Design for a resilient acute care system

Transformation strategies to anticipate a growing and aging population

Graduation Thesis

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Industrial Design Engineering

Strategic Product Design

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During this project, my view on care shifted. I was moved by the stories of care professionals and the tension that arose between caring for a human being and to care for the larger society. To you, dear reader, I hope that I have been able to shape a concise story and take you on a journey through the complexities of acute care. At the end, I hope you will feel inspired by a new perspective and empowered to think and act in new ways.

Have a good read!

Jesse Geurtsen

Summary

If nothing changes, one in four employees must work in the healthcare sector in 2040, according to the Scientific Council for Government Policy (WRR, 2021). Therefore, acute care must undergo a fundamental system transformation to effectively address the needs of a growing and ageing population, while on the other hand there is a growing scarcity of personnel. Currently, the acute care chain consists of cooperating care providers such as hospitals, ambulances, general practitioners, and nursing homes in each region. A *Regionaal Overleg Acute Zorgketen* (ROAZ)-agency organizes the collaboration and has been given the responsibility to formulate transformation plans for the acute care chain. While a ROAZ-agency excels in optimising current collaborations between chain partners, it faces at least three knowledge gaps when it comes to designing a fundamental transformation. Overall, 1) the actors of the acute care lack a holistic view on the problem situation, 2) are predominantly inward-looking, and 3) lack a desirable vision of how the acute care could change as a whole. Therefore, this graduation project used a systemic design approach to facilitate the transformation towards a more resilient system. Resilience theory was consulted in this project, because of the prevalent framing of the growing older population, as a pressure on acute services (Adema, 2019). To produce transformation plans, the design process consisted of three phases. The first was mapping the current state of the system, the second was proposing a resilient state, and the third was exploring strategic responses aimed at achieving that state. Central to a transformation from one system state to another is a shift in paradigm (Meadows, 2008). A paradigm shift radically changes the way we see the world and with that it changes the way we give purpose to our systems. Four paradigm shifts are derived from interviews with experts and stakeholders from the acute care domain:

> From viewing care as a business for professionals to approaching care as a social undertaking. From a belief in the makeable human, to live with a view of the end. From perceiving care as a commodity to seeing care as a common good. From the wish to live independently at home to the desire to grow old together.

These paradigm shifts are at the foundation to how we can transform our acute care system. However, they still have to be made tangible. The shifts are shaped in four responses addressed at decision-making processes, information flows, spatial concepts, and social network.

> We need a management structure which enlarges trust, flexibility, and professional freedom of action. A military mission command structure can be adapted to the context of acute care. Mission-command embraces operationally ambiguity and sees this as advantage, while commanders aim to be as clear as possible in their strategies and their underlying intentions (Braw, 2022).
>
> There is a need for a central information structure to improve decision-making processes in and before acute situations. Information entailing acute care policies based on a patient's values, wishes, and needs must be made available prior to an acute situation.
>
> There is a need for new (architectural) typologies and processes to address different (sub-)acute care situations. These options lie for instance in communal senior housing, neighbourhood clinics, and geriatric emergency squares in hospitals. Acute process needs to facilitate space for geriatric, and palliative skills of professionals, especially at ambulance organizations and ED's.

> At last, we must create a longing for intergenerational social networks instead of enforcing obligatory social service. We need to foster intergenerational social networks, based on value exchanges between generations. Stronger social networks, when directed at reassurance, are likely to indirectly lower the pressure on the acute care chain.

This thesis concludes with a discussion of each response, highlighting opportunities for further development, and a set of final recommendations for the ROAZ-agency to embrace systemic design practices.

Preface

Everyone has a mental image of acute care. Fast driving ambulances with loud sirens. Hard-working doctors treating fractures or heart attacks. In acute care, it is vital that a patient receives the right medical care as quickly as possible. Clearly, acute care is only possible through close collaboration between various care providers. In the field of healthcare, one speaks of the acute care chain in this case. This chain is made up by chain partners, care providers such as emergency call centres, ambulances, emergency departments (ED), general physicians (GP), GP- posts, obstetricians, nursery homes, and mental healthcare partners.

The acute chains have regional boundaries. In the Netherlands, the acute chain is divided in ten regions. Each region has a Regional Consultation for Acute Care Chain, in Dutch: *Regionaal Overleg Acute Zorgketen* (ROAZ), to establish agreements between chain partners to improve the organization and quality of the acute care in the regions. To facilitate the collaboration, each region has a ROAZ- agency that act as advisory bodies. This graduation project was developed under supervision of the ROAZ agency of the region North-Holland/Flevoland.

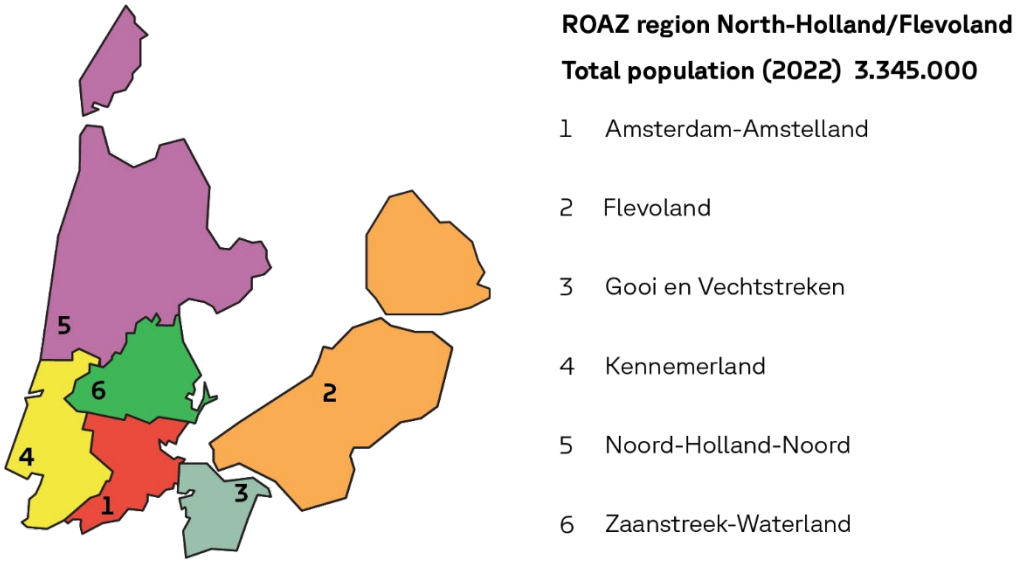


Figure 1 A close-up of ROAZ-North-Holland/Flevoland with its respective safety regions

Since September 2022 the *Integral Care Accordance*, in Dutch: *Integraal Zorg Akkoord* captures the shared ambitions of actors from within the Dutch health care sector. The consensus is as follows: the organisation of professional care must transform to remain affordable, accessible, and of high quality. The ROAZ agencies of each region were tasked to formulate an assessment, in Dutch: *ROAZ beeld*, of the current and plausible future state of the acute care in their region. Based on these assessments, a set of strategic priorities was formulated. Consequently, the ROAZ plan addresses the priorities of the region with the formulation of a strategic agenda with concrete initiatives.

Content

Introduction

The problem situation

The acute care system is facing a looming crisis, with as worst-case scenario, a total standstill in the Dutch healthcare sector (Berger, 2022). Two structural developments contribute significantly to this dire outlook. First, the Dutch elderly population is growing and aging. This demographic group has more complex health problems. To illustrate, 96% of people aged 75 and over have at least one chronic condition (VZinfo, 2022). Demand for acute care will more often be driven by a sudden worsening of these chronic conditions. This type of acute care is more complex compared to treating sports injuries, burns, heart attacks, and fractures. Complex care needs, caused by multimorbidity, polypharmacy and chronic diseases, will put great pressure on the acute care chain (Jaber, 2022). Second, the acute care must cope with an increasing scarcity of available personnel and other means. For instance, currently, around one in six workers is employed in the healthcare sector. If nothing changes, one in four employees must work in the healthcare sector in 2040, according to the Scientific Council for Government Policy (WRR, 2021).

To address these critical issues, each Regional Consultation for Acute Care Chain (ROAZ) is formulating transformation plans under guidance of ROAZ-agencies. While a ROAZ-agency excels in optimising current collaborations between chain partners by facilitating negotiations and providing empirical evidence, it faces at least three knowledge gaps when it comes to designing a fundamental transformation.

First, the problem situation is not addressed as a systemic challenge due to a lack of systems thinking in the acute care. The field of acute care is splintered in numerous organizations, resulting in transformation plans made up by many different initiatives. As explained by systems thinker Russell Ackoff (2004), if efforts are directed at improving parts of a system taken separately, a fundamental transformation is not possible. This is also the case in transforming the acute care system. For example, if we optimize the emergency department (ED), we cannot guarantee that the whole emergency chain will function better (Bosch & Nanayakkara, 2022). Ambulances may still be overloaded, and seniors will still have to flow out of the ED to overflowing revalidation homes. As a system is more than the sum of its parts, we should direct our efforts at transforming the system as a whole, rather than its isolated elements (Ackoff, 2004).

Second, the acute care is predominantly inward-looking, while the acute care sector and its actors alone cannot “solve” the problems that manifest themselves in the emergency chain. As a result, the transformation plans that are produced by acute care partners are aimed at short-term results within their direct sphere of influence. Instead, fundamental transformations for long-term value are not addressed. This is understandable, as asking of acute care partners to transform, is as asking to plan for a total renovation of their house, while their kitchen is on fire.

Third, current scenarios as laid out in the first paragraph, are predominantly negative and proposed changes remain abstract. For example, if we truly want to move from competition to collaboration, or focus on prevention instead of curation, all to address the looming crisis, how can we concretely shape such a transformation? Clearly, there is a need for a positive vision, which paints a picture of what a desired state of the acute care system could be.

General approach

The goal of this graduation project is to use a systemic design approach to facilitate the transformation of the acute care system towards a more resilient system. The added value of systemic design lies in practices aimed at opening the problem space, addressing multi-stakeholder perspectives in co-creative processes, and taking an evolutionary approach towards a desired systems change (Bijl-Brouwer, 2020). The approach is evolutionary, in the sense that it aims at learning “what works” in complex contexts. The process is also described as “probe-sense-respond”, where one learns through conducting safe-to-fail experiments (Snowden & Boone, 2007). Resilience theory was consulted in this project, because of the prevalent framing of the growing older population, as a pressure on acute services (Adema, 2019). This body of literature informs us that not all things break when being put under pressure. Some things are indifferent to external pressure, others have the ability to bounce back to “normal”, and still other things become stronger as a result of a stressor (Taleb, 2013).

Research questions

This thesis is centred around the following research question:

How could we transform the acute care system towards a more resilient system, in anticipation of a growing and aging population?

Consequently, this thesis aims to address three sub-questions:

1. What is the current state of the acute care system regarding a growing and aging population?
2. What could be a more resilient state of the acute care system?
3. What are strategic responses that attribute towards this resilient state?

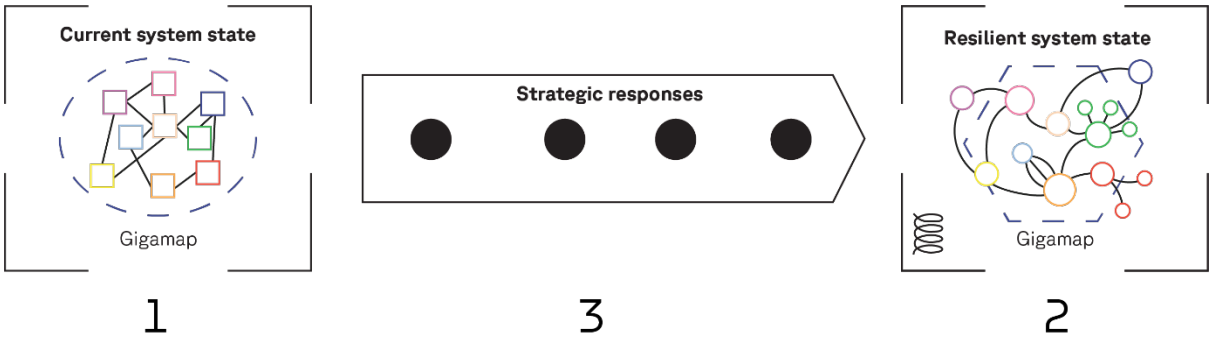


Figure 2 An overview of the research questions

Theoretical background

This chapter provides the theoretical basic principles on which this graduation project is built, while offering an introduction into the fundamental concepts of systems thinking, resilience and systemic design. The chapter answers questions as: "What is a system?", “What is systemic resilience?” and, “What transforms systems?”.

On complex systems

What is a system?

A system (see Figure 3) is a set of elements that is interconnected in a structure that produces a characteristic set of behaviours, often classified as its “function” or purpose” according to (Meadows, 2008). Only as a whole, a system can fulfil its purpose. To illustrate, only fully assembled a plane is capable of flying, where flying is an emergent property of the airplane. Systems have boundaries; however, they are of our own making. As explained by Meadows (2008): “there are only boundaries of word, thought, perception and social agreement and boundaries should be reconsidered for each discussion, problem, or challenge.” When talking about the plane, we did not include elements as the plane’s manufacturer or air traffic control. Depending on the problem situation, these may also have to be included to address certain challenges.

What is a complex system?

A system can be labelled as “complicated” or “complex”, which is a subtle but key distinction. A key heuristic to distinguish the two as provided by Taleb (2013), is to think of the complicated as something mechanical, and the complex as something organic. A washing machine versus a human body or a forest. The engineered varies from the organic in many ways, but we can highlight three main differences. First, compared to a complicated system, a complex system is an open system, resulting in many unknown elements. Second, these elements in turn, may have nonlinear interactions, where a small stimulus may cause a large effect, and vice versa. Such a non-linear relationship can be a result of unobservable reinforcing feedback loops. Third, complex systems or their parts have the capability of self-organization. Complex systems can learn, restructure, diversify and complexify, something you will not see your washing machine do (Snowden & Boone, 2007). This property of self-organization seems closely related to property of resilience. As according to Meadows (2008), resilience is the measure of a system’s ability to survive, persist or thrive in a variable environment.

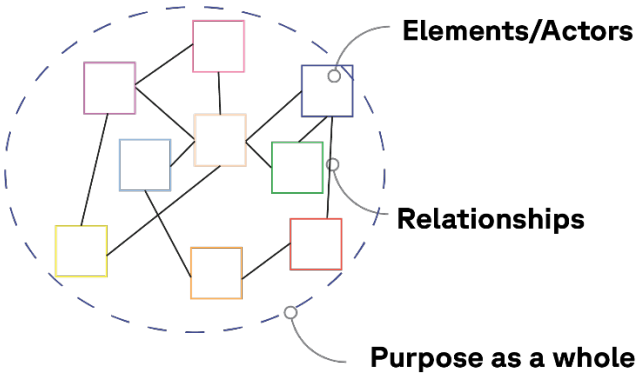


Figure 3 A visual of a system with its elements and relationships

Systemic resilience

Variable environments produce stressors

Every complex system is exposed to stressors from the variable, volatile environment it is situated in. Stressors have been classified by scholars in the following categories: incident, emergency, crisis, disaster, and catastrophe (Chroust & Finlayson, 2017). Besides having undesirable consequences, stressors contain information from which a complex system can learn. For example, every plane crash, sadly, makes flying for the larger population safer, because the system can improve as result of this stressor. Stressors trigger an evolutionary process, in which the removal of fragile parts, lead to the system getting fitter as a whole (Taleb, 2013).

As complex systems become more interconnected and embedded in a variable and volatile environment, these systems need to be able to cope with high-impact stressors more than ever before. Some stressors are plausible, to some extend foreseeable, and have a small impact on a system. On the other hand, we can distinguish a Black Swan event, which can be defined as a rare, unpredictable event with an extreme impact on a system (Taleb, 2007). To anticipate a looming Black Swan, efforts at trying to predict its consequences are misplaced. However, it is more valuable to address the apparent and measurable fragile parts of a system (Taleb, 2013).

The need for systemic resilience

Resilience has many definitions, but it is in essence the ability of systems to cope with a stressor. The resilience of a system has its limits and should be considered in relation to a stressor. To illustrate, think of a bouncing metal spring and the stressor of a gradual increase in force. If the force gets too big, the spring deforms. When the force is replaced by another stressor, such as temperature, the spring loses its function as the melting point is approached. In the case of a metal spring, the desirable bouncing capability can be pictured easily. However, designing for resilience of complex systems is more difficult, as the stressors of complex systems are partly unpredictable, and the systems fragilities are context specific. To increase the actionability of resilience-related concepts in decision-making and strategy development, Nieuwborg (2023) proposes a categorization of resilience. This categorization is based on a scoping review of definitions from many

different academical fields and industries. Here, resilience has been categorized into the system property: fragility, robustness, adaption, and transformation (Nieuwborg et al., 2023). This categorization can be viewed in two ways. First as a system capability, a way of coping with a stressor. Second as an aspired goal for a system state, a strategical goal.

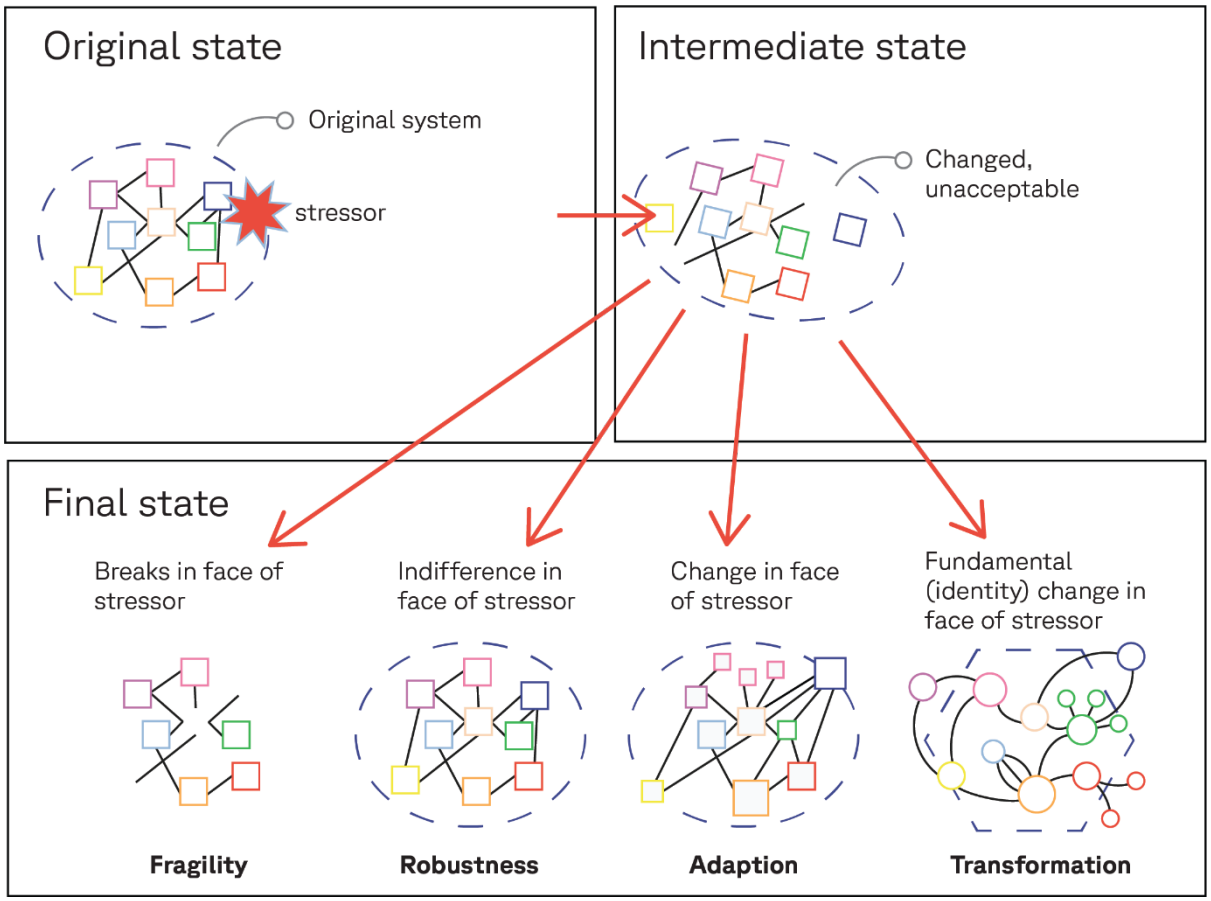


Figure 4 A categorization of resilience

Each desired final state implies the use of specific resilience strategies to work towards that goal (Ramezani & Camarinha-Matos, 2020). For instance, to increase robustness one can, enlarge certain buffers, create overcapacity, or increase the diversity of options within a system. To increase adaptability one can, create the conditions for self-organisation, i.e., creating parts that have the power to add, change, or evolve system structure (Meadows, 2008). At last, to transform a system means to fundamentally change the purpose of a system, giving a system a new goal in relation to its stressor. The field of systemic design provides practical principles for achieving this systemic change. The principles are captured in the work of researcher Van der Bijl-Brouwer (2020). They entail: (1) opening up and acknowledging the interrelatedness of problems, (2) developing empathy with the system, (3) strengthening human relationships to enable learning and creativity, (4) influencing mental models to enable change and, (5) adopting an evolutionary design approach.

Shaping paradigm shifts to transform a system

To conclude, a complex system undergoes a transformation when it fundamentally changes its identity in face of a stressor. This fundamental change in identity can be interpreted as a change in purpose, in other words the goal of a system changes. Literature on systems thinking informs that such a transformation only occurs after a shift in paradigm has been made (Meadows, 2008). A paradigm is a set of theories, models and views that together form a conceptual framework (Kuhn, 1962). When a certain paradigm is dominant in a society, it shapes the systems of that society. A paradigm shift radically changes the way we see the world and changes the way we give purpose to our systems as a result. As described in the following chapter, paradigm shifts can be shaped in a design discourse with stakeholders and outsiders of a certain context. Outsider experts, also called key interpreters, can provide a fresh perspective and propose new cultural interpretations of what can be meaningful in a certain domain (Verganti, 2009).

Methodology

To produce transformation plans, the design process consisted of three phases, each dedicated to answering one of the sub-questions. Integral to these phases was the practice of giga mapping, which combines many different types of visual information (see Figure 5). The first phase focused on mapping the current state of the system, the second on proposing a resilient state, and the third on exploring strategic responses aimed at achieving this state. The systemic design approach used in each phase is described below.

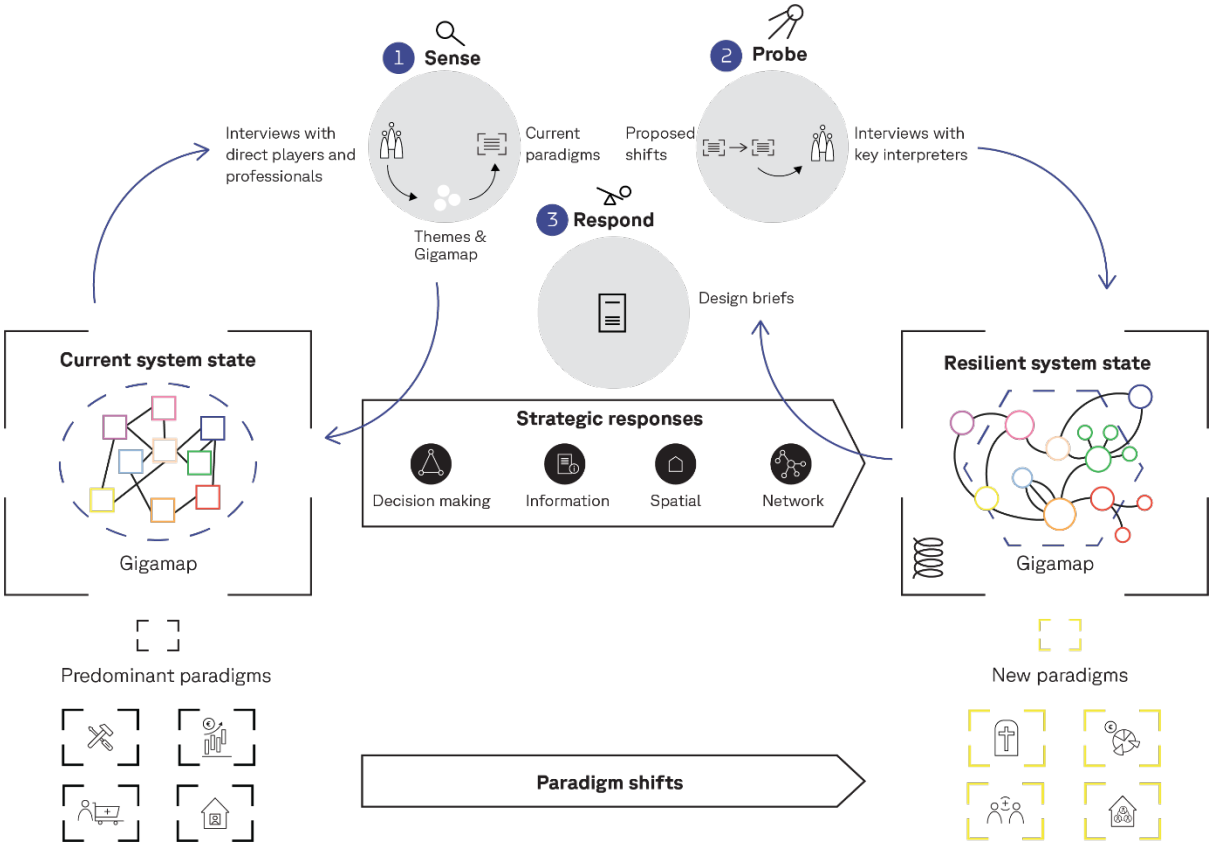


Figure 5 An overview of the process

Integral approach

To acknowledge the interrelatedness of the problems, the practice of giga mapping has been applied. This method was developed by Birger Sevaldson and builds on the visual capacity of design. The added value of this technique is that it allows us to map across multiple layers and scales to investigate relations between seemingly separated categories (Sevaldson, 2011). Giga mapping was done throughout the project and functioned as sensemaking tool and probing tool. Giga mapping was also an outlet for a learning approach (See Figure 6). First, it enabled to fail-fast and iteratively build understanding of the current system state. Second, it enabled to probe strategic responses and explore how different interventions relate to each other to create resilience. Third, it offered a visual means for communication with other stakeholders.

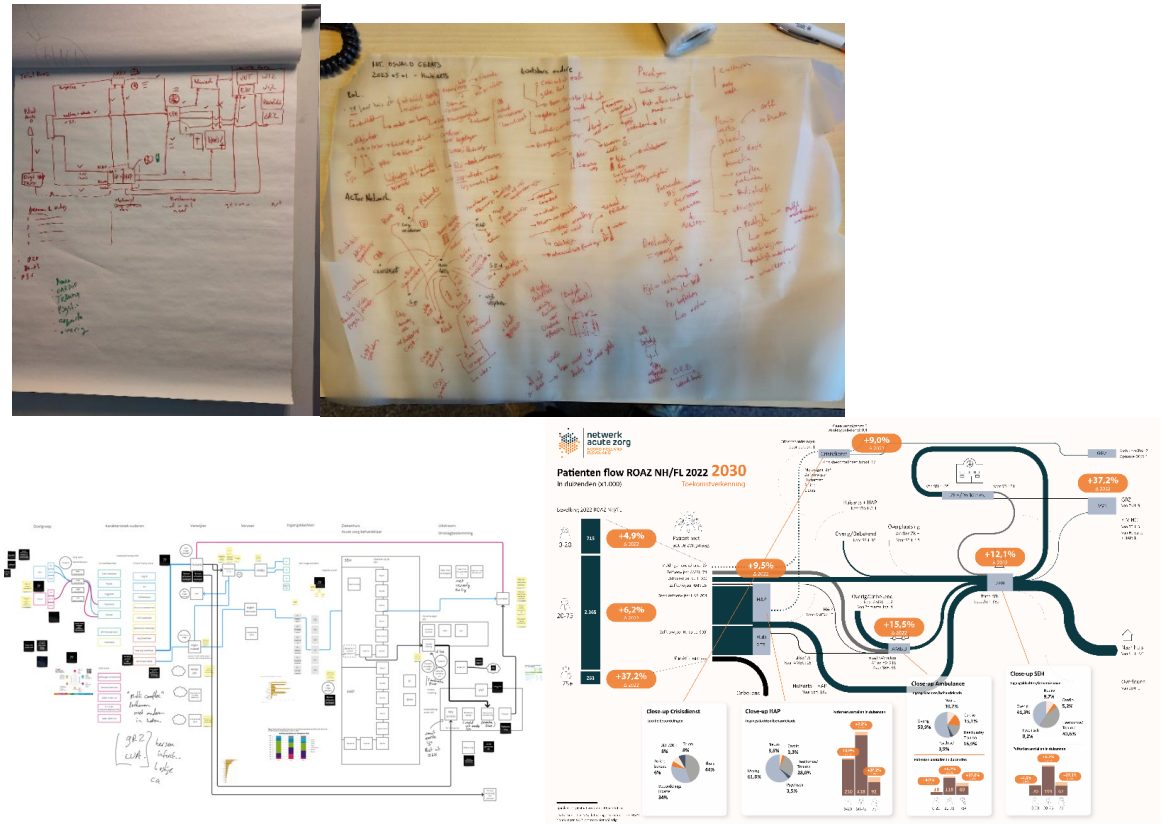


Figure 6 Showing different stages of patient flow in the ROAZ region, as a part of the gigamap

Multi-phase approach

The first phase was aimed at creating understanding of the current state of the system through conducting semi-structured interviews. The second phase was focused on proposing potential paradigm shifts to explore in which beliefs and models a resilient system could be grounded. The last phase aimed at exploring strategic responses to work towards this newly envisioned resilient system state.

1. Current system state
2. Resilient system state
3. Strategic responses

To familiarize with the acute care system, multiple means have been used to make sense of the context and to map this out in a giga map. I have attended, online seminars, conducted site visits to an emergency department and call centre, attended various symposia, joined ROAZ strategy meetings, held (in)formal discussions with policy makers, and met with elderly (ex) patients. However, the most extensive way to gather insight, was the conducted semi-structured interview study.

Phase 1 approach - Current system state

The aim of the first phase was to establish an understanding of the current state of the acute care system, through the eyes of direct players and professionals. Interviews enabled me to empathise with different stakeholders. The interview goal was to get a sense of their perception on the stressor, their role and relationship with other actors, and how they defined the current and potential purpose of the acute care.

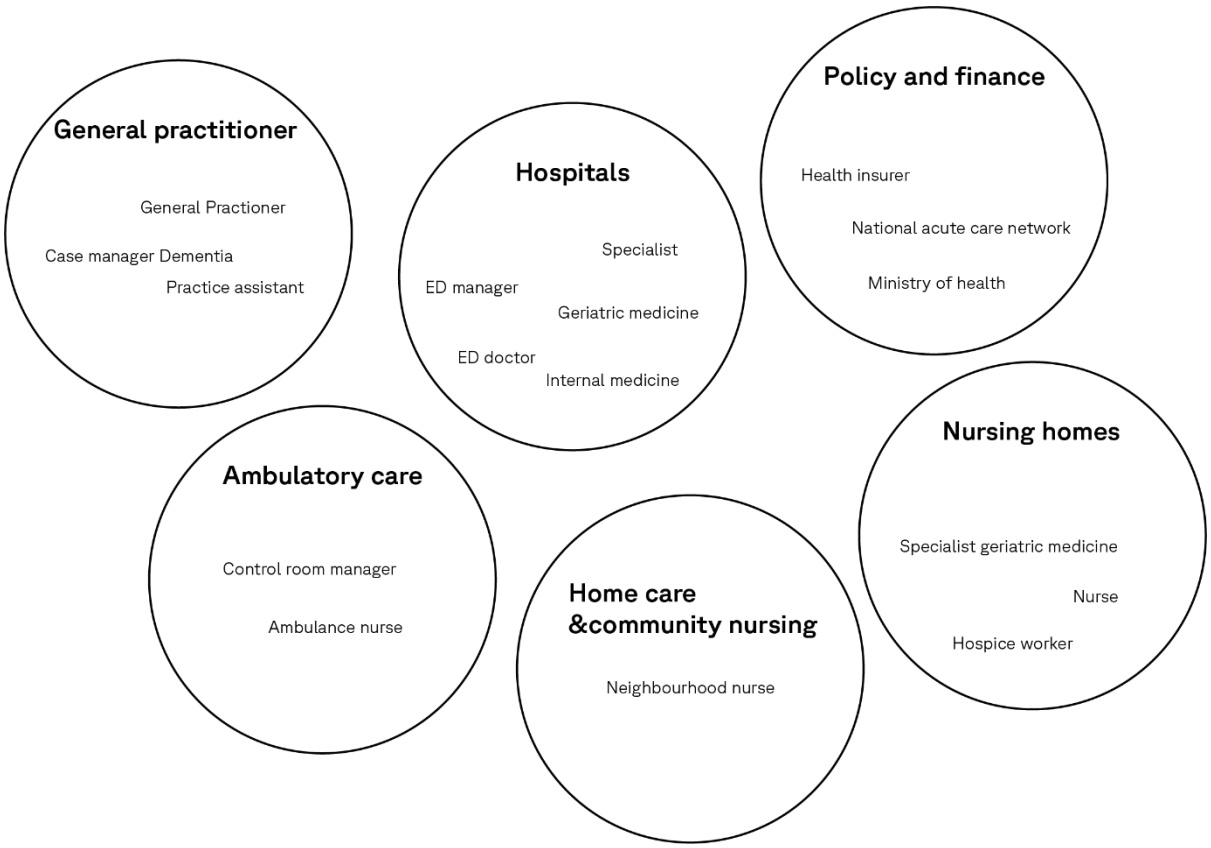


Figure 7 The different identified domains of the participants

This interview study aimed to gather the perspectives of professionals from all the sectors of the acute system (see Figure 7). Ideally each participant was located in the ROAZ region of North-Holland/Flevoland, however participants from outside the region were not excluded. The included professionals either worked in direct contact with the elderly or they worked on policy and management, influencing the acute care system indirectly. It was important that the participant had more than five years of field experience and was able to interpret the current dominant paradigms, in other words was able to zoom in and out of their operational context, to share their thoughts about the acute care on a systemic level. The participants (see Table 1) were recruited through personal relationships, contacts of the ROAZ agency, the medical hospital Amsterdam UMC, referral, and cold outreach. As the ROAZ agency already works closely with all the partners in the acute chain, relevant stakeholders could be identified in collaboration with them.

Participants - direct players and professionals

Table 1 An overview of the participants

Participant code	Titel, profession	Organisation
P1	Home care nurse	Zuster Jansen
P2	General practitioner	Zorggroep Almere
P3	Medical manager	Control room Rotterdam
P4	PhD, Geriatrics medicine	Tergooi MC
P5	Manager, Emergency Department	Franciscus Gasthuis
P6	Science coordinator Emergency Department	Meander MC
P7	Internal medicine	Ijsselland Ziekenhuis
P8	Full professor, Internal medicine	Amsterdam UMC
P9	Director, Design for end-of-life lab and volunteer in Hospice	TU Delft
P10	Network advisor VVT	Aafje
P11	Senior healthcare buyer	Zilveren kruis
P12	Managing director, Dutch Internal medicine association	NIV
P13	Project manager Learning network Acute Elderly Care	Cordaan

Semi-structured interview format

Each interview followed a semi-structured format, consisted of six parts, and gave room to briefly question specific topics per participant. If an interviewee published relevant papers about the target group for example, it was valuable to discuss their specific research. The interviews were conducted in Dutch and took roughly between one and two hours. Five were conducted online with Microsoft teams and the other eight were conducted in person. In the first part of the interview, the participant could describe their current role. Secondly, the participant was asked about its network and close collaborations. Thirdly, the interview focused on the participants perception of elderly citizens with vulnerabilities and the implications of the rise in elderly for their work. Here participants could elaborate on the systems fragilities. Fourth, the participants could discuss on their view of the current dominant paradigms in the acute care, after which they could state which changes in paradigm they find meaningful. At last, they could share concrete initiatives that embodied these paradigm shifts and were hopeful in their opinion. These six topics formed the basis of different themes that are used in a giga map and later in the design process.

Data analysis and ethics

All the recorded interviews were analysed with the use of statement cards, a method developed by (Stappers & Sanders, 2019). This method consisted of distilling paragraphs or quotes from the interview's transcripts, giving it a title, timestamp, and an annotation. These

statements cards functioned as a first filtering of the data. The criteria for filtering were stressor, actor, relationships, or purpose as a whole. Each statement should attribute to information about one of these topics. The statements were then coded into ATLAS.ti software. Patterns across participants were found and the well-grounded codes were grouped into overarching themes.

- Stressor: what is their perception of the growing and aging population?
- Actor: What is their perception on their role?
- Relationships: How do they relate to other actors?
- Purpose as a whole: How do they define the current goal and paradigm?
- Potential paradigm shift: What could be a meaningful transformation?

All the participants signed an informed consent form before the start of the interview. The participants agreed to be recorded with audio and video and freely express their thoughts. All their input would be pseudonymized to protect their views.

Phase 2 approach - Resilient system state

Key interpreters' interviews

The results from the interviewed direct players and professionals were synthesized to a set of paradigm shifts. Each shift highlighted subthemes from a predominant paradigm towards a new paradigm. These shifts were discussed with key interpreters, experts who helped to develop the strategic responses. Key interpreters are experts that look from a different lens to the same life experience. They challenge our own cognitive frame through a process of developmental criticism: simultaneously judging and envisioning the paradigm shifts and potential strategic responses. Interviews were conducted with key interpreters, because paradigm shifts that are bold and radically different from the status quo are also weak. In other words, the proposed paradigm shifts are, in a sense, hypotheses about what a renewed acute care system could be based on. In intimate discussions with the key interpreter, these hypotheses are sharpened and strengthened.

The selected key interpreters (see Table 2) are mainly 'outsiders' to the current acute system, working in adjacent fields, indirectly shaping the acute care through their profession, or they worked in a totally different context on acute care. For example, an architect who designs hospitals and shapes an emergency square or a medical planner in acute military care managing the acute care chain during military operations. A framework of Verganti (2009) was used to identify different categories of interpreters to the domain of acute care. They were subsequently found and recruited via literature consultation, desktop research, and referrals of other professionals as thought leaders in their field.

Participants - key interpreters

Table 2 An overview of the selected key interpreters

Participant code	Titel, profession	Organisation
KI1	General practitioner	HZW
KI2	(retired) Mental health psychologist	-
KI3	Founder, Senior architect	Vakwerk Architecten
KI4	Design strategist	Philips

KI5	Tech & design director	Kysos
KI6	Policy maker	Ministry of Health, Welfare and Sport
KI7	(ex) Process manager within the operational healthcare of defence	Ministry of Defence

Discussion format and analysis

During one-hour discussions with key interpreters, each was introduced to the aim of the discussion, after which the paradigm shifts were presented one by one. In between each shift, there was room for the interpreter to react. The following questions were central to the discussions: “Are the shifts understandable?”, “Are they in agreement with the interpretation of the current paradigm?”, and, “What are their reflections on the implications of the shift?”. After discussing the paradigm shift the focus was placed on discussing responses. In some of the discussions, the giga map was used to discuss multiple responses integrally. The audio of each discussion was recorded, and interviewer notes were used in the development of the responses, and sharpening of the paradigm shifts. Due to time constraints, the audio was not transcribed and analysed.

Phase 3 approach - Strategic responses

In the synthesis of insights gathered from the first two phases, the goal of the last phase is to create a cohesive and interconnected set of responses.

> *Increasingly I no longer talk about solutions, because I don’t think there are any “solutions” to what we face. I think we face a predicament, not a problem. A problem has a discrete solution. I prefer to think of responses, there are a million or more responses to the situation we face.” – Nate Hagens (VPRO, 2023)*

Systems thinker Hagens (2023) expresses in the statement above how “problems” on systemic level, cannot be framed as ordinary problems since these are problems that cannot be solved. Likewise, the third phase of this project focuses on creating responses. This was done by developing responses derived from the new paradigms and mapping them on a giga map to explore a resilient system state. Each response derives inspiration from various resilience strategies as captured in the theoretical background (Ramezani & Camarinha-Matos, 2020). The main guiding ideas to increase resilience was to make more options available or enable parts of the system to self-organise and have the power to create new options. Finally, each response is described in design briefs, outlining their intended effects on a predicament, and discussing implications for further evolution.

Results

This chapter presents the results of the research phases. The interviews with the thirteen participants resulted in 315 quotations and 134 codes, which were clustered into themes. To present the findings in a concise manner only the themes informing the perceptions on the stressor, professional mindsets, and paradigm shifts are presented below.

Professional perceptions on elderly with vulnerabilities

To understand the way the aging and growing population puts pressure on the acute care system, a shared understanding of the vulnerabilities of older adults must be established. The following themes unravel the stressor in a set of key insights which later can be used in designing systemic responses.

Professional perceptions on elderly with vulnerabilities	
The vulnerable elder is a construct.	The vulnerable elderly. See, that's a term that was coined. That's a construct. You are also vulnerable and so am I. You could say the vulnerable person (P9).
Multi-morbidity and *chronic illness*	We see a lot of patients who suffer from more than one condition and who are also chronically ill. So, there are many chronic conditions that also interfere with each other. [...] And that makes the care question for those specific patients more complex. (P11)
Suddenly vulnerable	But the largest group are people who, [..], are creaking wagons that keep driving until they run over a small stone. And then the wheel flies off. [..] It's a delicate balance. And if something happens, and that can be something physical, a pneumonia, a urinal tract infection, but that could also be a partner who has fallen away due to illness or death. [..] So that balance is broken (P10).
Domain transcending problems	People with problems that transcend domains. And for example, we now regularly see older drug-dependent patients who are ill (P10).
Small informal care network	More and more in this society, there are people who simply don't have children. There are many more than before. I don't have any children either. So, when I get older, I will still have a partner. But I don't have children. So who's going to help me (P5)?

The vulnerable elder is a construct.

When asked to describe the vulnerable elderly, in Dutch: *de kwetsbare ouderen*, a frequent answer was “the vulnerable elder” does not exist (P9). Or “There are also vulnerable young people” (P8). Overall, the consensus was that vulnerability lies in dependency. These dependencies vary to such extend that you cannot talk about the vulnerable elder as if it is a homogenous group (P2). These dependencies can lie on multiple axis: physical, social, cognitive, emotional, and spiritual. The last, spiritual care, is often neglected or not addressed at all in the medical field (P9).

Multi-morbidity and chronic illness

Multiple interviewees concluded that due to the growing aging population, the care demand will be more complex because of chronic illnesses as a result. People will have an acute care demand when there is a sudden worsening of their chronic illness (P11). When it comes to elderly people, this is already a large part of the acute presentation at the emergency department. This type of acute care cannot be handled without in-depth knowledge of the prehistory and medication use of the elderly patient (P12).

Suddenly vulnerable

When speaking about the vulnerable situation of elderly, several participants reffered to a fragile equilibrium that has to cope with a sudden shock. In other words, a disruption of the life of a senior, making them dependent. Different methapors were used to describe this sudden change. With vulnerable elders there is a “constant threat above the market” (P2), these seniors are “house of cards patients” (P7) or “creaking wagons” (P10). More than often this shock comes from the interaction with the current acute care system. P7 stated: “[Older] people are tired to the bone, which often puts pressure on their cognition.” Physically, elderly are weakend (by their hospital visit) because they do not eat properly (P13). The large majority of the participants concluded that the work processes of the acute care are detrimental to the needs of the elderly.

Domain transcending problems

It was often stated that an elderly person had a care question rather than a medical question. Participants suggested that the elder should not have been assigned to the hospital with these issues. At the same time, participants experience a rise in elderly with domain transcending problems. To illustrate some of these cases, seniors are either mentally disabled, have extreme obesity, are homeless, cope with an addiction, have limited willingness, are not insured or a combination of the above (P2, P4, P10). While these cases are extremes and do not make up most of the elderly patients, this minority requires a lot of care and attention from professionals.

Small informal care network

Currently care professionals from the emergency chain struggle more with elderly patients with a small informal care network. Social networks have a monitoring function and can reassure distressed elderly. For example, a family member can simply arrange a drive to the GP instead of relying on ambulant care (P3, KI1). When a senior has family living at a distance, a family conflict, or no children at all, it takes more time and effort to get someone home and to provide informal care (P5).

To care or to cure: varying mindsets of professionals.

Within the acute chain, professionals fundamentally differ in their modus operandi and the way they address the stressor. This section presents a pallet of different attitudes that arose from the interviews. This study cannot and does not aim to generalize the beliefs of a whole profession. However, some of the mindsets are likely more present in the acute chain than others. As this thesis focuses on transformation by shifting paradigms, these tensions are addressed as a source of inspiration for paradigm shifts.

There is a distinction between patient centred care and protocolised care. This difference is fuelled by the work cultures and type of care. According to the GP, at the emergency department, protocols shape the work culture: “I have chest pain, then these and these steps are executed, and we'll see what comes out (P2)”. An ex-ambulance nurse (P3) described a similar attitude: “To us, at that moment, the vulnerable older adult is not a vulnerable older adult, but just an acute care patient.” This protocolised approach directly opposes the view of the interviewed geriatric nurse and general physician. For example, the latter stated: “The culture at the ED is a different culture than that of the GP post. Then it firstly is about looking and personal curiosity. And thinking about what this patient needs to be able to move forward from here (P2).”

While nursery homes are viewed as the end of the acute care chain, they traditionally are based on the principles of Peace, Cleanliness and Routine for their residents, which is the direct opposite of acute care of elderly, according to participant (P10). To illustrate, an ED doctor stated that her main goal is to stabilize the patient (P6). To quote another internist: “Doctors are trained to save people's lives. Cure. Not giving comfort. That will happen later, but first we must diagnose, first we must heal” (P8). In addition, it is notable to mention the difference in interventionistic attitude of different actors in the chain. While a GP has learned to stand with his hands behind his back, such an act is perceived as “pulling out all the stops” from the perspective of an internist (P7).

Varying mindsets of professionals	
Patient centred care vs. protocolised care	In my experience, good care means providing care that suits the patient. That is what you should strive for. (P4) vs. To us, at that moment [of the ambulance pick up], the vulnerable older adult is not a vulnerable older adult, but just an acute care patient. (P3)
Care vs Cure	I also learned to stand with my hands behind my back. (..) I never had the belief, I am going to save people from death. (P2) vs. Doctors are trained to save people's lives. Cure. Not giving comfort. That will happen later, but first we must diagnose, first we must heal. (P8)

Paradigm shifts

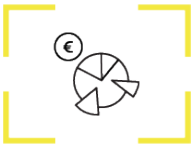
The following section will describe the current dominant paradigms and the proposed paradigm shifts within the acute care system. Each paradigm is a cluster of themes which are summarized in a short paragraph.

> From viewing care as a business for professionals to approaching care as a social undertaking. From a belief in the makeable human, to live with a view of the end. From perceiving care as a commodity to seeing care as a common good. From the wish to live independently at home to the desire to living old together.

From: Care is a business for professionals

The current health care system where care is perceived as a business for professionals, fosters over-specialisation, distrust, and fragmentation. Currently, care professionals are rewarded via a production-funding structure with specific diagnosis-treatment combination's (P12). This system fosters over-specialization among professionals. Specialization, while enhancing competitive positions, has led to fragmentation, particularly evident in medical departments and mental health organisations (P7). Complex patients are often shuffled between providers due to financial disincentives, leaving patients without solutions (KI1). The competitive environment also contributes to distrust, reflected in an administrative burden, and limited professional freedom (P8).

Care is a business for professionals	
Production based rewards	but an orthopaedist also wants to do hip and knee work, so that he makes his money, or a cardiologist who uses telemonitoring sees that he can declare much fewer DBCs and therefore in relation to his medical specialist company receives less income. He thinks, yes, I want to be paid through my production. If I implement this innovation, less money will come in, but you will also get paid less. Yes, that is of course a huge hurdle (P11).
(Over)specialisation	Because in recent years we have seen that specialists have started to specialize more and more. And we, [internists], tried to return that to the basic federal knowledge that is necessary to see the patient much more as a whole and to prevent a patient from seeing two or three or perhaps more internists (P12).
Administration & limited professional freedom of action	If you prescribe a certain drug for the patient... you must write an authorization. And you write that authorization. And then the pharmacy says, oh no, this is not good. And then you get an email [weeks later]. But it's not once, it's not twice, it's continuous (P8).
Informal care is secondary to formal care	I sometimes take [groceries] for them. That is officially not allowed. For the special bond you could build with those elderly. That's just deemed not being professional, that's not allowed (P1).



To: Care is a social undertaking

As opposed to the business-like approach, care is at its core a social undertaking, an interaction between humans (Berger, 2022). If we think of care as a social undertaking, we can see that not every acute issue demands a specialised medical intervention (P5). For example, a senior needs to be monitored or more importantly reassured. Professionals also need informal care networks to meet these care needs. These networks must be strengthened, educated, and overall set up for success (P4). The focus on collaboration creates room for directorship and professional trust. This is especially needed in hospital context (P8). Elders are helped making decisions on what is medically and socially possible.

Care is a social undertaking	
Population funding	I firmly believe that we as an insurer will soon be paying much less attention to how much production do you deliver now? But look more closely at whether my duty as care provider has been fulfilled? So is my accessibility in a “care area” of hospital okay? And is the amount I spend on care in proportion to what I receive in premium income from that population? (P11).
Integral view on care	The coordination, the directorship is what is currently missing. And what older people need is someone who knows a little bit of everything. An internist, geriatric medicine, Nursing home doctor. Or a hospital doctor. A care director (P8).
Trust and professional freedom of action	In my experience as a soldier, if you make people responsible for the execution. And you give them the right conditions. Then people find it very exciting. And at a certain point also very pleasant. Because you're somehow, you are actually the boss of your own business. And that's where you get part of your professional honour (KI7).
Professional care helps informal networks thrive	Because in a formal healthcare system that already exists for that patient, which is sometimes very well organised, you take that with you and incorporates into your own care that you maintain that network and supports a plan for success, so that they can arrange things at home as quickly as possible. And there are still challenges for my own profession (P4).

From: Care is a commodity

The presence of care is taken for granted. Strong individualisation and marketization of care has shaped behaviour of citizens. Increasingly people behave as consumers. Care is seen as a commodity, a widely available and interchangable consumer good (P7). This can be examined with general practitioners, who are more and more organized in large-scale structures in which people no longer have their own general practitioner. The benefit of a GP lies in the trusted personal relationship with a patient, something which is lost in such a structure (KI1). Internet has broaded the horizon of people, simultaneously fueling fears and highlighting medical possibities (P7). The elderly of tommorow, will demand more of care. Mistakes are less accepted and when expectations are not met, people “shop” for a doctor that goes a step further. In a world were services are available 24 hours a day, people expect instant gratification from the acute care system. A yearly care premium was introduced to increase cost awareness of Dutch citizens. However this resulted in more demanding behavior (P3). This attitude was also illustrated by another doctor: “I'll pay the 300 euros myself, but I'll go to the emergency room if I want to go to the emergency room. I don't wait for the GP. (P7)”

Care is a commodity	
Consumer is king mentality	People consume their health, too, and then we [medics] must solve it (P7).
100% certainty demanded	Because society simply no longer accepts mistakes. You know, in the past, family members could sometimes say yes, that can happen. Yes, it is human work (P3).
Instant gratification	Patients will behave as consumers. And that makes it increasingly difficult to regulate this properly. A lot of people say, it doesn't matter to me, I'll pay the 300 euros myself, but I'll go to the emergency room if I want to go to the emergency room. I don't wait for the GP (P7).

To: Care is a common good

Currently, we are not confronted with the limits of what is possible with medical technology, but we are confronted with the limits of what is possible in terms of costs and operations (KI5). Professional care is a limited resource and as a society we must make tender decisions as to what we want to do (KI6). A partial reaction is to de-medicalise: not everything can and has to be answered by the medics. However, this is a hard and radical shift for individual patients (KI5).

Care is a common good	
Understanding the limits of what is possible	We are not confronted with the limits of what is possible medically and technically, but we are confronted with the limits of what is possible in terms of costs and operational capacity (KI5).
Tolerate uncertainty	Society as we know it in the Netherlands is becoming very medicalised and we want an answer for everything (P4).
Patience	but also, their own GP is very busy. Because people sometimes indeed have to wait for 45 minutes, 50 minutes. In the end they think, well, things won't turn out well and they call 112 (P5).

From: The makeable human

The belief that new medical technology can improve our health and quality of life is central to the worldview of many doctors and members of society at large (P9). In a way, a consequence of this belief is that care creates care: “We can do more, so we will do more”. Notably, acute care is organised in a reactive manner to address sudden health issues: “Heart attacks, fractures, sport injuries, the moment something happens, we’ll fix it”. Also, doctors notice society increasingly having difficulty accepting the fact that we all are mortal beings. Once the “the emergency train” departs, the system has the goal to stabilize to extend the life of a patient. While effective for a generally healthy population, this approach proves insufficient for elderly patients, who may experience increased frailty after hospital visits and a general lack in personal care. This becomes especially crucial as, in the future, more elderly need to rely on acute care. Medical technology is poised to significantly prolong human life, raising questions about the potential extension of the dying process and society's strained relationship with mortality.

The makeable human	
Med tech optimism	So, people live as if they were immortal. And the moment something happens, we'll fix it, so they can live again as if they were immortal (P9).
Acute care is reactive	The well-known hip breaker, [a common case of elderly acute care]. If the hip fracture is not clear, you want to rule it out. For this you go to an emergency room at night. And then it turns out there is a fracture in the hip. (..) Then, immediately healthcare will switch to a treatment process. Although we have already gone through the whole (advanced care planning) program with the GP (P10).
Stabilize to extend	I do not like long-term chronic outpatient follow-up care. That doesn't really bother me either. If I can stabilize someone [..] that gives me a lot of satisfaction (P6).

To: Live with a view of the end

A lifestyle where we are conscious of our own mortality. Many people today live as if they are immortal (P9). They are forward-looking and see death as an obstacle in their way of life (KI7). In contrast, being conscious of one's end of life allows for a gradual adaptation of lifestyle in accordance to age. Consequently, death will not cause unease. When a society pays attention to the inevitability of death, the medical expectations set by patients and their families will be more realistic (P7). This paradigm also changes the ways we shape our elderly care. We can assign resources to proactively shape meaningful care for seniors in their final phase of life and the case of emergency. This means that acute care for elderly is better equipped in providing palliative care and informal care.

Live with a view of the end	
Memento mori in 21st century	I really like those initiatives, who do not intervene in that last part. But preparing those people for that last part. I think death literacy is such a beautiful term. If you have been familiar with the end of life from an early age. And as you get older you also understand better what matters to you in your life (P9).
Acute elderly care is (above all) proactive	Together, what is it called to map the elderly and the geriatric specialist also naturally has additional expertise to do this. To help the GP if he or she does not know something, so we now call that preventive and proactive care at home. For the elderly who have the impression that they are vulnerable (P13).
Not acting as medical option	Currently someone dying [in a hospital], that's seen as a medical failure. Then they [ED doctor and nurse] also shouted, yes, now we can't do anything for you anymore. Well that sentence, "now we can't do anything for you anymore", so that's what it's all about: you can do something. And that is called palliative care and hospice care (P9).

From: Live independently at home

Autonomy is one of the central values of Dutch culture, inherently intertwined with the concept of self-reliance. Something you lose once you become dependable at old age (P9). Autonomy is also the central value on which policy of the Dutch government is grounded: “living independently at home as long as possible” (Rijksoverheid, 2023). This policy is reflected in the cutbacks and closures of elderly homes, the introduction of neighbourhood nurses and subsides for adapting one’s home for one’s old age (P7). In the past elderly citizens moved to a retirement home, which had an infirmary with nurses and close ties to the GP’s. Many of those retirement homes have disappeared (KI1). The crowding in the emergency room is related to the lack of alternatives in rehabilitation care and nursing homes. The moment the fragile equilibrium of a homebound elderly person is disrupted, the emergency chain is triggered. This results in sub-acute care questions as a pneumonia or a urinal tract infection, putting an extra burden on acute care (P2). There are more seniors living at home, where they adapt their current home to fit their care needs instead of moving to another home or nursing home that would fit all their needs and wishes. These alternatives are not widely available and there are financial disincentives (KI7).

Live independently at home	
Autonomy	It is very good that everyone wants to live independently at home for as long as possible. But as a society we are not ready for it at all. To say, okay, but then we also bear the consequences if things no longer are manageable (P7).
Adapt the environment one’s age	We have people who regularly call 112. Calling 112 stops the moment they end up in a nursing home. Then they have care. Suddenly we no longer see or hear from them. Whereas, if those people give the wrong answer 1 in 20 times they call, then an ambulance will come and if the nurse is in doubt, the senior will be transported (P3).

To: Live old together

A new generation of seniors are eager for new spatial concepts with intergenerational social structures (P4, KI3). Next to added spatial, social, and medical benefits, the intergenerational housing should be made desirable for the generation of 60-year-olds (KI3). “You should not move old trees”, or at least as little as possible in an acute situation according to (P13). These moves can be permitted to some extend if an older adult moves to a livelong home with adequate care facilities when they are still vital. If seniors consider communal housing forms, in the last stage of life, they want to surround themselves with people with a similar lifestyle, culture, ethnicity (KI2). Simultaneously, when you age, your world becomes smaller, up to the point you live as a hermit (KI2). Sometimes this is voluntary, but that is not always the case. Meanwhile, autonomy and independence as opposed to dependency has benefits. The effect of as much self-reliance as possible is that you remain at a certain level as an older person (KI2). New spatial concept should therefore not be “disabling” and offer gradual options of care reliance.

Live old together	
Connection in inter-generational social networks	I also very much believe in the combination of young and old together. (..)they go there. If they are, I know, many 60 of them are still quite fit, then they contribute a lot to the culture and taking care of each other. And at a certain point they get older and then they stay alone in that room until nothing is possible anymore, of course. And then they receive care at home (KI3).
Move to a lifelong home	from the government you see that that is glorified, that it becomes longer independent at home, because that is what many elderly people would want. Well, I wonder if that's true? Who wants to grow old alone behind their own geraniums? I would love it if my friends lived around the corner, and I could drop by for a coffee when I'm older (P4).

Giga map of the current system state

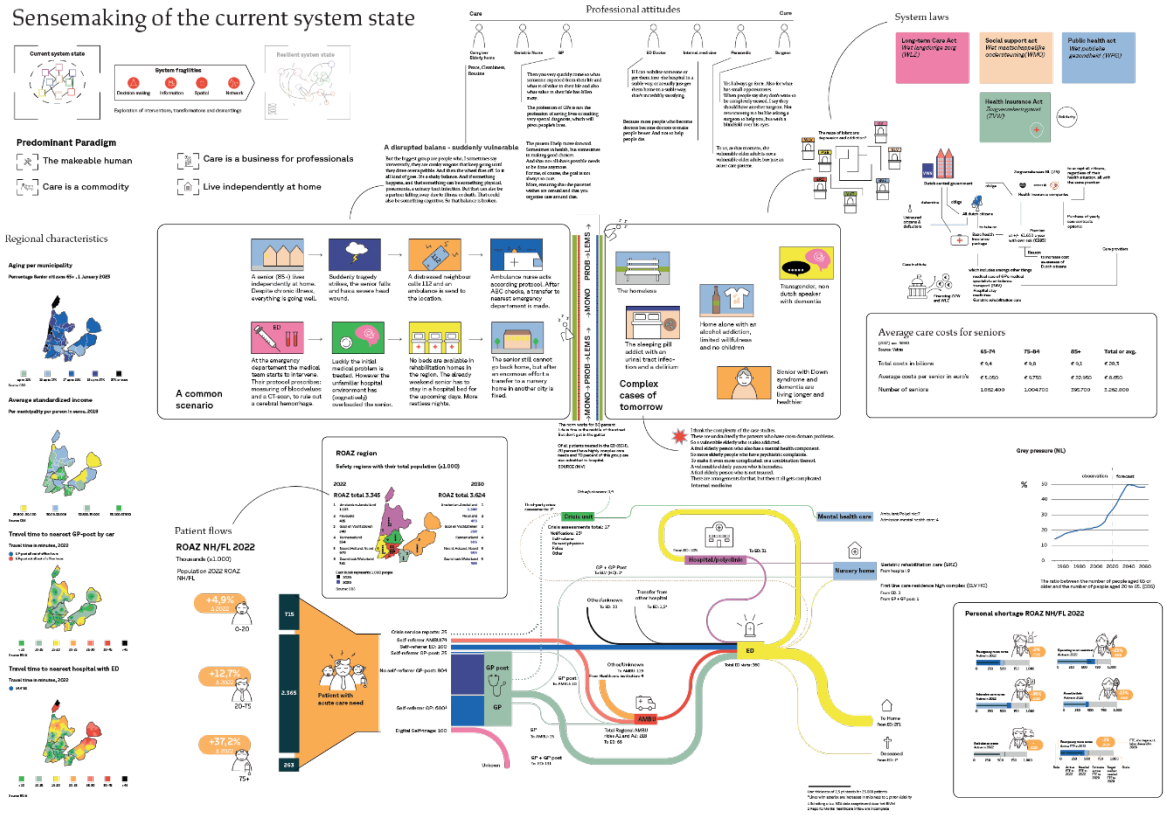


Figure 8 An overview of the giga map of the current acute care system

Figure 8 shows an overview of the giga map of the current acute care. Appendix C, shows an large depiction of the map. The regional patient's flow is depicted, even as various regional characteristics as populations, average standardized income, age per municipality, and travel times to the nearest GP posts and ED's. To build an understanding of the stressor an common scenario and domain transcending cases are visualized. The different attitudes from professionals are shown in the middle. At last, the giga map shines a light on regional personnel shortages and care costs.

Responses

Design briefs – systemic responses for resilience

This chapter describes four designed responses aimed at a fundamental system transformation. All are based on the newly established paradigms. It is an exploration of what could lead to a desirable resilient system state. What follows are four design briefs, directed at improving, decision-making process, information flows, spatial concepts, and social networks. Each design brief will shortly describe the predicament, a brief description of the problem situation of the current system state, followed by a description of a systemic response. Figure 9 shows an overview of how the responses relate to each other (see Appendix C).

Giga map resilient system state system

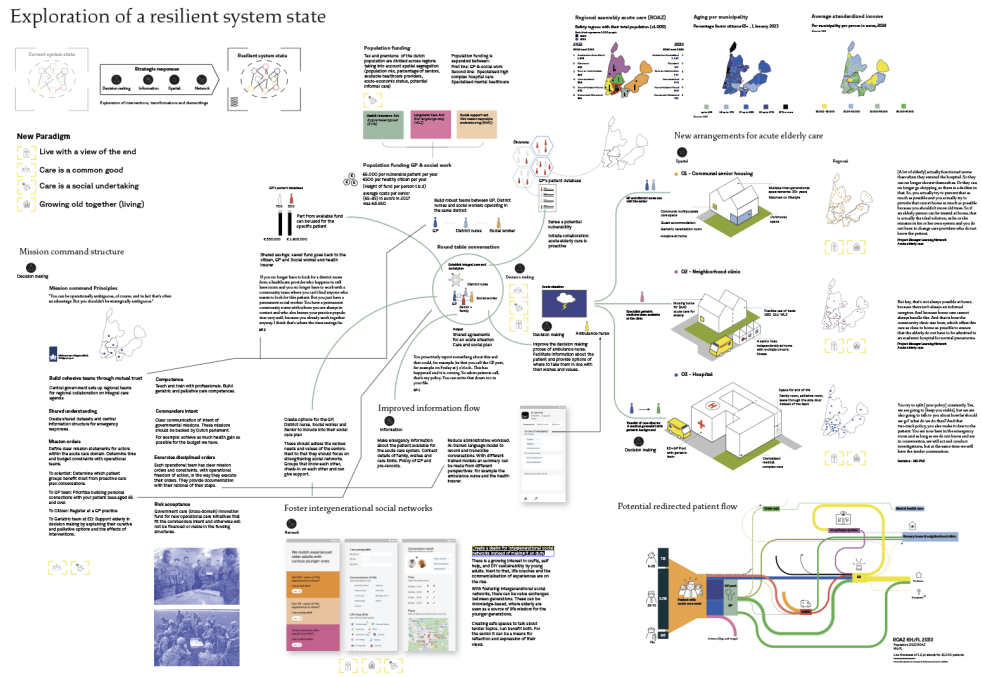


Figure 9 An overview of the giga map of the resilient system state

1. Mission command management model for care

Predicament in current system state:

In the current system state, care is perceived as a business for professionals. This results in fragmentation of care providers, a lack of professional freedom, distrust between stakeholders and a gap between policymakers and operational teams. National formed strategies are ambiguous, and the operational freedom is extremely limited.

Response

If we shift our paradigm from competition to collaboration, we need a management structure and principles to shape and support collaboration. Inspiration can be found in a mission command structure in military organizations. Mission-command model embraces operationally ambiguity and sees this as advantage, while commanders aim to be as clear as possible in their strategies and their underlying intentions (Braw, 2022).

A military commander formulates a mission and communicates the context, intentions, desired effects and rational to their subordinate teams. These can provide feedback on the orders and decide within their delegated freedom of action how best to achieve their missions. To see how a mission-command structure can be adapted to the context of acute care, we can examine the seven underlying principles. The first two principles are to build cohesive teams through mutual trust and build competence. Central government sets up teams for regional collaboration on integral care agenda. Be in close face-to-face contact with the professionals, teach and train certain scenarios with them to create robust teams. An example of such a team could be with a permanent GP, district nurse and social worker operating in the same district. The third principle is to create a shared understanding of the situation. The face-to-face contact between the Ministry of Health, Welfare and Sport and professionals is likely to help, however there needs to be invested in creating central information structure for emergency responses and “the lay of the land”, information about a region. This should include variables as population mix, percentage of seniors, available healthcare providers, socio-economic status, potential informal care (KI7).

The fourth principle is regarding commanders’ intent. There should be a clear and concise expression of the purpose of a mission order. The expressed intent describes what a desired situation, as a result of an executed order looks like. For example, the intent expressed to the GP’s could be to achieve as much health gain as possible for the budget we have. The intent would describe this health gain to further detail. Also, it sets clear constraints in time and budget. These budgetary constraints could be established with a population funding structure. Each GP-team could get six thousand euros for each vulnerable patient per year. With this fund, they can create an integral care and social plan and are free to spend the budget on first-line care/social initiatives, how they see fit together with the senior. To put this in perspective, the average costs (excluding WMO) per senior (65-85) was 8.650 euros in 2017(Vektis, 2019).

The fifth principle relates to creating mission orders. The Ministry of Health, Welfare and Sport must define clear mission statements for actors within the acute care domain. A mission statement should emphasise the results to be obtained, not how they are to be achieved. These mission statements must be concise: For example, an order to the GP teams: prioritize building personal connections with your patient base aged 65 and over. Or to scientists: determine which patient groups benefit most from proactive care plan conversations (KI1). Determine time and budget constraints with operational teams.

The sixth principle is exercise disciplined orders. Each operational team has clear mission orders and constraints, with operational freedom of action, in the way they execute their orders. Knowing the commander’s intent, gives the team the flexibility to address new threats or seize opportunities. They need to provide documentation with their rational of their steps. The last principle is risk acceptance. The teams are focussed on exercising initiative, and act decisively even with uncertainty of outcome. To relate this principle to care, one could set up (cross-domain) innovation fund for new care initiatives that fit the commander’s

intent and otherwise will not be financed or viable in the funding structures.

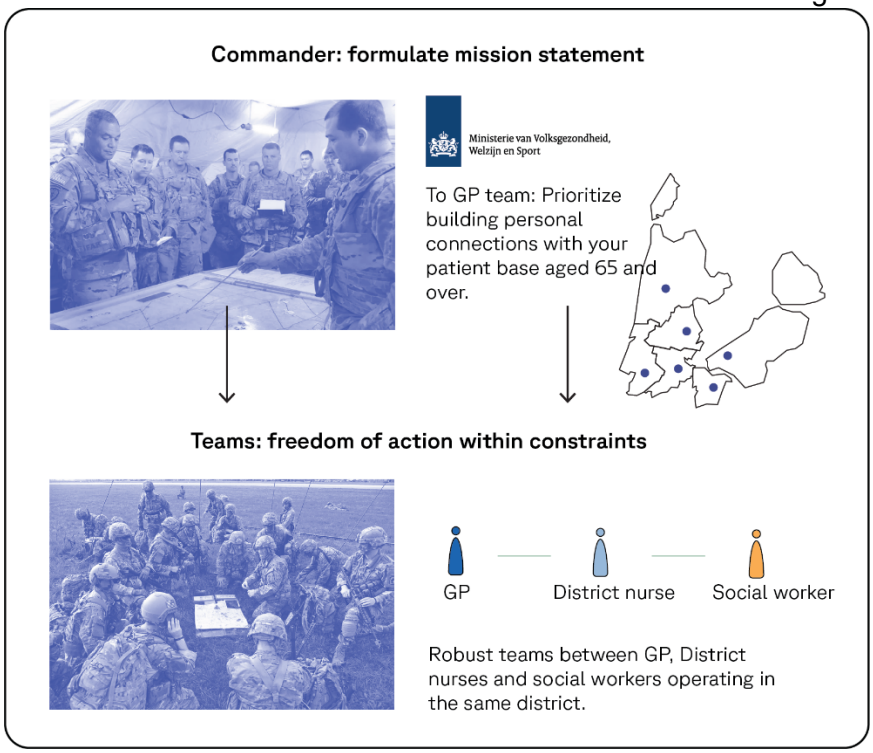


Figure 10 An visual of an possible adoption of a Mission Command structure to care

Discussion and recommendations

This response was a manifestation of the paradigms care as a common good and care as a social undertaking. Highlighted elements of these paradigms are the increased professional freedom of action, respecting limitations of care, and integrating population funding. Clearly, the financial constraints and the boundaries in the given example of the responsibility for the GP's must be developed. But, according to KI1, a GP, this structure could be very interesting for GP practices, organizations who already are quite self-reliant. The formation of strong teams with permanent contacts is something he found promising. It could save a lot of time, currently used in outreaching to other organization. However, the overall design of this management structure must be developed further. It could be that the mission statements are formulated by the Dutch Healthcare Authority (NZa) instead of the Ministry of health for example. Various stakeholders need to be convinced and a transition process has to be shaped. The ministry of defence must be involved in this exercise; something (KI7) mentions they are likely to be open to.

2. Improved information flow

Predicament in current system situation

In the current system state, information does not flow through the system. Either care policies are not proactively formed or accessible in an acute situation. The current information system has a lot of legacy: past decisions aimed at marketization has led to a cluttered field of ICT providers, that are not integrated properly. Software providers are incentivized to keep information locked away in their system (KI5). This hinders decision making processes in an acute care situation. A newly accepted law already addresses this issue: the law for electronical data exchange in care. This law brought forth a developmental agenda (Ministry of Health, 2023). However, acute care is not fully integrated in this agenda yet, although it is one of the most needed cases.

Response

There is a need for a central information structure to improve decision-making processes in and before acute situations. Information entailing acute care policies based on a patient's values, wishes, and needs must be made available prior to an acute situation. This response puts a total redesign of the information exchange system on the agenda. Estonia can be seen as an example. When the Soviet Union fell apart, they immediately set up a digital government apparatus. Currently they have a secure data infrastructure with information about passport and ID card, marital status, businesses, real estate, and medical data combined (KI5). When we start with a secure centralised electronic patient's file, we need tomake emergency information about the patient available to the right actors within the acute care system at the right time. Contact details of family, wishes, and care limits. Pro-active documented care policy of GP and pre-records (P2). Improve the decision-making process of ambulance nurse. Facilitate information about the patient and provide options of where to take them in line with their wishes and values. A total redesign makes it easier for the integration of new technology to reduce administrative workload., for example by AI-trained language model to record and transcribe conversations. By different trained models a summary can be made from different perspectives, for example, the ambulance nurse and the health insurer (KI1).

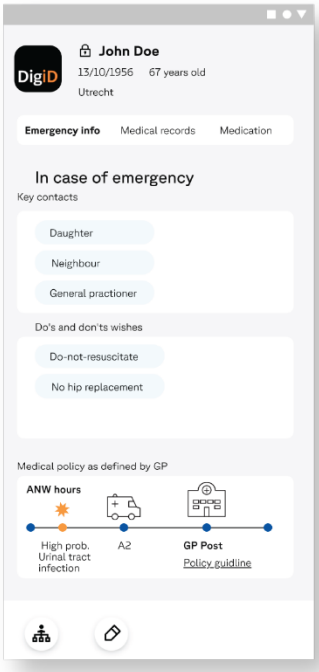


Figure 11 A conceptualisation of an user interface where a senior can manage his or her emergency info together with a GP.

Discussion and recommendations

Proposing a total redesign of the information system is a radical change. Further research is needed with software developers and ICT professionals to create a feasible plan. The political feasibility also needs to be considered, for example how will vulnerable data be managed, and privacy protected in a central data structure? At last, part of this response is also in advanced care planning (ACP). P1, the interviewed GP, stated that to do ACP, one needs to deeply know a patient. This goes beyond knowing someone's medical history and pill use. It takes time to know a patient's values and lifestyle to be able to formulate a fitting care plan for acute situations and someone's end of life. Also, it is important to restate the strong belief in the makable human. Admitting to being vulnerable makes you more vulnerable (KI2). Hence, ACP only focused on end-of-life care policy will probably hit a nerve with an ageing population. ACP should therefore be focused on an integral social care plan, where the GP together with a social worker can also provide social initiatives in line with the wishes of seniors. At last, other responses need to be directed at enhancing the death-literacy of society and facilitate non-medical spaces for seniors to think and formulate a position about their end of life.

3. New arrangements for acute elderly care

Predicament in current system state:

The urgency of acute situations requires professionals to act according to established protocols. This is specifically the case for an intake dispatcher, ambulance nurse and ED doctor. A negative side-effect of these protocols is over-triage and lack of decision-making based on patients' values and wishes in an acute situation regarding end of life. Lack of options for (sub-)acute elderly care, results in a crowding at the ED, where the care policy is aimed at stabilization and prolonging of life, which does not fit the formal and informal care needs of a large group of older citizens.

Response

Therefore, new arrangements for acute elderly care should be established. Professionals need options in how to address the care wishes and needs of seniors. These options have a service and spatial element. Next to the need to enlarge the geriatric, and palliative skills of professionals, especially at ambulance organizations and ED's, there is a need for new typologies and processes to address different (sub-)acute care situations. These options may encompass communal senior housing, neighbourhood clinics, and geriatric emergency squares in hospitals. Since many Dutch senior want to live as long at home as possible, earlier moves to life-long homes must be incentivized for the population of 65 years and older. Communal senior housing has to be designed in such a way that the requirements and wishes of seniors are met. These requirements have a strong financial, social, spatial, and medical component. Apart from this concept, many elderly still want to live at home as long as possible. For them, the neighbourhood clinics offer an opportunity for sub-acute care close to home, better addressing their informal needs. At last, if a neighbourhood clinic is not capable in addressing the acute care needs, a move to a hospital with an emergency department can be made. There must be director with geriatric emergency capabilities to assess the integral needs of the senior.

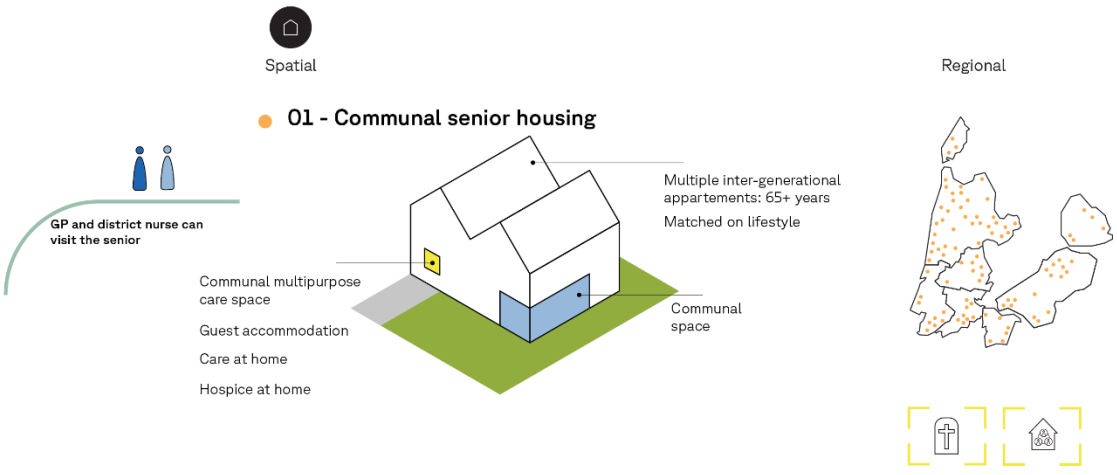


Figure 12 An example of an spatial and process arrangement for acute elderly care at home

Discussion and recommendations

This response stems from the remark of geriatric nurse (P5) stating that "as the entire population gets older, there is simply a different type of care that you need to provide than

what we did in the ED ten years ago". This new type of geriatric emergency care has to be further developed. Essential research questions are: "What information do first responders need for triage?", "What are different needs for elderly in acute situation?", "What is a protocol for determining the acuteness of a geriatric emergency?". And at last, "What sub-acute care options, next to the ED, do there need to be established?".

4. Foster intergenerational social network

Predicament in current system situation

In the current system state, older citizens are viewed as a burden on the acute care system and society as large. Their care needs are complex and expensive, they do not flow easily through the acute care chain, and they have small social networks, that cannot support them in an acute situation. This can be seen as an undesired effect of the individualistic culture in the Netherlands, strongly focused on autonomy and self-reliance. Admitting to being vulnerable makes one more vulnerable. As a result, there are many older people who do not give in to their increased dependency, so they withhold help and do not take precautions.

Response

The response is grounded in the frame of viewing elderly citizens as societal asset instead of a burden. By aligning our response with this perspective, the interventions that emerge will avoic alienating seniors by framing them as needy and vulnerable. We must create a longing for intergenerational social networks instead of enforcing it through obligatory social service. A push for cohesion will not be successful if enforced top-down. Instead, we need to foster intergenerational social networks, based on value exchanges between generations. Such an exchange can be knowledge-based, where elderly will be seen as a source of life wisdom for the younger generations.

Inspiration can be taken from the neighbourhood sharing app Peerby and especially the dating app Breeze, where they match potential partners and facilitate dates in partnered bars. In the same way matches between older and younger adults can be made based on common interests, where they can meet in partnered libraries, nursing homes, community centres, museums, or other partnered locations. Facilitating safe spaces to talk about tender topics, can benefit both. For the senior it can be a means for reflection and expression of their views on life. For younger adults it can help to put personal struggles into perspective and learn from an older generation. For example, there is a growing demand for self-help by young adults (Polak, 2022). Next to that, the number of life coaches are growing (KVK, 2021). There are many young adults that want to learn; however, they lack fundamental knowledge and resources, and that is where the older generation comes in. If a social bond is formed when the senior is vital and continuous over time because it is based on mutual interest, respect and friendship, the informal care network of this senior will be strengthened. They will have someone extra in their network who can sense their frailty. Someone to rely on in a moment of distress, to go to the GP instead of calling for an ambulance.

Discussion and recommendations

This response aims to create a platform for organic knowledge exchange between seniors and students, fostering a stronger network of informal care. The emphasis on shared interests and the rejection of top-down approaches underscores the importance of building connections authentically. It is just one design example, however, a wide pallet of initiatives that foster stronger social networks are needed since not all will be successful. Social networks must be an available option for the GP to refer to as part of their integral social care plan. These social networks can also play a crucial role in creating safe environments to form an opinion on the final phase of life.

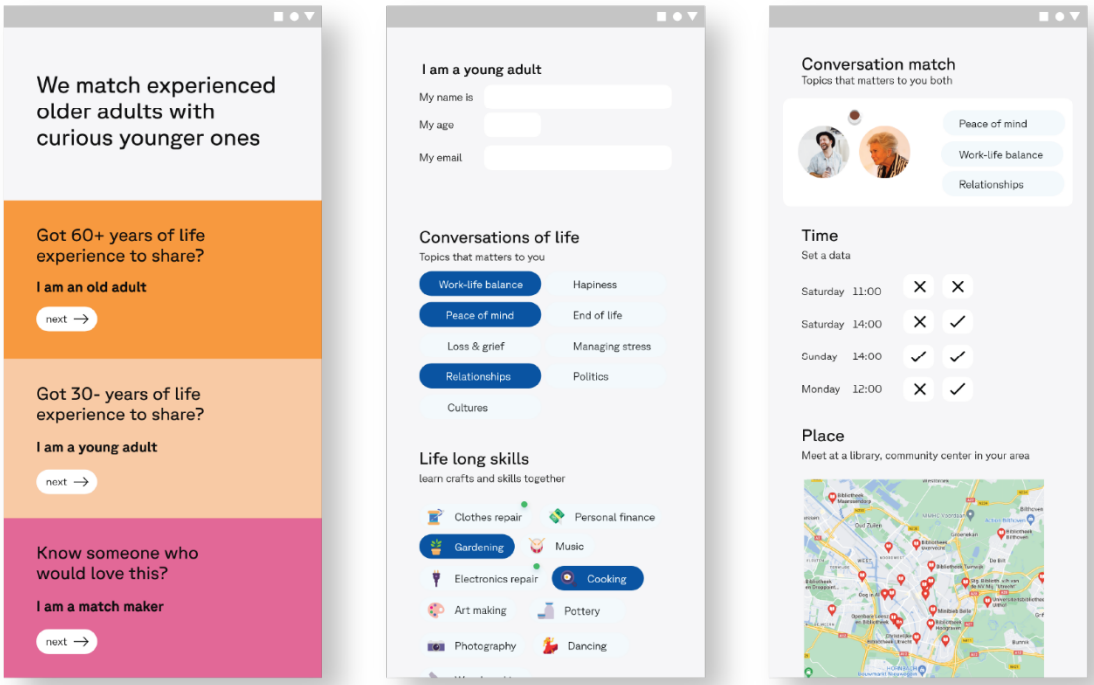


Figure 13 A conceptualisation of the application to build intergenerational relationships based on knowledge exchange.

Discussion and conclusion

This chapter discusses the paradigm shifts and responses integrally and the methods used to create them. Starting with the core of the transformation, this thesis focused on the four paradigm shifts. Hence, it is essential to acknowledge the limitations inherent to 41his design research, for example in the interview study.

On the methodology

The interviewed actors mainly comprised professionals within the context of care. Recognizing that the stressor of an increasing elderly population is mainly driven by human actors, the principle of fostering empathy with the system was prioritized in this research. However, this was a significant limitation, due to time constraints. The perspective of patients is needed in the further development of the paradigm shift and the responses. The elderly of tomorrow are from a different generation, indicating that the sample of patients and elderly need to be carefully put together. Their perspective is needed to address their capabilities and their view on feasibility and desirability of design responses. For example, how do they view the development of a centralised care information system? Next to that, culture shapes the way we give care. To illustrate, one Dutch senior spoken with stated that he could not hide his joy when he saw that his nurse was a Muslim. The different sub-cultures and ethnicities of care professionals and patients were not fully addressed and can provide a deep source of further inspiration to shape acute elderly care.

> From viewing care as a business for professionals to approaching care as a social undertaking. From a belief in the makeable human, to live with a view of the end. From perceiving care as a commodity to seeing care as a common good. From the wish to live independently at home to the desire to live old together.

In the discussions these proposed shifts were never challenged by the key interpreters. The feedback they gave was predominantly positive and additive. Additive in the sense that they were able to generate examples illustrating the dominant paradigms or they added other themes which also reflected the dominant paradigm. They were positive about the concise way the shifts were phrased, KI2, for example stated that the shifts were spot on. However, their reaction to the new paradigms were more uncertain, which was to be expected. A key reason was the use of concepts that already have a certain connotation in the field. For example, when talking about collaboration or population funding as a part of the new paradigm, it is hard for experts to pinpoint what you are really talking about as they already have preconceptions. However, discussing these preconceptions was still useful. Another consideration involves how the paradigm shifts may inadvertently constrain the perspectives of the key interpreters. For now, it was useful to deepen the content of the shifts, but it is notable that additional paradigm shifts were not introduced by them in the discussion based on their background. All the key interpreters were interviewed following the same format, which in hindsight was not necessarily productive. The most useful way of interacting with key interpreters is in sharpening concrete responses related to their field and discuss the underlying paradigm shifts via the responses instead of vice versa.

To end the discussion of the methodologies, giga mapping must be addressed. The strength of giga mapping, is in expressing the complexity of a situation and express various relationships. This way, paradigms could be explored. However, it does not support exploring system dynamics. A gigamp is an expression of my own mental model as a designer. Each model is wrong and likewise a gigamp falls short in grasping the complexity of the acute care. Various ways of modelling, in different phases could be useful in the future.

On the responses

The proposed responses also need to be addressed overall. As the approach of this project was systemic instead of reductionistic, there is a need to view the responses holistically. To illustrate, apps for stronger social networks alone, will not radically change acute care. Besides, it is important to note that desired values as trust, collaboration, or social connection, are designated side effects of an interaction in the designed responses. It is not measurable in advance if the proposed responses will lead to the desired interactions, let alone enhance the resilience of the acute care system. We know that a mission command structure enlarges trust in military teams, but we cannot know if this is also the case for teams in the context of care. Therefore, through a continues learning approach, we must find out if these effects are obtained. A key heuristic here is to have skin in the game in developing responses. This means that the one who conducts safe-to-fail experiments in a complex system as care, should take responsibility for the negative consequences because of the intervention. The attitude of systemic designer should not differ from a doctor: primum non nocere, "first, do no harm".

Despite their potential, the responses are not set up for success in the current system. Now, interventions and innovations are being conducted in separate pilots. Hopeful initiatives are launched with a temporary payment title and other transformation plans must fit very detailed requirements to be entitled to part of the 2.8 billion euros of transformation funds that are designated to optimize the current acute chain. As is clear by now, the responses aim at transformation instead of optimization. Due to their systemic nature, a broader scope of acute care is proposed, with the change parts far outside the direct acute chains. To further develop the responses, it is likely that a political strategy must be formulated in the future. The aim for short-term projects with direct cause effect relationships, must be balanced with projects aimed at long term value, to increase a systems resilience.

Recommendations

The end of this project is somewhat open-ended, I have provided broad paradigm shifts and four responses aimed at transforming the acute care system. Both the shifts as the responses carry a lot of potential, however they also fall outside the scope and sphere of influence of the ROAZ-agency. Therefore, these last set of recommendations are directed at the ROAZ-agency.

Integrate systemic design

Acute care is a system with many different actors with weak relations. To paraphrase Full professor, Internal medicine (P8), thinking in chains, let alone systems, is not in our DNA as medical professionals. The ROAZ, as network organization, already fulfils a crucial role in strengthening the collaborations by bringing different medical worlds together in symposia, focus groups and strategy sessions. Systemic design is a very useful new mean, in collaborating on transformations as network organization. It offers new ways of communications. Where the current standard are written documents and meetings as main medium of communication, systemic design adds contextual maps, systemic concepts, and visual patient flows. These visual expressions help to address complexity and create a shared understanding.

Co-creation next to negotiation

A second benefit of systemic design is in adopting a learning approach of change management. There are five different cognitive styles for change management (see

appendix B). Currently the strength of the ROAZ-agency is in negotiation and empirical understanding as main mode of change management. However, this focus on negotiation may also be a weakness in collaborating with chain partners. Often, hidden interests prevail, where chain partners do not cooperate with the best interests. Or complexity overwhelms, getting lost in intertwined problems, leading to diffuse verbal communication.

To illustrate, while attending a ROAZ strategy session, it became clear after five minutes that acute care means something totally different for an emergency doctor than for a nurse in a nursing home. Because of the dominant verbal communication, the misunderstanding goes unnoticed. A co-creative approach puts stakeholders in a shared learning position, where they can create a shared understanding via visual means.

A GP for example, with whom I discussed the giga map, showed great interest in the format of co-creation.

> *I find this session with you much more interesting than that entire session with ROAZ. And that has to do with the fact that you are constantly wary as you don't want to offend anyone there and you can't really think outside the box. But looking at the system in front of you is much more interesting. Why doesn't it work the way we want it to? And I think that's ultimately where the real solutions are going to come from (KI1).*

As show by acute care consultant Jeroen Dokter, the co-creative systemic approach was useful in the formulation of plans in the regional transformation plans. The further integration of systemic design practices is promising where the practices can evolve along the way.

Figure 14 One of the acute care consultants of the ROAZ-agency facilitating a strategy session using "Systems thinking as a means".

Balance short term with the long term

The ROAZ-agency already has conducted a focus group aimed at futureproofing the acute care chain. In doing that, the recommendation based on resilience literature would be to split energy to short term solutions, making the chain more robust while not lose sight of long-term transformational ambitions. We must withstand the urge to use all our resources for partial short-term solutions, since a looming Black Swan could be truly devastating if we do not address fundamental systemic fragilities.

Build a systemic concept car for acute care

Concept cars are made to express a vision of a car company with the outside world. Key interactions and new ideas are tested, and eventually key elements of the concept car are brought back to reality in the production model.

There is a need for a systemic concept car, an overarching vision for acute car in the ROAZ region. Such a concept car can be developed with key interpreters, radical, openminded professionals from within the region. If this systemic vision is developed over time and shaped in multiple media, then buy-in (in Dutch: *draagvlak*) of key organization can grow. With shared buy-in can be worked towards systemic pilots. Networked interventions where a region orchestrates pilots as neighbourhood clinics, advanced care planning, population funding and a Mission-Command structure integrally.

Collaboration with outsider the acute chain partners

A final takeaway is that the healthcare and its actors cannot “solve” the issues of the care domain. Hence, many of the proposed responses fall outside the sphere of influence of the ROAZ agency. Thus, the ROAZ agency can take at least two courses of action. First, the ROAZ agency can be an active advocate for systemic change, addressing systemic issues to the National Acute Care Network and other national bodies. Second, the ROAZ-agency can look for partnerships outside the domain to enlarge their sphere of influence and co-create possible responses. For example, the ministry of Defence is open to explore the adaption of Mission Command principles to the field of acute care (KI7).

To conclude, this project proposes four fundamental paradigm shifts to address a transformation of the acute care system. The aim was to make the system more resilient, which can only be determined retrospectively. Therefore, through a continuous learning process, the proposed responses need to evolve. To do so, the involvement of seniors next to other professionals is essential. While the systemic design approach has shown its merits in the context of acute care, a political journey awaits in bringing paradigm shifts and their responses closer to reality.

Final remarks

To conclude I have one remaining insight to share. My view on care shifted drastically because of this project. Care in essence is a fundamental human need. Fundamental to receive and to give. It is clear that we all need to be cared for when we are most vulnerable. But equally important, we need to care for others to give meaning to life. This can be at the side of a hospital bed, or behind a desk writing policy. At last, I hope you feel inspired by a new perspective and empowered to think and act in new ways to shape the way you care.

Acknowledgements

I am grateful to conclude my time as a student of Industrial Design Engineering, with such a systemic challenge. I was given an opportunity to explore, get lost and eventually found. In a struggle with complexity, I wanted (perhaps) too much. I wanted to dive headfirst into the wide context of care. I wanted to explore concepts as antifragility and resilience. I wanted to engage in a design discourse with key interpreters. All that rests is a feeling of not being done exploring.

I could not have wished a better supervisory team. To my chair Prof. Kleinsmann, thank you for your sharp mind and attention with which you guided me in the medical context. I always felt trusted and empowered by your guidance, even at the moments I lacked behind. To my mentor Alexander Nieuwborg, it was an absolute pleasure to be able to learn from your deep knowledge of resilience. I will not forget the beautiful talks about uncertainty, Black Swans and antifragility. Thank you for your abundance of time. To the team of the ROAZ agency, thank you for welcoming me into your midst. From day one I felt at ease. To Tom Fresen and Marloes Wessel you always were one phone call away. To Jeroen, thank you for opening the door of the ROAZ-agency and being one of the first to embrace systems thinking. To you all, thank you for showing me the many facets of acute care and for trusting me to take part in the ROAZ sessions.

Finally, to my parents, sisters, grandparents, thanks for being there for me. It is a privilege to feel loved by you all. You were the source of recovery, enabling my own mental resilience during this project. To Sanne and Ties, in perhaps the most exciting phase of our joint adventure, you guys kept the lights on and my headspace clear. It was me who cluttered it again with acute care, but for the peace of mind, I am forever grateful. At last, Zoë, thank you from the bottom of my heart for your structure, the reintroduction to “transition words” and above all for your love and your resilience in coping with the stressor I can be.

Jesse Geurtsen

Appendix A: A categorization of resilience

	Fragility	**Robustness**	**Adaption**	**Transformation**
A complex system	breaks in face of a stressor	Is indifference in face of a stressor	changes in face of a stressor	has a fundamental change of purpose in face of a stressor
A design goal could be	To diagnose, assessing weak points as opportunity to learn	Absorption, recovery & stability	To introduce or grow the capacity of reorganising, learning, and reconfiguring	To create new conditions of fitness; prosper in turbulent times
Achieved	Within dominant paradigm	Within dominant paradigm	Within dominant paradigm, adjustment in (change style)	After shift in paradigm (Meadows, 2008)
Through predominant change style		Negotiation/ Empirical understanding	Learning/ organic	Learning/ organic
Responses include (Ramezani & Camarinha-Matos, 2020)	Informational flows (weak-links): what is fragile has to break in an early stadium (when it is small) and functions as a stressor (a signal)	Embed options: Overcapacity, Diversity, Redundancy	Self-organisation (Introduce the capacity and power of sub-systems to create new options Exaptation (radical repurposing)	New purpose, new dominant goal of a system Create new condition of fitness
The result is		Short-term value	Medium-term value; evolutionary	Long-term value; revolutionary

Table A – A categorization of resilience, four states of a system in regard to a (known) disruption/stressor Adapted from (Nieuwborg et al., 2023)

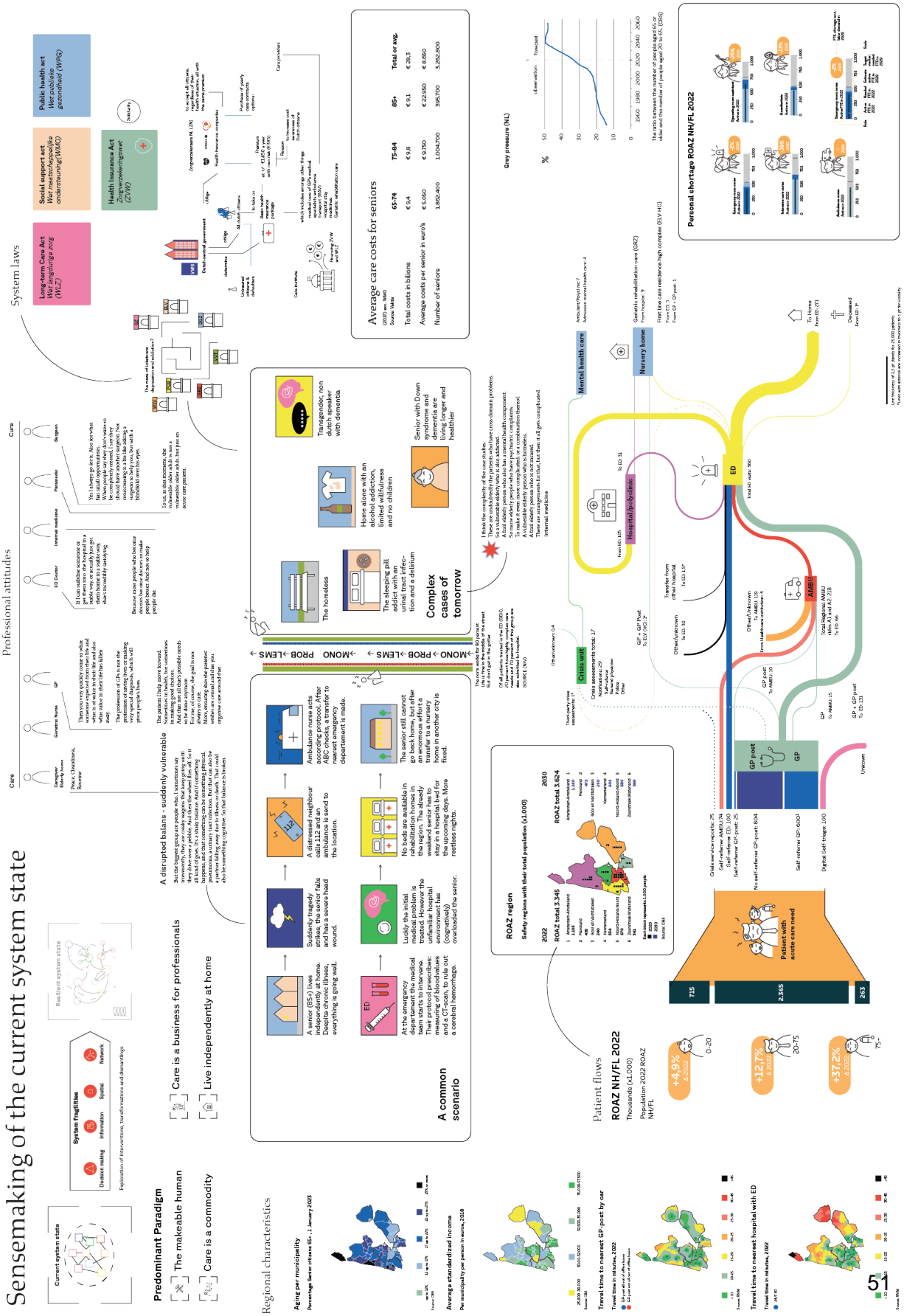
Appendix B: Change management styles

Hans Vermaak and Leon de Caluwé, two leading change management experts, distinguished five different approaches to change management, which are captured in the table below.

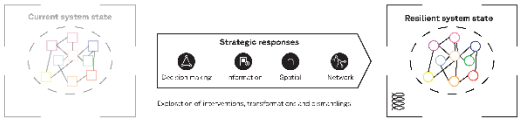
	Negotiation (power)	**Empirical understanding (cognitive)**	**Learning**	**Motivating**	**Organic**
Things change when you	Align interest	Think first, then act according plan	Create settings for collective learning	Stimulate people in the right way	Make space for spontaneous evolution
This happens in a	Game of power	Rational process	Development process	Trading exercises	Dynamic process
towards	A feasible solution, a win-win situation	The best solution in a makeable world	A solution reached through co-creation	A motivating solution, the 'best fit'	A solution that releases energy
Interventions include	Forming coalitions, top structuring	Project-based working, strategic analysis	Reframing the issue, empathic research, prototyping	Assessing and rewarding, social meetings	Open space meetings, self-learning teams
Through a	Process director who uses their authority	Content expert, project leader	Designer or context builder, (process leader)	HRM expert, coaching manager	Pattern identifier who puts themselves in the game
Focussed on	Positions and context	Knowledge and results	Shared meaning, setting and communication	Procedures, inspiration, and atmosphere	Complexity and meanings
The result is	Unknown and shifting	Defined and guaranteed	Unknown and often lies outside the original scope	Conceived, not guaranteed	unpredictable
The pitfalls are in	Flights of fancy, lose/lose	Ignoring external or irrational aspects	Ignoring content or systemic complexity, (endless) analysis without taking any action	Suffocating systems, soft healers	Complexity not being thought through fully, muddling through within the wrong frame.
Typical actors include	Process director, people with most formal or informal power, representative of interests, grassroots supporters, 'bystanders' and the surrounding environment	Process leader/expert, client, project staff, target groups, end-users, and the outside world	Designer, process director, end users and specialists from the organizations involved	HRM experts, tastemakers, HR staff, team builders, role models, and stakeholders	Pattern identifier, intrapreneurs, entrepreneurs, everyone who takes the initiative, sponsors and innovation, networks

Table B – Five styles of change adapted from (De Caluwé & Vermaak, 2002; Schaminée, 2020)

Appendix C : Giga maps



Exploration of a resilient system state



New Paradigm

- Live with a view of the end
- Care is a common good
- Care is a social undertaking
- Growing old together (living)

Mission command structure

Mission command Principles

Build cohesive teams through mutual trust

Shared understanding

Mission orders

Competence

Commanders intent

Exercise disciplined orders

Risk acceptance

Population funding

Population funding GP & social work

Round table conversation

Improved information flow

Foster intergenerational social networks

Regional assembly acute care (ROAZ)

Aging per municipality

Average standardized income

New arrangements for acute elderly care

01 - Communal senior housing

02 - Neighborhood clinic

03 - Hospital

Potential redirected patient flow

ROAZ NH/FL 2030

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