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# Prototyping future societies: GIGA-mapping and narratives as design material

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**Abstract**

In Norway, the housing challenges faced by migrant workers highlight increasing inequality. Designers striving to create more equitable and sustainable futures must adopt system-oriented tools and human-centered approaches. Utilizing giga-mapping and narratives as prototypes helps reframe issues, enhance communication, and simplify complexity into actionable steps. However, successful outcomes demand refined application and careful attention to communication, necessitating significant investment of time, skills, and effort.

*Keywords: design methods, prototyping, social innovation, giga-mapping, narrative design*

## 1. Introduction

Design has moved into an age in which the design material is increasingly immaterial and no longer limited to physical artifacts or computer interfaces. The conscious, visible and the subconscious, tacit relation between the designer and the material in a design situation has been described historically by many design scholars (Schön, 1992; Simon, 1988; Soo Meng, 2009). What we currently refer to as the design material in a design or design process, seems to take an almost unimaginable variety of forms. In fields such as systems-oriented design, service design, and design for policy, the transition from insights through conceptualization to tangible implementation can pose significant challenges. The current and rapid advancement of our digital everyday daily life further pushes the boundaries of what counts as the artifact. The democratization of design has even spurred criticism and questions regarding when something stops being design altogether. Proposing solutions through tangible and concrete examples is an expectation and a unique characteristic that separates designers from other disciplines that work to understand people and societies, such as sociologists, anthropologists, and psychologists from whom we adapt methods. Designers, including urban designers and architects, put forward unfinished ideas, potential futures and illustrate changes in a manner that makes it easier for non-designers to see new possibilities, test and give feedback even in highly complex situations. Despite an increasing immaterialism in design practice, the vocabulary describing design practice still belong to a concrete past with words such as tangible, objects, blueprints and maps. All words associated with something that can be physically held. This design vocabulary reminds us how design as research and practice remains firmly linked to the artifacts, and the necessity for designers and stakeholders in co-design processes to have something to gather around. Designers working with the immaterial, relational and abstract aspects may find an increased necessity this concreteness, especially to illustrate to decision makers what types of futures are available, possible and imaginable.

In navigating intricate socio-political terrains and addressing inequalities, the task of designing for democracy requires proposals that have the potential to pave the way for improved societies. The

situation of temporary work migrants in European countries is one of the contexts in which power relations, globalized production systems and free labour movement has contributed to a larger divide of income, opportunities, and citizen rights. It is, in essence, a brilliant example of the interdependency of global structures and local conditions. Policy analysis has shown that work migrants are perceived in policy development as commodities rather than people, participant of our communities (Friberg, 2016). Within the Norwegian context, sectors that depend on low cost, skilled workers on temporary contracts often exhibit a significant variability in the standard of housing. Frequently, these housing is intentionally situated in areas that are invisible to the general population. Due to the high demand for foreign workers in Norwegian industries, a significant portion of the society now resides in various substandard accommodations. These include barracks, makeshift homes constructed with minimal resources, dilapidated private houses repurposed for worker habitation with minimal quality, and even tents or caravans situated in overlooked areas within the cities. The housing conditions of migrant workers have become visual representations of the increasing inequality in Norway. Consequently, designers and city planners are now actively focused on envisioning alternative futures that promote a more equitable society and sustainable community.

In the pursuit of equitable urban development, the proposition and implementation of stakeholder involvement and collaboration emerge as recurrently advocated strategies. Extensive scholarly discourse exists, wherein numerous researchers have documented and deliberated upon the significance of engaging various stakeholders in the domains of urban development and housing (Blaasvaer & Sevaldson, 2019). In design, GIGA mapping is a systems-oriented tool which represents a designerly way of not only achieving stakeholder involvement but also removing the barrier between informant and designer and making the stakeholder landscape and its relationships tangible and transformative. Kvam (2021) for example describes GIGA mapping as a boundary object in sustainable product design. GIGA mapping has been increasingly used in urban planning, for example through city analysis and through the creation of a built environment for cross-species co-living (Davidova, 2018). In combination we employ narrative inquiry to bring forth the personal stories that communicate the experiences of the migrant workers in their own voice, the way they seem fit. Thus, GIGA-mapping provided a visual representation of the entire stakeholder landscape, while storytelling illustrated the accumulated experiences of work migrants (Sevaldson, 2011).

In the spring of 2020, designers and urban planners from the Norwegian University of Science and Technology (NTNU) partnered with a building and construction sector inspection unit in Trondheim, Norway to address overlooked issues for construction workers from Eastern Europe. Despite foreign labor contributing significantly to employment growth in Norway since 2007, particularly in the construction industry, political attention to this situation is minimal (Farahmand & Brevik, 2022). This lack of attention is attributed to the fact that housing and living standards are primarily the responsibility of employers in the private sector. In response to this unexplored terrain, we adopted a holistic understanding by employing both a systems-oriented, co-designed perspective and a human-centered, qualitative perspective. The combination of these methods aimed to guide future interventions and involve relevant actors in the process. Our goal was to create an overview of the stakeholder landscape and propose interventions to enhance the situation of work migrants, including their housing and work standards. The design process involved systems-oriented design and narrative inquiry, culminating to the development of a policy design lab concept. This lab envisions fostering collaboration among stakeholders from housing, welfare, and building industry with the common goal to improve housing and work strategies.

In this paper, we explore representative narratives and GIGA-maps as a rich design space for prototypes, allowing the testing of assumptions and proposing new futures with stakeholders, ultimately reframing the positioning of work migrants in societies. We take the case of housing for temporary migrant workers to emphasize the importance of various forms of prototyping when proposing future societies. Through the synergy of these two methods and a retrospective examination of our design research process, we identify the stages at which narratives and GIGA-mapping function as prototypes whilst discussing their complementary nature in the discussion. Our goal is to contribute to the development of a more refined vocabulary for designers and design researchers shaping future societies. In order to produce conference proceedings of a professional and consistent quality, the template is protected and cannot be modified.

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## 2. Background and approach

Migrants who are in a loop between country of origin and country of work are referred to as transmigrants, repeat migrants, back-and-forth migrants, pendular migrants or circular migrants. All terms referring to a lifestyle in which one does not intend to stay in the country where one works but keep returning for temporary work contracts. Ødegård and Andersen, (2021) claims that having satisfactory living conditions, together with being treated well at work are the two most important factors for remaining in Norway in the years ahead. Besides that, very little is known about the lives of migrant workers and the effects this has on their housing experiences in Norway, their choices to return for work, or even remain permanently (Rishi, 2021).

While GIGA-mapping and narratives have proven effective in numerous design and urban planning projects for comprehending complex systems and design challenges, the concurrent use of these methods in an interdisciplinary context for housing transmigrant workers is a novel approach. In combination to co-creation, both these methods have proven to allow for a more inclusive and participatory design process. From the start, the role of the GIGA map was to be an inclusive and undogmatic approach to large-scale system mapping (Sevaldson, 2018). It allows designers to look at complex situations that include a variety of stakeholders and relations and map them extensively within various layers, GIGA mapping has been previously used in educational planning, product design, architecture and urban planning to understand complex systems and to also design them (for more, see Blaasvaer & Sevaldson, 2019; Davidova, 2017; Veerdonk, 2023). Simultaneously, narrative inquiry has extensively used in design processes to humanize the process as is has the individual stories of the informants at the centre of qualitative interviews.

In many ways, our study is inspired by Rowe's (1987) descriptive and analytical identification of how designers think; looking for the flow of work of designers and at what point the use of external representation becomes visible tools in moving the design process forward and minimizing the risk that something is overlooked (Rowe, 1987). Prototyping has a vast set of characteristics and are described in a vast number of studies and publications. The following ways to characterize prototypes will structure the way we discuss prototypes as useful tools in our study:

- Prototyping helps the designer think (Blomkvist & Holmlid, 2010)
- A prototype is something that can transform a complex or wicked situation into an actionable one (Nakhimovsky et al., 2010)
- A prototype can help reframe a situation (Jobst & Meinel, 2014)
- Prototypes are tools for enhanced communication, increased learning, and informed decision making (Lauff et al., 2018)

There is also a frequent talk about good or bad prototypes, and ways of prototyping, including prototyping skills, for example referring to the ability to reframe a problem representation several times during the process is central for the solution of wicked problems. This means that prototyping in a useful manner require both the ability to handle complex problems and the ability to reframe purposefully (Jobst & Meinel, 2014).

## 3. Methodological approach

Preliminary conversations with stakeholders in Trondheim highlighted that the context of work migrants in the building and construction industry is not completely understood or clearly communicated, which makes it difficult to propose new strategies to combat modern slavery and inadequate work and housing conditions. The comprehensive representation of stakeholders was unclear, and there is no regional policy for providing inclusive housing for work migrants, even though the city has established inclusive housing strategies specifically for refugees. Our aspiration was that design could help illustrate the full picture, identify new areas of intervention, and see new possible connections that can propose a new future of how to regard housing for work migrants in the city.

In both trajectories of GIGA-mapping and narrative inquiry, four design researchers oversaw the data gathering and the evolving GIGA maps and narratives. While two design researchers led the GIGA-mapping, one researcher led the narrative inquiry and the fourth supervised the process and led the critical discussion. The entire project included sixteen narrative styled interview and 23 semi structured interviews (for more, see Rishi, 2021; Farahmand & Brevik, 2022). Additionally, three physical workshops were organized in a shared space in Trondheim, mainly using power point presentations of insights and process, as well as large pieces of paper and markers to design GIGA-maps together. These workshops brought together key stakeholders in face-to-face settings to brainstorm and co-create possible interventions. Simultaneously, three digital workshops were facilitated on the Microsoft Teams platform, and involved both experts and stakeholders. The details of the process are mentioned below.

## 3.1. Verbal and visual narratives as design material

To explore the question of personal experiences, we applied narrative inquiry as the main approach. While contemporary design manuals frequently refer to 'storytelling' as a method to enhance empathy in a design process, there are limited studies describing the potential of narrative inquiry in relation to social design. For example, Jones (2016) describes that narrative inquiry "*conceptualized as a feminist research tool and useful approach to design, can help promote considerations of social justice and inclusion in human centred design approaches*". Furthermore, design is very much like storytelling, in which designing the right product or service is like designing the right story (Quesenbery & Brooks, 2010). In narrative inquiry, the individual stories of the informants are at the centre of qualitative interviews. The holistic nature of human experience is regarded as valuable entities for understanding humans and society. Building an interview in a chronological manner and ensuring that the informant can express the complexity and evolving nature of their experience, results in data that is rich in insight and can be excellent starting points for the idea generation of a design process.

The interview strategy was organized as a snowballing approach, beginning with our initial gatekeeper, and subsequently visiting as many work migrants as possible in their homes where they felt at ease. This meant that we also gained a visual account of the different types of temporary housing, ranging from single houses filled with work migrants to barracks, tents and caravans on undeveloped land surrounding the city (see fig 1). The physical setting of the interviews allowed us to absorb the scenery of their homes and listen to their experiences with a background of their current reality (see Rishi, 2021). In total, we conducted 16 narrative-style interviews, with 9 of them involving migrant workers. The interviews lasted 60-90 minutes where the respondents were given a broad question that they could describe in their own unique ways. Subsequent questions were drawn from their initial information thus having an organic and less structured style of interviewing.



**Figure 1. Conducting narrative interview with temporary migrant worker outside the caravan they live in**

## 3.2. GIGA-maps as design material

A narrative approach focusing on lived experience needed to be complemented by a systems approach, to get a grasp of which parts of the stakeholder landscape need to be involved and transformed, and with whom, in order to achieve a change. A systems-oriented perspective is needed to understand how to prototype a more well-connected system that can cater for the needs of the people involved in the interviews.

Together with narrative inquiry, the process of producing a GIGA-map with stakeholders became a prominent methodology. GIGA-mapping was chosen due to its promise to allow the designers to gain an overview; to work in a collaborative manner, and to allow for the designers together with the stakeholders to identify areas of interventions. Architecture has adopted the method into the framework of Systemic Approach to Architectural Performance (SAAP), in which they see this as a tool for complexity co-designing. Davidová (2018) highlights that GIGA-maps can "drive extensive generative agencies across various communities and agents; and while doing that, across much larger systems". This means that GIGA-maps may be appropriate when designing with and for housing for work migrants, a situation where welfare services, housing, employment and industry policies become interlinked and overlapping systems. GIGA-mapping is a holistic method which like storytelling perceives an individual's interpretation of the holistic situation to be valid when looking for possible areas of intervention. Capra (1997) explains that "Systems thinking is 'contextual', which is the opposite of analytical thinking. Analysis means taking something apart in order to understand it; systems thinking means putting it into the context of a larger whole". GIGA-mapping has evolved as a go-to method for designers in situations which require a systems-oriented approach.

Typically, the process of creating a GIGA-map takes place in a workshop setting in which key stakeholders are gathered with large pieces of paper and markers (see fig 2 and 3). Design facilitators give them instructions to draw the overview of a system that these stakeholders have knowledge about. The GIGA-mapping focuses on drawing the relationships between actors, activities, and other elements, and is hence a participatory process. It is somewhat unclear how the GIGA-map lives on from one workshop and into a continued design process, but the creators of the term encourage for every designer to explore by themselves and to keep evolving this method. For GIGA-mapping to become a prototype, it will need to be able to fill the above-mentioned functions, in which the designer(s) detail and polish the map enough for it to be useful for testing assumptions with new audiences and target groups.



**Figure 2. GIGA-mapping workshop**

The final version of GIGA-map was done after achieving a saturation of data. Before displaying the information on the GIGA- map, the findings were analyzed from the interviews while the impressions were still fresh. Then three main points were drawn out right after each interview, and when we talked

to several people these points were grouped together (see Farahmand & Brevik, 2022). Additionally, Z-points (zoom) are positioned on map areas indicating a knowledge gap. P-points (potential) are placed on areas highlighting a distinct problem or potential in the system. I-points (ideas) are positioned on areas of the map associated with ideas for altering the system. Typically, the process follows the order ZPI as the three modes progressively lead toward innovation. However, due to sounding unconventional, Sevaldson (2013) has termed the tool ZIP. Ultimately, data triangulation was used to compare several data against each other to reach the final conclusions.

# 4. Prototyping and prototype: Key observations

The process of GIGA-mapping and narratives are intertwined as the process involved many of the same participants within the same theme. We have divided our finding in sequence of the four characteristics of prototypes as introduced earlier, in order to discuss how GIGA-mapping and narratives can be a useful tool for prototyping for designers, depending on the aims of prototyping.

## 4.1. A prototype helps the designer think

While the narrative inquiry led us to understand how the work migrants experience working and living in Norway as a constantly evolving situation, the systems overview provided by the GIGA-map depicted how different stakeholders impact this experience.

Both the stories and the GIGA-map highlighted that work migrants lacking social capital, language skills, financial stability, and knowledge about the Norwegian welfare system are more vulnerable to exploitation. The GIGA-map also revealed active stakeholders advocating for work migrants but exposed a lack of strategies for housing and support in public plans. The raw GIGA-map, co-produced on large paper, served as a prototype, enhancing communication among stakeholders. However, its complexity made it challenging for a wider audience to interpret effectively.

## 4.2. A prototype enhances communication, learning and decision-making

We analysed insights by triangulating between interviews with work migrants, workshops with stakeholders, and GIGA-mapping outputs. Designers visualized migrant narratives and a refined GIGA-map for usability, incorporating graphic designers' input for effective communication. The iterative process, involving audience collaboration, culminated in a prototype map. In other words, the GIGA-mapping became a way to inform the prototyping and to enhance communication, learning and decision-making in line with Lauff (2018). According to Blomkvist (2014), prototyping embodies a design thinking methodology. The visually improved GIGA-map functions as a prototype, conveying information to new audiences, steering decision-making, and fostering additional co-creation.

The narrative inquiry provided a detailed description of work migrants' perceptions of relocating to Norway and securing housing. The complexity of how migrants access adequate living standards in Trondheim involves multiple actors. Migrants with weak social connections and language barriers are vulnerable to exploitation, especially when stakeholder landscapes and regulatory frameworks are unclear. Some migrants arrive with no network, informal debt, and modern slavery contracts, highlighting the need to prioritize identifying and supporting vulnerable individuals. The workers described feeling at home through food, weather, proximity to their place of birth, and accessibility to their families, rather than physical attributes of a space (Rishi, 2021). This suggests shifting the perspective on housing from a purely structural and utilitarian aspect to one that encompasses broader dimensions of human experiences and the wellbeing of temporary work migrants. However, stakeholders often viewed housing as a business model, making it challenging to emphasize the importance of suitable housing and workers´ wellbeing.

Prototyping the GIGA-map and narratives enabled a comparison between the two models, revealing that the issue of work migrants' exclusion and living standards is not on the political agenda. The systems-oriented approach and GIGA-map guided communication to the relevant audience for potential transformation. To test narrative validity and elicit feedback, verbal accounts were presented with visuals of housing situations and quotes to a diverse audience. This approach aimed to trigger reactions,

creating an early prototype ready for collaborative redesign. The presentation went beyond the traditional prototype definition, incorporating personal stories, emotions, and thoughts, fostering audience interest and engagement. The active dialogue between stakeholders with varying familiarity on the issue facilitated understanding and collaboration. Testing the narratives proved effective in communicating with non-experts, leading to insights and urgency to address housing concerns. The narratives transformed into prototypes, sparking evaluation of the current housing scenario, idea generation for stakeholder influence, and a shift in the mindset of public and private stakeholders.
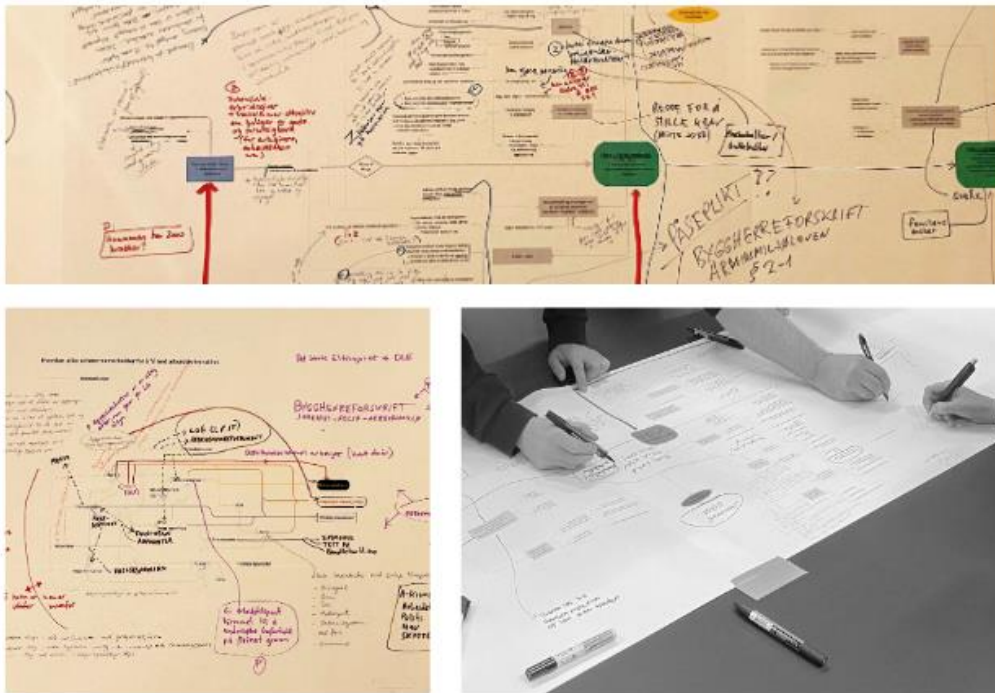


**Figure 3. Prototyping the raw giga-maps informing the final prototype**

The presentation of narratives departed from conventional prototype definitions, incorporating personal stories and emotions of work migrants, fostering interest in future housing policies. Attendees actively engaged, sharing concerns on the housing market. The narrative-driven study became a vital tool, bridging understanding between stakeholders, including designers and researchers, and non-researchers. Testing the narratives simplified research comprehension for non-experts, with stakeholders gaining new insights and expressing urgency for action. The narratives evolved into prototypes, prompting evaluation of the housing scenario, idea generation for stakeholder influence, and strategies for shifting the mindset of public and private stakeholders.

## 4.3. A prototype helps reframe a situation

After completing the GIGA-map and narrative prototypes, five workshops on teams, involved a diverse group of stakeholders in the Trondheim region, including design researchers, young designers, public entities, municipalities, recruitment agencies, labor unions, housing agencies, and employers. The narratives and proposed interventions from the GIGA-map led to the idea of a policy innovation lab. The lab seeks to co-design enhanced policies and practices by integrating narrative inquiry, systems-oriented design, and political science. Addressing challenges in welfare services, housing, and regional business development, the collaboration among stakeholders was inspired by the GIGA-map's insights into stakeholder landscapes. Together, they crafted a proposal to reshape the perception and treatment of work migrants, utilizing the narratives and GIGA-map as prototypes for envisioning this vision.

Prototyping was proven effective as stakeholders formulated a new vision for local efforts. This was evident in their active participation, knowledge sharing, openness to future collaboration, forward-

thinking perspective, and recognition of the urgency and necessity for changing the existing system present to the migrant workers. The vision promotes a democratic approach, involving work migrants in decision-making for the future society they wish to return to in Norway. Whilst the regional country officials stressed the need for inclusion across social services, housing, policies, and industrial and business councils.

## 4.4. A prototype is something that can transforms a complex or wicked situation into an actionable one

Discussing the GIGA-map and narratives with public and private stakeholders resulted in a commitment agreement for establishing a policy design lab with two municipalities. The lab aims to develop and test policy prototypes that view work migrants as democratic participants in local communities. This transformation demonstrates how prototypes and prototyping turned a challenging situation into an actionable one.

While the GIGA-map prototype engaged local stakeholders in Trondheim, the international community focused on equality and housing rights showed more interest in the narratives. Organizations like Habitat Norway and Hope for Justice found narrative inquiry aligned with their expectations. However, for key stakeholders to envision a better future, they need to recognize the interconnectedness of interests and roles, moving away from a singular focus on the individual. The GIGA-map and systems overview were crucial in highlighting the region's need to attract workers to industries. In essence, both informants and target audiences shape prototyping, influencing its potential for societal impact.

# 5. Conclusion

Addressing social impact in complex areas goes beyond local stakeholder systems; it requires a global perspective on policies, practices, and geopolitical dynamics. We encourage designers to explore policy design and prototyping for innovative approaches. While narrative inquiry can manifest in various forms, GIGA-mapping has no fixed recipe. This paper demonstrates their combined value as prototyping tools. Our findings reveal that current policies predominantly favor the industry rather than benefiting the local population or the work migrants themselves.

We argue that GIGA-mapping and narrative inquiry can serve as central methods for co-creating new policies and practices with private and public stakeholders, as well as with the work migrants. Engaging two municipalities in testing this possibility, we found both methods to be relevant and effective in triggering action and setting new visions among stakeholders, designers, and researchers. These methods facilitated a reframing with stakeholders, shifting the focus from the work migrant to viewing the situation as a welfare, housing, and business sustainability issue, necessitating cross-sectoral collaboration for societal transformation. This article contributes to the perspective that GIGA-maps can act as prototypical urban interventions, fostering generative agencies across communities (Davidova & Zímová, 2018). A key challenge with the GIGA-map is the sense of ownership it instills among stakeholders involved in its creation, which diminishes when presented to a new audience. However, this shift can be advantageous, fostering the emergence of novel ideas. In contrast, narratives operate more autonomously than a systems-map, allowing open interpretation by the audience and generating empathy that grounds action. Nevertheless, framing the use of narratives in a design process can be challenging for designers.

For prototypes to be effective in systems-oriented and story-focused design projects, they require as much time and effort as physical or digital prototypes. Communicating input from GIGA-mapping and narratives, and selecting a target audience to test assumptions, demand the same level of attention as testing a prototype in a consumer market. The full potential of prototyping in systems and service processes is often overlooked, possibly due to an emphasis on prototyping as a thinking tool rather than a testing and progression tool. We argue that investing time in refining prototypes until they are ready for testing is valuable, fostering the development of mature and holistic overviews. This is crucial not only within a design team but, more importantly, for communicating with a wider audience and co-creating new futures with stakeholders.

We believe that the combination of sociology, urban planning, political science, and design is still at an early stage. A variety of design prototypes in a rich design environment could be the crucial link connecting these fields with urban reality, resulting in a more respectable working environment for migratory workers, and a resilient local industry and communities.

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## References

Blaasvaer, L. (1), & Sevaldson, B. (2). (2019). EDUCATIONAL PLANNING FOR SYSTEMS- ORIENTED DESIGN: APPLYING SYSTEMIC RELATIONSHIPS TO META-MAPPING OF GIGA MAPS. DS 95: Proceedings of the 21st International Conference on Engineering and Product Design Education (E&PDE 2019), University of Strathclyde, Glasgow. 12th -13th September 2019. 21st International Conference on Engineering & Product Design Education (E&PDE 2019). https://doi.org/10.35199/epde2019.40

Blomkvist, J. (2014). Representing Future Situations of Service: Prototyping in Service Design. https://doi.org/10.3384/diss.diva-105499

Blomkvist, J., & Holmlid, S. (2010). Service Prototyping According to Service Design Practitioners. Service Design and Service Innovation, 2, 1–11.

Capra, F. (1997). The Web of Life: A New Synthesis of Mind and Matter. Flamingo.

Davidova, M. (2017). Systemic Approach to Architectural Performance. FormAkademisk, 10(1), Article 1. https://doi.org/10.7577/formakademisk.1713

Davidova, M. (2018). Roles, Agency and Relations of Gigamaps in Systemic Approach to Architectural Performance: The Special Prototypes of Post-Anthropocene (pp. 104–119).

Davidova, M., & Zímová, K. (2018). COLridor: Co-design and co-living urban adaptation. FormAkademisk, 11(4), Article 4. https://doi.org/10.7577/formakademisk.2647

Farahmand, A., & Brevik, E. M. (2022). Sårbare arbeidsinnvandreres situasjon i Norge [Master thesis, NTNU]. https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/3023100

Friberg, J. H. (2016). Arbeidsmigrasjon Hva vet vi om konsekvensene for norsk arbeidsliv, samfunn og økonomi? Fafo, 50.

Jobst, B., & Meinel, C. (2014). How Prototyping Helps to Solve Wicked Problems. In Design Thinking Research: Building Innovation Eco-Systems (pp. 105–113). https://doi.org/10.1007/978-3-319-01303-9_8

Jones, N. N. (2016). Narrative Inquiry in Human-Centered Design: Examining Silence and Voice to Promote Social Justice in Design Scenarios. Journal of Technical Writing and Communication, 46(4), 471–492. https://doi.org/10.1177/0047281616653489

Kvam, E. (2021). Giga-Mapping and Knowledge of Boundary Object Theory in Sustainable Product Development. In 6. The Design Society. https://doi.org/10.35199/EPDE.2021.58

Lauff, C., Kotys-Schwartz, D., & Rentschler, M. (2018). What is a Prototype? What are the Roles of Prototypes in Companies? Journal of Mechanical Design, 140. https://doi.org/10.1115/1.4039340

Nakhimovsky, Y., Miller, A., Dimopoulos, T., & Siliski, M. (2010). Behind the scenes of google maps navigation: Enabling actionable user feedback at scale. 3763–3768. https://doi.org/10.1145/1753846.1754052

Ødegård, A. M., & Andersen, R. K. (2021). Working and living conditions among resident migrants from Poland and Lithuania. Fafo, 70.

Quesenbery, W., & Brooks, K. (2010). Storytelling for User Experience: Crafting Stories for Better Design. Rosenfeld Media.

Rishi, G. (2021). Between housing and home - Housing experiences of transmigrant labour workers in Trondheim: A narrative enquiry [Master thesis, NTNU]. https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/3034030

Rowe, P. G. (1987). Design thinking. MIT Press.

Schön, D. A. (1992). Designing as reflective conversation with the materials of a design situation. Knowledge-Based Systems, 5(1), 3–14. https://doi.org/10.1016/0950-7051(92)90020-G

Sevaldson, B. (2018). Visualizing Complex Design: The Evolution of Gigamaps. In P. Jones & K.Kijima (Eds.), Systemic Design: Theory, Methods, and Practice (pp. 243–269). Springer Japan. https://doi.org/10.1007/978-4-431-55639-8_8

Sevaldson, B. (2013). Systems Oriented Design: The emergence and development of a designerly approach to address complexity. Learn X Design Conference Series. https://dl.designresearchsociety.org/learnxdesign/learnxdesign2013/researchpapers/131. https://doi.org/10.21606/learnxdesign.2013.133

Sevaldson, B. (2011, June 3). GIGA-Mapping: Visualisation for complexity and systems thinking in design. https://doi.org/10.21606/nordes.2011.015

Simon, H. A. (1988). The Science of Design: Creating the Artificial. Design Issues, 4(1/2), 67. https://doi.org/10.2307/1511391

Soo Meng, J. C. (2009). Donald Schön, Herbert Simon and The Sciences of the Artificial. Design Studies, 30(1), 60–68. https://doi.org/10.1016/j.destud.2008.09.001

Veerdonk, R. L. G. P. van de. (2023, August 28). From Slim to Smart: How Empathic Design can help understand a craftsmanship-driven factory's manufacturing capabilities for product and production improvement. [Info:eu-repo/semantics/masterThesis]. University of Twente. https://essay.utwente.nl/97171/