem Bauen bespielt worden wäre. Ehm, wenn man vielleicht diesen Unterschied noch einmal sehen

könnte. Aber ich glaube, die Herausforderung war jetzt effektiv am Tool. (Der Bildschirm zeigt nochmals das Szenario "Dichtes Bauen") Man konnte ja nicht wirklich sagen, ich möchte da einen Baum und da einen Schirm, sondern es hat sich ja alles auch ringsherum verändert und am Schluss hat man sich ja effektiv für ein Paket entschieden. Ehm, also ich habe jetzt zum Beispiel, wenn ich da sehe, das Gebäude gerade vorne dran, da habe ich gefunden, ja, das muss jetzt nicht unbedingt sein. Die Schirme sind ja herzig, aber ich kann mich nicht entscheiden. Also ich habe mich für ein Szenario entscheiden müssen, wo das, wo meinem Gedanken am meisten entsprochen hat.

M: Und das haben sie für nicht möglich gefunden nur diese Fläche zu skizzieren, weil hier hinten hätte man ja etwas anderes auswählen können. (Cursor zeigt auf die visuelle überbauung auf dem kleinen Schulplatz im Szenario "Dichtes Bauen") Das ist nicht möglich gewesen?

SK: Das war für mich zu grob. Das Tool im Allgemeinen war halt sehr grob von dem, was man dann eigentlich bepinselt. Aber ich bin Grafiker, (lacht) ich bin "Finetuner", also, ich bin darüber gefahren und habe gefunden, ja.

CZ: Ich habe erst bei der zweiten Runde festgestellt, dass ich die Pinselgrösse verändern kann. (lacht) Und durch das, ja, ich habe einfach jetzt vom Sechseläutenplatz, ich bin nicht jeden Tag in Zürich, aber im Sommer habe ich das unglaublich, ehm, wie soll ich sagen, erdrückend gefunden dieser Platz. Es ist so heiss dort, diese Schattenplätze sind viel zu wenig. Darum habe ich jetzt irgendwie hier für Lachen dies gar nicht, gar nicht, ehm, mir ins Auge gefasst. Ich muss ehrlich sagen, ich weiss gar nicht, ob dies überhaupt so in Stein gemeisselt ist. Ist das so auf dem Platz vorne?

WR: Auch da, eben, wenn ich jetzt auch noch kann, Pascal. Was sprichst du an, was so angeplant (unv.) wir sind auf Stufe Vorprojekt, das sind natürlich, eh, ja, da ist natürlich noch gar nichts in Stein gemeisselt. Das sind auf Vorstufe angedachte Szenarien gewesen. Jetzt geht man ja an die Detailprojektierung und da wird das jetzt sicher auch noch thematisiert werden, ganz klar.

M: Das ist sehr, sehr spannend, dass dies gemacht wird und darum sind auch genau solche Tools vielleicht auch spannend, um dies zu ergründen. Was ist eigentlich erwünscht oder was nicht? Um zurückzukommen zum grossen Platz, eben, weil was ihr Teilnehmer*innen denn eigentlich habt, sind wirklich entweder grüne Flächen, wirklich eine schöne begrünte Fläche oder halt dann eben auch teils asphaltiert, teilbegrünt mit Bäumen, aber dann auch Spielplatz. Was spricht jetzt eher für, für die grünere Fläche? Was spricht jetzt eher für die asphaltiertere Fläche? Wo sind hier Problematiken? (6)

SK: Also ich kann vielleicht noch aus meiner Sicht sagen, die Grünfläche habe ich auf dem grossen Platz nicht gewählt, weil ich kenne mich bautechnisch nicht aus, ich hatte das Gefühl, sobald ich das grün oder Wiese denke, ist dies nachher für Chilbi nicht mehr bespielbar. Wenn das aber natürlich so ist, wo man weiss, das ist möglich, ehm, (.) dass man sagt, es, es gibt andere Möglichkeiten; es ist trotzdem grün, aber man könnte immer noch bespielen, dann würde ich gedanklich zum Beispiel schon mehr wieder zu Grünfläche switchen. Da denke ich im Sommer auch an kühlend, und an angenehm, an Sitzen. Dann fände ich das spannender als die untere Variante (Szenario Aktivität) zum Beispiel. Ist aber mehr vom Nichtwissen, was man eigentlich technisch bauen kann.

WR: Doch, da ist heute eigentlich schon, wie gesagt, vieles möglich, wenn man schon nur sieht, begrünte Parkplätze oder eben mit diesen "Rasenliner" oder Schotterrasen. Da ist Verschiedenstes möglich. Was ich als, bin zwar kein Lachener, ein "Obermärchler", aber der Platz da unten ist natürlich für die Lachener selber ein sehr wichtiger Platz. Da können mir die gebürtigen Lachener oder auch die, die in Lachen wohnen oder auch für die ganze March, also darauf hat auch der Feenmarkt stattgefunden. (...) (**M:** Jetzt bist du auf "mute" Wolfgang) Ja eben, dieser Platz da unten ist natürlich heute nach wie vor ein sehr wichtiger Platz für die multifunktionale Nutzung. Da kann, die Lachener können mir das sicher bestätigen; auch ich als "Obermärchler" ist, ist, der Platz in Lachen natürlich, eh, eine wichtige Geschichte. Machbar bautechnisch ist da sicherlich einiges, also heute, wenn man sieht mit Rasenliner an der Schützenstrasse. Nur schon Parkplätze wie das Grün unten hochkommt. Es macht einen besseren Eindruck. Wie die Elsbeth Anderegg angesprochen hat, eh, das Regenwasser kann versickern, das Klima wird anders und heute auch allgemein die Begrünung hineinzukriegen in die Dörfer, in die Städte ist ein Riesenthema. Da hat das BAFU auch "Klima in Innenstädten" da gibt es ganze Bücher heute und, und Studien dazu. Ist aber auch nicht ganz einfach da unten, wo Gemeindeplatz ist, eher, aber dort, wo es wieder an Privatliegenschaften grenzt. Wir haben Verhandlungen mit der Kernerneuerung. Niemand will mehr ein Blättchen am Boden. Es ist verrückt. Es will niemand ein Blatt mehr aufnehmen, also, es ist schon ein schwieriges Thema. Für mich ist es klar, dass es dies braucht, mehr Begrünung. Aber der Platz da unten, ein sehr wichtiger Platz für Multifunktionalität. Welche meines Erachtens heute, bautechnisch auch mit einer Begrünung möglich ist. (...)

M: Es haben eigentlich alle eine Grünfläche skizziert, also auch die Frau Zunkel, die Frau Anderegg Marty, ausser eben die Frau Sonia Kümin. Aber sie haben gesagt, sie würden dies jetzt sogar anders machen?

SK: Ja, es ist effektiv so. Ich habe mich dann nicht für die Begrünung entschieden, weil ich ganz stark an Wiese und offene Fläche gedacht habe

und das Gefühl hatte, dass dies nicht vereinbar ist mit einem Bespielen für "Chilbi" und einem Markt oder so und darum, eh, bin ich dann eigentlich nicht auf die Grünfläche gegangen auf dem grossen Platz; sondern habe dann die Grünfläche auf den kleinen Platz verschoben, dass irgendwo Grünfläche ist. (...)

M: Frau Elsbeth Anderegg, ehm, sehen Sie denn ihre Wünsche für eben, Stichwort Ökosystemleistungen und so weiter, sehen Sie diese erfüllt mit so einer Grünfläche, wie sie jetzt daher kommt. Oder könnte es noch mehr sein, dass eine Bespielung auf diesem grossen Platz nicht mehr möglich ist? (.)

EA: Nein, nein, für mich wäre auch eine Begrünung, wo auch eine Zweitnutzung oder ein Bespielbarkeit möglich macht, erwünscht, definitiv, ja. Weil, ehm, ein grosser leerer Platz ist ja dann auch nicht das, was man will. Es soll ja auch eine Aktivität möglich sein. Aber es ist mir gegangen wie der Frau Kümin. Es war mir nicht ganz klar gewesen, weil ein Rasenstein, der jetzt Herr Reumer erwähnt hat, weiss ich jetzt nicht, ob man darauf Bahnen stellen kann. Also ich kann das auch nicht abschätzen, oder. (.) Aber wenn das möglich ist, wäre ich auch für eine Grünvariante. (6)

M: Und, sonst wechseln wir doch auch noch einmal das Hauptthema und gehen vielleicht schnell zum kleinen Platz. (..) Weil, man könnte ja eigentlich auch argumentieren, dass man sagen kann, auf dem grossen Platz sollen Aktivitäten stattfinden, "Chilbi", und auf dem kleinen können wir dann etwas anderes machen. Seht ihr das so, dass auf beiden etwas gemacht werden können soll? Das ist bisher von allen so angedacht gewesen. Oder, ich glaube, Frau Sonia Kümin hat, ehm, die Meinung geäussert, dass es hier wirklich nur Frei- und Grünfläche für die Erholung geben soll.

SK: Ich muss jetzt auch ehrlich sagen, ich habe gar nicht so weit gedacht, was ist notwendig oder für Lachen. Ich habe einfach das Tool etwas ausprobiert. Aber letztendlich fände ich es schon schön, dass dieser Bereich in Sicht von Hotel, der angrenzend ist, dass dieser attraktiv ist und zum Hinsetzen einlädt. Auch wenn ich überlege, wenn ich in Lachen arbeite, und ich gehe an den See runter und möchte mich hinsetzen, um Mittagessen zu können, habe mir etwas geholt bei der Bäckerei oder, ehm, irgendwas im Restaurant und möchte mich da hinsetzen. Und im Bereich der Uferpromenade, wo es schon Wiese gibt, wo ich mich hinsetzen kann, aber dies würde doch etwas Erweiterung bedeuten, wenn ich mir vorstelle, unter einem Baum zu sitzen und auf den See hinauszuschauen. Das Ganze lädt ein, um für eine halbe oder ganze Stunde den Kopf zu lüften. Es ist grün und angenehm. Ob das nachher noch genutzt wird für "Chilbi" etc., ist jetzt vielleicht in diesem Bereich auch nicht der erste Gedankengang gewesen. (5)

M: Hat jemand die gleiche Meinung oder findet ihr, dass an dem, dass dieser kleine Park eigentlich als Erholungsfläche, wo man eher keine Ak-

tivitäten hat oder so, findet das jemand problematisch? Ist das überhaupt gar nicht möglich? Was sind hier die Kommentare? (7) Frau Zunkel sie haben auch die gleiche Meinung. In ihrer Vision haben sie da ja auch eine Grünfläche (CZ schaut weg und hustet) skizziert?

CZ: Ja, genau. (4) Ich finde, wenn man durch das Dorf geht, wenn man so, ich sage einmal, Lachen durchquert, vom Oberdorf ins Unterdorf geht, hat es wenig grün. Man versucht zwar schon im Dorfkern jetzt die Gestaltung nach dieser Kernerneuerung, diese Querstrasse, diese, die Strassen, wo, ehm, eh, Langsamverkehr ist, da versucht man schon noch ein Alleenstil reinzubekommen, indem man dort Bäume pflanzt. Aber eigentlich ist Lachen, wenn man durchgeht, und man geht, und man sieht es nicht von der Luft, da ist Lachen eigentlich nicht wirklich grün. Und darum habe ich gefunden, es sei ein Privileg, wenn man sich als Gemeinde überlegt, dass (.) diese Plätze, wo direkt an den See anstossen, wo für die Allgemeinheit zugänglich ist, wenn man diese grün behaltet. Es ist ein Luxus, hm, sage ich auch auf eine Art, aber an der Goldküste sieht man vielfach, dass das Seeufer eigentlich fast gar nicht verfügbar ist, oder dass man sich da aufhalten kann. Es gibt so kleinere Parks, aber Lachen würde sich dann eigentlich schon, ehm, ein Privileg schaffen, wenn so eine grosszügige Fläche grün wäre. (...)

SK: Ich glaube, es würde auch ein wenig Abwechslung bieten, weil man hat ja auch auf der anderen Seite den Raffplatz noch. Und der Raffplatz ist auch Beton. Man hat zwar auch das Wasserspiel, aber dort ist nicht Grünfläche. Und ich habe mir auch vorgestellt, wenn man jetzt so am Ufer entlang geht, dann hat man den unbegrünten Raffplatz, dann käme der kleine Platz, der ist begrünt, dann käme der grosse Parkplatz, der wäre allenfalls nicht begrünt und dann käme wieder Rasenfläche. Also, man hätte dann vielleicht auch diese Abwechslung. (5)

M: Wäre das denn möglich, Wolfgang, von der Gemeindeseite aus oder siehst du hier eine Problematik dahinter, wenn man dort für die Gemeinde, das ist ja noch ein überbleibsel von der Kernzone, das gehört ja der Gemeinde, wenn man dies einfach für die Erholung überführt, eigentlich für Lachen, für das, was Frau Zunkel gesagt hat, als Gemeinde, dass man das auch ein wenig als Bijou darstellt. Gibt es da eine Problematik dahinter? Ist das überhaupt möglich? (..)

WR: Also, also, möglich ist natürlich vieles. Es ist schlussendlich der Wille, was von der Bevölkerung gewünscht wird. Was ich einfach feststelle, es ist schon ein wenig ein heikles Thema dieser Platz da unten, allgemein in Lachen. Ich höre viel, dass dieser als Platz zur Verfügung stehen soll, wirklich für "Chilbi", Seenachtsfest, was auch immer, Veranstaltungen. Das ist meine Wahrnehmung, die ich höre. Aber rein machbar, ist natürlich rein

von der Gestaltung vieles, oder.

M: Und wenn der grosse dafür zur Verfügung steht? Oder müssen beide für Veranstaltungen zu Verfügung stehen?

WR: (Schmunzelt) Das kann ich jetzt nicht wirklich beantworten. (schmunzelt) Das müssten die Lachener sagen, die vielleicht in der Marchkommission dabei sind, was sie weiterhin wünschen, oder die Lachener selber, ja. (...)

M: Okay, aber ich stelle hier auch einen gewissen Konsens fest (..) Sonst können wir noch schnell auf diese zu sprechen kommen. (Display zeigt Octapharmaparzellen) Hier ist ja vor allem angesprochen worden, ehm, zum einen ist allen klar, dass hier etwas geplant ist, dass gewisse voreingenommen waren von dem, und dass auch aus diesem Grund dies skizziert wurde. Dann sind auch Kommentare gekommen, dass das rein visuell zu gross dahergekommen ist und das dies auch wegen dem nicht ausgewählt worden ist. Und dann gibt es auch wirklich Leute, die sich das gar nicht so wünschen und dass dies eher aufgelockerter daherkommen soll, ehm, aber es nicht zwingend eine Wohnsiedlung sein muss. Und ich würde dort auch gerne aufgreifen, wie soll das daherkommen? Da gab es wirklich Unstimmigkeiten. Also ich glaube, Wolfgang, du bist ja sehr eingenommen gewesen und hast dies dann skizziert, hast dann aber deine Meinung ein wenig geändert. Frau Zunkel, sie haben dies in beiden Szenarien drin. Für euch war das eigentlich klar. Frau Elsbeth Anderegg sie haben hier eigentlich immer die lockere Variante ausgewählt. Was spricht denn jetzt für das Gebäude, für das, für diese überbauung, die natürlich auch wie ein Prestigebau daherkommen würde, sehr urban. Was spricht für das Frau Zunkel? (...)

CZ: (lacht) Also eben immer mit meinem Hintergrundwissen. Dieser Bau ist jetzt in Privatbesitz, dieser Platz dort. Die Schwierigkeit ist dort, dass auf die hintere Seite, wo man nicht sieht, ist ja eigentlich der Dorfkern teilweise auch noch ein wenig geschützt. Man muss wie eine Verbindung machen von dem alten Dorfkern zu dem eher, ich sage jetzt, modernen Platz. Das Marina ist ja auch so ein wenig ein moderner Bau. Und die Auflage für dies ist schon, dass das Gebäude von hinten anders aussieht, anders daher kommt, wie wenn ich es vom See her anschaue. Es ist ja mit Glas, also die Visualisierung ist ja eigentlich, es ist zwar gross vom Volumen her, aber, aber, optisch wirkt es mit Glas leicht. Allenfalls kann man ja eine Fassade auch begrünen, wie das in anderen Städten auch ist, ehm, ja. Ich habe es, ich finde es nicht einmal so schlecht. (6)

M: Was meinen denn Sie dazu, Frau Elsbeth Anderegg? Sie haben eher die offene Siedlung gewählt, wo man vielleicht auch Wohnen kann. Es wirkt ja auch wie eine Wohnsiedlung auf dem Szenario Grün. Wo sehen denn sie das Problem an so einer eher urbanen, dichten Bebauung? (..) Wieso haben sie sich für das andere entschieden? (..)

EA: Ah, ehm, also mir ist es wirklich einfach die, die visuelle Grösse, also, also, ich habe irgendwie gefunden, dieser, wenn man effektiv auf dem Platz steht, ist der Bau, wo es schon gibt, also links von dem, wo wir visualisiert haben. Und, der nochmals links davon, diese beiden finde ich schon einfach sehr gross, sehr massiv. Und darum habe ich mich einfach eher von diesem Volumen einfach abschrecken lassen. Es gäbe ja noch eine dritte Version Gebäude, wo dann auch eine Mischnutzung wäre, die ich einfach technisch von diesem Tool her nicht fähig war, einzufügen. Eigentlich würde mir dies noch besser gefallen.

M: Hat euch dies noch besser gefallen? Das hätte ja auch noch etwas Erdgeschossnutzung enthalten.

EA: Das wäre ja eigentlich für mich, also, es ist ja zwingend, also, man, ich, diese Diskussion von vorher wegen dem Wohnen und dem Lärm, das ist durchaus ein Thema, oder. Eigentlich müsste man schon eher irgendwas Gewerbemässiges platzieren.

M: Hier haben, jetzt mit dieser Variante ist das ja eher etwas so, dass dies wirklich, ehm, (.) Octapharma, ihr kennt das, es ist in diesem Fall bewusst und daher wäre es ja nur eine Nutzung für eine Firma. Und diese Variante, die sie gerne visualisiert hätten, das hat leider technisch nicht geklappt, aber gehen wir davon aus, dass sie das jetzt so gemacht hätten. Diese wäre ja einfach auch mit Erdgeschossnutzung, ehm, auch ein wenig, ja, für die Bewohner*innen, für die Passanten und Passantinnen zugänglicher gewesen. (...) Herr Wolfgang Reumer, sie haben hier auch ein wenig die offene Variante gesehen. Eben, wir haben jetzt auf der einen Seite dieser geschlossene, dichte Bau, sehr Octapharma-fixiert. Sie sind ja auch voreingenommen von dem. Und dann haben wir die lockere Variante mit Erdgeschossnutzung. Was, was soll jetzt, ehm, oder was wünschen sie sich? Was sind die Argumente? Was sind die Problematiken? (...)

WR: Also, sprichst du mich jetzt an? (**M:** Ja, Wolfgang, gerne) Also, also, ich muss jetzt vielleicht sagen, rein dieser Bau, der hier drinnen ist, dieser Glasbau, man darf sicher jetzt auch nicht zu fest fixieren auf das. So wird er sicher nicht daherkommen, sage ich jetzt. Da sind wir jetzt natürlich, das ganze "Finetuning", wo daran ist, also, genau. Ich habe kein Sinneswandel vollzogen, sondern es ist einfach eine zweite Variante, wo allenfalls möglich wäre. Ich sage, das Ganze oben, dieses Projekt ist ja noch nicht gebaut. Ich arbeite schon lange im Bauwesen. Es ist noch lange nicht jeder Bau, der angedacht wurde, ausgeführt worden, aus welchen Gründen auch immer, auch aus juristischen oder was auch immer, oder. Und darum einfach eine zweite Variante, wo man auch sagen kann, es wäre auch sowas möglich. Ich habe in diesem Sinne kein Sinneswandel durchzogen, oder. (9)

M: Dann ist das eigentlich hier noch eher ein offener Punkt zum Thema

Octapharma. (7) Was ich mich eben gewundert habe, wieso hat niemand aus dem aktuellen Stand beibehalten, wie es ist? (...) Wieso hat niemand den heutigen Stand bewahrt, weil zum Beispiel die alte Turnhalle so schön ist oder weil ich lieber einen Parkplatz will, obwohl dies für alle klar ist, dass das nicht so sein soll. Was sind hier Meinungen? (12)

CZ: Also für mich war es so, dass die alte Turnhalle ja eigentlich den Blick an den See nicht ermöglicht, wenn ich dort auf dem Platz stehe. Persönlich habe ich zwei Herzen, ich finde es eigentlich noch schön, solche alten Gebäude, aber man müsste diese aufwendig restaurieren, dass sie wieder gut daherkommen. Aber der Blick, was ich auch wieder finde, was eigentlich dieser Platz auszeichnet, dass man Blick auf den See hat, und das hat man mit dieser alten Turnhalle nicht. Und bei dieser alten Turnhalle ist ja auch hintendran schon eine Wiese und dann würde sich ja eigentlich dieser Platz vergrössern oder dies begrünte Fläche vergrössern. Und hinten hat man ja auch noch einen Spielplatz für die kleinen Kinder. Deshalb war für mich keine Option, diese Turnhalle zu behalten. Und bezüglich der Häuser, diese mittleren, wo wir unterschiedliche Vorstellungen haben, ist für mich auch keine, keine Möglichkeit, weil ich einfach finde, man müsste diese Häuser restaurieren. Sie sehen nicht mehr schön aus. Und durch das sich diese Besitzverhältnisse geändert haben, denke ich kaum, ausser sie würden es wieder verkaufen und es gäbe ein anderer Besitzer, dann wäre es sicherlich auch eine Möglichkeit, dass man diese Häuser auch restaurieren könnte. Aber die sind auch vom Stil her nicht so gebaut, als dass sich das irgendwie würde, ja, ich glaube man müsste zu viel Geld in die Hand nehmen, um diese Häuser da zu behalten und schön machen.

M: In den Fragebogen ist geäussert worden, teilweise, dass man sich mehr Details wünscht, also in den Visualisierungen. Und, ehm, auf den Szenarien, die vorgegeben waren, hatte es zum Teil kleinere Details wie zu Beispiel hier hinter ein Skatepark oder ein "Outdoorgym". Oder dann im Szenario Aktivität hat es auf der Seite auch Fahrradständer gehabt. Da habe ich mich gefragt, zum einen sind mehr Details gewünscht worden, zum anderen sind die einzelnen nicht ausgewählt oder dort skizziert worden. Könnt ihr mir dazu ein paar Kommentare dazu geben? Waren diese vorhandenen Details gar nicht relevant oder konnten sie technisch nicht eingezeichnet werden? Wie ist das? (5)

SK: Ich muss vielleicht so sagen, dass das für mich nicht, wenn ich es so im Nachhinein höre, bei allem immer so ganz klar war, dass wenn ich jetzt dort ein wenig darüber pinseln würde, käme ein Fahrradständer. Für mich die Szenarien wie so ein wenig grobflächig gewesen, grober, wenn man so darüberfahren konnte. natürlich konnte man den Pinsel vergrössern, aber wenn ich es dann zusammengesetzt habe, hat es für mich so gebastelt ausgehen und dann hat es für mich wie nicht gestimmt. Ich glaube, es wäre

anders gewesen, wenn man in einem "Visualiser" oder so, wo man auf der Seite ein Bäumchen hat, ich habe ein Fahrradständer, ich habe eine Bank und dann wähle ich die aus und setze diese hinein. Das wäre für mich hundertprozentig klar gewesen, dass ich dies auswähle und einfüge. Jetzt aber einfach so mit diesem, ja, einfach ein wenig Grobmalen war das für mich nicht gegeben, dass ich das wirklich so auf kleinen Flächen ausprobiere. (3)

EA: Ja, ich kann das so bestätigen. Ich bin wirklich nicht, ehm, ich hätte mich vielleicht eine Stunde mehr mit diesem Programm beschäftigen, aber da hat mir jetzt einfach die Zeit gefehlt dafür und das hat sich mir nicht erschlossen. Also ich denke hier irgendwie anders. Ich kann das genau bestätigen. Ich hätte gerne Elemente reingeholt und ich bin darüber gefahren und dann hat das wieder anders ausgesehen. Ich war wirklich irritiert.

CZ: Ja, ich muss das bestätigen, vielleicht ist es ein Geschlechterthema, aber mir ist es auch genauso gegangen. (Alle lächeln; FC verlässt ohne Verabschiedung die Diskussion) (...)

WR: Nein, also ich, ich habe das eigentlich am Pascal auch so, ich bin ja eigentlich der, der das angemerkt hat, ist das richtig, Pascal?

M: Das weiss ich nicht, das ist nicht zuzuordnen.

WR: Ah, jaja. Aber (..) ich kann das auch so bestätigen eigentlich.

M: Danke vielmals. Jetzt, was mich vor allem noch interessieren würde, ist, von jedem auch, nach dieser Diskussion, nach diesem Austausch, ihr habt jetzt auch erfahren, was sind die Gründe, wo zu gewissen Entscheidungen geführt haben, eben, visuell. Was würdet ihr nach dieser Diskussion, wenn ihr könnt, verändern? Würdet ihr nochmals etwas verändern? Und wenn ja, warum? Oder eben gar nichts und ihr würdet alles genauso belassen wie vorher. Wer möchte hier anfangen?

SK: Also, ich glaube, ich würde schon wie nochmals neu zeichnen, weil es gibt verschiedene Inputs: Einerseits ist das, man weiss, was vielleicht kommt oder nicht kommt. Also wenn man hört es sind schon Gedanken da, dass etwas an einem anderen Ort Platz gibt zum Beispiel für zum Skaten oder so. Dieser Hintergrund macht etwas aus. Das andere ist aber auch das Wissen vom baulichen, das verändert auch die Meinungen, mach ich eine Grünwiese oder nicht. Man kann sie bespiele oder nicht. Und das Dritte, wo mitspielt ist auch das Tool, dass wenn ich weiss, okay, ich könnte dort noch etwas pinseln oder da noch etwas pinseln, dann verändert sich das auch noch ein wenig. Also ich glaube, da spielen ganz viele Punkte mit. Ehm, vielleicht auch so die Vorgaben für zum Malen, also ich glaube, ich habe es jetzt sehr stark auf das Tool bezogen und gar nicht fest überlegt, was, also was würde ich jetzt effektiv in einem Gespräch reell dort hinsetzen. Zum Beispiel mit

der Gemeinde sich hinsetzen und sagen, was sind unsere Visionen. Ich habe das jetzt nicht so ganz in diese Richtung angeschaut.

M: Was würden Sie denn, würden Sie denn überhaupt irgendwas, was würden Sie denn ändern, wenn Sie das in ein paar Sätzen sagen könnten?

SK: Ich glaube, ich müsste zuerst darüber nachdenken und nicht so aus dem Bauch heraus. Das sind für mich sehr klare Strukturen oder Gedankengänge, wo man sich wirklich überlegen muss, was wäre für das Hotel wichtig, was wäre für die Bevölkerung wichtig. Ich glaube, das wären ein paar Gedankengänge, die zuerst stattfinden müssten.

M: Aber sie haben gesagt, jetzt durch die Diskussion, durch diesen Wissensaustausch würden Sie auch den grossen Platz grün, ehm, skizzieren, sozusagen.

SK: Grün oder grüner. Eben, könnte ich jetzt nicht aus dem Bauch, ich müsste mich jetzt wirklich nochmals hinsetzen und mir so verschiedene Szenarien ausdenken, ja.

M: Frau Zunkel?

CZ: Ja, was ich jetzt, ich würde sicher auch nochmals darüber gehen. Ehm, eben, jetzt mit dem Wissen, dass man nochmals bisschen mehr Details hat. Eh, Beispiel, ich habe überhaupt nirgends einen Fahrradabstellplatz angedacht und ja, ich glaube, ich hätte, ich hätte dort noch ein wenig etwas gemacht und auch in den Details. Ja, aber im Grossen und Ganzen, was die Begrünung anbelangt oder grünere Fläche da unten, da würde ich nichts ändern, ja. (...)

M: Und auch jetzt das Gebäude auf den Octapharma Parzellen, das würden sie jetzt auch nicht, das würden sie jetzt auch so belassen oder die Frau Elsbeth Anderegg, sie würde jetzt Mischnutzung, dort würden Sie auch nichts verändern?

CZ: Ich würde es eben mit dem Wissen, dass man jetzt trotzdem, ehm, eine Mischnutzung machen kann, aber (.) eben von der Grösse her oder, denke ich, würde ich es, würde ich es nur bedingt kleiner machen. (...)

M: Wolfgang? Würdest du etwas ändern? Wenn ja, warum? Oder nicht?

WR: Grundsätzlich eigentlich nicht, ich muss auch nochmals sagen, die Voreingenommenheit spielt natürlich schon auch, jetzt auch gerade da im ganzen Ensemble unten, eine wesentliche Rolle. Ich weiss, was vielleicht läuft und geht oder, aber auch übrige, die anderen Beteiligten auch. Grundsätzlich, mein, mein Credo ist grundsätzlich so grün wie möglich hineinzubekommen. Eh, das ist so, ob aus gestalterischen Elementen, klimatische Bedingungen, ob Thema Versickerung und so weiter. Eh, man müsste

ganz klar wissen, was nach wie vor auf dem Platz passieren soll. Was soll stattfinden, klare Nutzungsdefinition. Und dann kann man natürlich auch, sage ich heute, ist viele (unv.) möglich. Eh, wie die Elsbeth Anderegg angesprochen hat, ist es auf einem Rasenliner, ob aber auf einem Schotterrasen diese Bahnen aufgestellt werden können, muss man alles sauber klären. Aber wie gesagt, ansonsten, würde ich das so unterschreiben.

M: Also dann unterschreiben bei dir hiesse eher die erste Vision.

WR: Ja, aber das ist ein privates Vorhaben, welches grundsätzlich in der Entstehung, in der Anfangsphase ist, wo jetzt, eh, bald vielleicht mal ein Gestaltungsplan kommt, aber wie gesagt, eh, wer weiss, was in zehn Jahren. Wir hoffen, es steht, aber es kann ganz anders herauskommen und dann kommt vielleicht ein andere Nutzung. Was ich sagen muss, also die heutige überbauung jetzt gerade gegenüber dem See ist architektonisch absolut keine Perle. Wohin gegen der Kreuzplatz, eh, eher das kleinteilige, ja, noch ein wenig da ist. Es ist (unv.), aber dort ist nicht mehr viel erhaltenswert, gerade gegenüber dem See, da muss man sagen, da kann vieles kommen, dass sicher besser ist. Aber man muss ganz klar den Wert und Ding darauf legen auf architektonische Qualität, das ist sicher so. Heute, eh, was je länger wie mehr einfach das Thema ist.

M: Merci vielmals. Frau Elsbeth Anderegg würden sie heute nach dieser Diskussion etwas ändern an ihrer eigenen Vision?

EA: Ehm, ja, ich würde jetzt auch nochmal überlegen, ob man die kleinteilige Sache, die ich nicht gefunden habe, eben diese mobilen oder diese Fahrradständer oder was das war. Also, es ginge für mich eher darum, mich nochmals mit dem Tool nochmals auseinander zu setzen. Sonst an der Aussage, von der Gestaltung vom Platz würde ich nicht sehr viel ändern. (..)

M: Okay, vielen Dank. Es war sehr interessant. Danke vielmals an dieser Stelle, dass ihr mitgewirkt habt. Ich konnte das Tool wirklich testen und habe viel Feedback erhalten visuell, über die Fragebogen, die ihr beantwortet habt und jetzt auch nochmals über diese Diskussion. Es war auf jeden Fall sehr spannend, nochmals herzlichen Dank von meiner Seit, dass ihr euch für das Zeit genommen habt und auch offen gegenüber dem ward und eure Meinungen geäussert habt. Und, eh, ich freue mich, wenn ich das nächste Mal in Lachen bin und bin gespannt auch wie sich das entwickeln wird in den nächsten Jahren.

WR: Nein, ich, eh, ich danke dir auch, Pascal, wir sind ja seit längerem, ja (unv.) in Kontakt sind, auch mit deiner Professorin. Grundsätzlich finde ich das Modul, dass du entwickelt hast, sehr gut. Gerade so in einen grossen öffentlich Raum hinein. Man kann verschiedenste Szenarien darstellen und dann am Schluss wirklich auch unter Nicht-, eh, ich sage jetzt Fachleuten,

visualisieren und miteinander besprechen. Das finde ich jetzt wirklich ein gutes Tool.

M: Merci. Okay.

CZ: Ja, ich möchte mich auch noch einmal bedanken, ihnen, Herr Hofer, also auch für die perfekte Organisation, für das "reminden", für das Link-schicken. Es war alles perfekt. Ehm, für mich hat sicher der Aufwand wirklich in Grenzen gehalten und ja, viel Erfolg, auch weiterhin für das Tool. Und ja, immer sehr willkommen in Lachen.

M: Danke ihnen vielmals, danke. Merci (...)

SK: Ich wünsche ihnen noch alles Gute für die Arbeit, dass das gut läuft und wenn sie einmal an der Marina vorbeikommen, um etwas zu esse oder zu trinken, geben sie Bescheid, ich bin im vierten Stock. (lacht) Dann gibt es einen Kaffee.

M: Alles klar, ich werde mich melden, merci vielmal euch allen.

WR: Natürlich "toi toi toi" für den Abschluss, Pascal.

M: Ja, danke vielmals, das kann ich gebrauchen, okay. Dann wünsche ich euch einen ganz guten Appetit und dann ein ganz schönes Wochenende am See.

(Alle bedanken verabschieden sich und gehen offline)

Appendix J

Technical Difficulties and Absence during the Stakeholder Discussion

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This Appendix chapter analyses the discussion's 'digital approach'. Particular attention was paid to the occurrences of technical difficulties or stakeholder absences during the Skype conference (shown in Table J.1). The durations of occurrences were measured and labelled. Additionally, remarks provide additional detail for each of them. Lastly, these findings are described in Chapter 5 and discussed in Chapter 6.

Technical difficulties and absence during the digital stakeholder discussion		
Time (max. 80')	**Remarks**	**Code**
00'00" - 01'20"	**EA** logging in too late	Absence
00'08" - 01'35"	**WR** with technical Problems, interruption of the discussion	Technical Problems
00'00" - 03'27"	**AB** logging in too late	Absence
03'48" - 04'45"	Disturbing noises coming from **AB**, disturbs the discussion	Technical Problems
04'55" - 05'50"	Unintelligible, high-pitched voice from **AB**, which excluded the person from the following conversation; frozen image afterwards	Technical Problems
05'50" - 07'10"	**AB** offline	Absence
06'50" - 07'50"	**EA** leaves the screen	Absence
07'10" - 38'30"	**AB** online without image and sound	Absence
11'30" - 11'50"	**WR** was muted; interruption of the discussion and restart of monologue	Technical Problems
11'30" - 11'50"	**FC** speaking to another person	Absence
14'30" - 16'00"	**EA** leaves the screen	Absence
14'50" - 20'00"	**FC** speaks with another person and takes headset off	Absence
27'00" - 29'00"	**FC** starts to work	Absence
37'00" - 38'30"	**EA** leaves the room	Absence
38'30" - 43'30"	**AB** was back with image, but without sound; **AB** works during the discussion	Absence
39'00" - 41'30'	**FC** starts to work again after his statement following my question addressing him	Absence
45'40" - 45'45"	**WR** was muted while speaking	Technical Problems
45'15" - 56'30"	**FC** was otherwise engaged	Absence
46'05" - 46'45"	**AB** was offline	Absence
47'00" - 68'20"	**AB** was otherwise engaged and phoned	Absence
61'45" - 63'00"	**FC** was otherwise engaged	Absence
64'00" - 80'00"	**FC** was otherwise engaged and phoned; logged out without comment	Absence
68'20" - 69'30"	**AB** was offline	Absence
72'15" - 74'00"	**AB** was otherwise engaged and phoned	Absence
74'00" - 79'00"	**AB** was offline	Absence

Table J.1: Category 'digital approach' analysis with the codes 'technical problems' and 'absence'.

Appendix K

Written Declaration

Personal declaration: I (Pascal Hofer) hereby declare that the submitted Thesis is the result of my own, independent work. All external sources are explicitly acknowledged in the Thesis.

Zürich, January 31, 2022