# Coping with Complexity: Designing Homes and Facilities for Frail and Dependent Elderly in a Changing Society

Maarten J. Verkerk

## Contents



**Abstract**

Demographic changes, technological innovations, and plurality in values place architects and consulting engineers for large challenges. This chapter unravels the different types of complexity that play a role in designing homes for frail elderly and facilities for adults with dementia. Five types of complexity are identified as follows: aspectual complexity, contextual complexity, stakeholder-related complexity, value-based complexity, and technological complexity. It is shown that this model guides architects and consulting engineers in analyzing and designing complex homes and facilities.

**Keywords**

Design • Complexity • Values • Demographic changes

M.J. Verkerk (✉)
Department of Industrial Engineering & Innovation Sciences, Eindhoven University of Technology, Eindhoven, The Netherlands

Department of Arts and Social Sciences, Maastricht University, Maastricht, The Netherlands
e-mail: m.j.verkerk@tue.nl



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## Introduction

In 1964 Bob Dylan sang his famous "The times they are a-changin." This 50-year-old song is still very topical. The developments in science and technology are amazing, the financial crisis has left deep marks in our economy, and demographic developments will change the face of our society considerably. Additionally, individuals shape more and more their own life, social relationships become "thinner," and long-life companionships cannot anymore be taken for granted.

Demographic developments will give society a new look. I would like to illustrate these changes with some data from the Netherlands. In the period 2010–2040, the number of people over 65 will increase from 2.6 to 4.6 million and the number of people over 80 from 0.65 to 1.5 million. The societal impact of this growth is reflected in the so-called gray pressure that presents the ratio between the number of people over 65 and the potential working population. This ratio will increase from about 25 % to 50 % (Van Duin and Stoeldraijer 2012). Another important development is the growth in the number of single person households: from about 2.7 million in 2010 to about 3.8 million in 2040. The elderly account mainly for this growth: the number of single person households of people with the age of 65–79 will grow from 0.5 to 1.0 million and of people with the age over 80 from 0.3 to 0.7 million (Van Duin et al. 2013). In the same period, the number of people with dementia will increase from about 240,000 to 540,000 (Alzheimer Nederland 2013). These developments place Dutch society for a double assignment: how to deliver care and how to finance care.

Innovation is one of the answers on the burden of the graying society. New technologies are developed to support independent living at an old age. Self-management systems are already on the market to support (old) citizens to manage their chronic illnesses. Finally, family care and volunteers are expected to give informal care. It goes without saying that many promises of innovation are not yet redeemed.

At the same time, the philosophy of life of citizens is also strongly changing. The mediaeval idea of *cuius regio, eius religio* lies far behind us and has given way to a plurality in basic beliefs. In most Western countries, Christian, modern and post-modern views on the good life are simultaneously present (Ferry 2010). Additionally, Islamic values have secured a position in non-Islamic countries. On the one hand, elderly people stress the value of autonomy. On the other hand, the limits of this value come the fore when elderly become frail and dependent on daily care.

Demographic changes, technological innovations, and plurality in values place architects and consulting engineers for large challenges. The design of homes and buildings is already a complex and dynamic process. However, the overall complexity is strongly increased when the design process concerns home buildings for specific user groups with nonstandard requirements. For example, the design of a smart home for frail elderly or a long-term facility for older adults with dementia requires interdisciplinary dialogues involving many disciplines like social workers, care professionals, senior citizens' associations, and patient associations. In addition, the design of the building should also take into account the standard requirements of an adequate operation and cost-effective maintenance. Technological innovations will increase the complexity and dynamics of the designing process further. Interdisciplinary design teams that cover all (new) technologies are of utmost importance. Finally, architects and consulting engineers are not used to take a plurality in values into account. Additionally, they are often not aware of their own hidden values that determine their designing process.

The complexity of the built environment becomes particularly evident when concerning the evidence-based design of health-care facilities (Ulrich et al. 2008; Huisman et al. 2012). Various researchers have proposed theoretical or conceptual frameworks linking different built environment characteristics to health outcomes or to capture the current domain of evidence-based design in health care. However, these models all capture a different part of the complexity and, thus, reflect a part of reality (Van Hoof and Verkerk 2013).

The aim of this chapter is to unravel the complexity of the design process of homes and facilities for frail and dependent elderly. I distinguish five different types of complexity: contextual, stakeholder related, value based, aspectual, and technological. I will show that architects and consulting engineers have to analyze every type of complexity and its influence on the design process (Ribeiro et al. 2012; Van Hoof and Verkerk 2013; Verkerk 2014).

## Unraveling Complexity

It is of utmost importance to develop models that cover the full complexity of designing homes for frail elderly and facilities for older adults with dementia. One route to develop such models is to combine health-care models with construction models (Van Hoof 2010). This route presupposes that both models can be combined and that the combined model is complete. However, both presuppositions are problematic. Another route is to use philosophical theories that address complexity and to elaborate these theories for the topic under investigation (Van Hoof and Verkerk 2013). If necessary, disciplinary theories or tools can be used to bridge the gap to reality. Basically, this route is more promising because philosophy as “discipline of the disciplines” has the best “credits” to investigate the complexity of reality (Strauss 2009).

In this chapter, the route of philosophical theories will be taken to investigate complexity in designing homes for frail elderly and facilities for adults with dementia. Five different types of complexity are distinguished:

(a) Aspectual complexity
(b) Contextual complexity
(c) Stakeholder-related complexity
(d) Value-based complexity
(e) Technological complexity

For each type of complexity, the philosophical roots will be given.

*Aspectual Complexity.* In philosophy a distinction is made between "wholes" and "aspects" (Dooyeweerd 1969). A "whole" is a totality with an own identity. Examples of wholes are human beings and animals, trees and bushes, and stones and grains of sand. All these wholes have an own identity. Humans, animals, trees, and bushes are a part of the living world and stones and grains of sand not. Humans can enjoy art and think rationally, and animals cannot. Animals have emotions and actively perceive their environment, and trees and bushes do not. Each whole functions in a number of different aspects or dimensions. For example, a human being needs food (biological aspect), has feelings (psychical aspect), interacts with other people (social aspect), exchanges goods with another person (economical aspect), enjoys art (aesthetical aspect), shows ethical behavior (moral aspect), and does or does not believe in God (spiritual or religious aspect). All these aspects have an own nature or character, show their own dynamics and mechanisms, and can be described with specific laws or norms. For example, the dynamics of social interaction are quite different from the dynamics of enjoying art. The biological laws that determine the digestion of food are quite different from the norms for moral behavior. In other words, every aspect has its own core that cannot be reduced to another one. Technological artifacts like homes for frail elderly and facilities for adults with dementia are also wholes. They function also in different aspects or dimensions. For example, a facility for adults with dementia functions in the spatial aspect (it has a specific shape) and in the physical aspect (it consists of materials with specific properties). It also functions in the economic aspect (investment money, operating costs) and in the aesthetic aspect (its beauty). Finally, it functions in the juridical aspect (a facility has an owner) and in the spiritual aspect (giving hope and trust). In total 15 different aspects are distinguished as follows: numerical, spatial, kinematic, physical, biotic (biological), psychic, logical (analytical), formative, lingual, social, economic, aesthetic, juridical, ethical (moral), and spiritual (pistical). The idea of aspectual complexity is based on the theory of modal aspects developed by Dooyeweerd (1969, Vol. II). The idea of aspectual complexity prevents that architects or consulting engineers focus themselves on the most well-known aspects and "forget" the other ones.

*Contextual Complexity.* The idea of contextual complexity acknowledges that the context of design has a strong influence on the design itself. For example, the context of a church is quite different from the context of a showroom of cars. In a church people are invited to give oneself up in God's hands, whereas in a showroom customers are seduced to buy a new car. In the same way, the context of a home for frail elderly is different from the context of a facility for adults with dementia. Homes for frail elderly have to be designed in such a way that they can live as autonomous as possible and can participate in society, i.e., the design has to support social functioning of the frail elder. Facilities for adults with dementia have to be designed so that the environment is healing and optimal care will be given to patients, i.e., the design has to support healing and care. The idea of contextual complexity is very important: it highlights the intrinsic nature, dynamics, and normativity of a design. The idea of contextual complexity can be sharpened by using the theory of modal aspects: the design of a home for frail elderly is led by the social aspect and the design of a facility for adults with dementia by the moral aspect. It has to be noted that the core of morality is “caring for.” The idea of contextual complexity is based on the analysis of societal plurality by Mouw and Griffioen (1993), the idea of internal values as developed by MacIntyre (1981), and the theory of individuality structures of Dooyeweerd (1969, Vol. III).

*Stakeholder Complexity.* The idea of stakeholder complexity stresses that stakeholders have to be involved in the design process and that different stakeholders have different types of justified interests. For example, in designing facilities for adults with dementia, many stakeholders play a role: patients, families, associations for people with dementia, health-care professionals, owners, government, local authorities, insurance companies, architects, constructors, and so on. All these stakeholders have justified interests. The justified interests of patients are a healing environment, good care, and financially affordability. The justified interests of owners are return on investment and long-term occupancy. The idea of “justified” interests on the one hand opens the eyes of engineers for the diversity of stakeholders and their different interests, and on the other hand supports them in critically reviewing existing practices. For example, in architecture the judgments of peers about the design and the beauty of the building are considered as very important. However, from a philosophical point of view, their judgment is not a justified interest. The idea of stakeholders and justified interests is based on the theory of individuality structures of Dooyeweerd (1969, Vol. III) and the theory of stakeholders as developed by Freeman (2001).

*Value-Based Complexity.* The idea of value-based complexity highlights that values, ideals, or dreams play a role in the design of homes of frail elderly and facilities for adults with dementia. Firstly, values can have a cultural source. For example, the values “freedom” and “individual responsibility” underlay the health-care practices in the United States of America, whereas the values “solidarity” and “dignity” underlay the health-care practices in the Netherlands. Secondly, values can have an institutional background. For example, one health-care institution for elderly with dementia is driven by the values “safety” and “excellent care,” another one is driven by “feeling at home” and “closeness,” and again another one by “dignity” and “living in the sight of God.” Finally, values can have a personal background. For example, a client can have a Buddhist, Christian, Humanist, or Islamite principles or an investor can be driven by “social return on investment” or by “financial return on investment.” The idea of value-based complexity discloses the whole field of the good life. It supports the engineer in making explicit the various values that influence the design and invites him or her “to translate” values or ideals in a design. The idea of value-based complexity is based on the practice model developed by Jochemsen, Glas, Hoogland, Verkerk, and others (Jochemsen and Glas 1997; Hoogland and Jochemsen 2000; Jochemsen 2006, and Verkerk et al. 2007) and the theory of ground motives of Dooyeweerd (1969, Vol. I).

*Technological Complexity*. The idea of technological complexity emphasizes that different types of technology are used. Brand (1994) presents six systems: stuff, space plan, services, skin, structure, and site. Each system has a specific set of functions (which can be seen as solutions) that contribute to the optimization of a certain value for (different) stakeholders. It has to be remarked that the six systems are differently qualified in view of the theory of modal aspects. For example, the stuff is physically qualified, the space plan spatially, the social media services socially, and the security services morally.

## Heuristics for Complex Designs

In the foregoing section, we have introduced five types of complexity. It could be remarked that these distinctions do not simplify the design process but makes it more complex "than it was." This remark has a grain of truth in it: we are dealing with five types of complexity and every type has its own complexity. However, it is well known that complex realities never can be understood by means of simple models. That means, the complexity of designs only can be understood by models that do justice to that complexity. The different types of complexity order reality and support the architects and engineers in ordering information, in asking questions, and in finding answers on these questions.

In this section I will show that the different types of complexity offer a heuristic to define the specification and to support the creative design process. I would like to illustrate this heuristic by the design process of facilities for adults with dementia.

The design process can be schematized in five steps. Basically, for every technology (technological complexity), a specification has to be made and a (draft) design proposed. This specification and design is multi-aspectual (aspectual complexity) and has to be developed from three perspectives:

1. The requirements of the specific context (contextual complexity)
2. The values that underlay or have to underlay the design (value-based complexity)
3. The justified interest of different stakeholders (stakeholder complexity)

It must be noted that in designing complex systems, the phases "analysis" and "creative design" are not successive steps but are strongly interwoven:

*Step 1: Determine the technological complexity of the design.* For example, the systematic of Brand (1994) can be used to understand the technological complexity of a new facility. Especially, the services have to be elaborated in more detail: communication, recreation, safety, care, and so on. A further qualification of the different technologies by using the theory of modal aspects can be very helpful to understand their function more fundamentally and to stimulate innovative solutions.

*Step 2: Determine the intrinsic dynamics and normativity of the context of the design.* Every context has its own dynamics and normativity. The context of a facility for elderly with dementia is determined by the fact that these patients cannot anymore live independently but that they need care, 7 days a week and 24 h a day. The care for elderly with dementia is not "just care" but is care for elderly whose cognitive and noncognitive functions are deteriorating. Architects and consulting engineers have to understand the nature of the deterioration in order to design a facility that supports care for this specific type of patients.

*Step 3: Specify the requirements of every technological system from the perspective of the patient and check all 15 aspects.* In step 2 we have determined the nature of the facility: care for elderly with dementia. In this step the requirements of every technological system are determined from the perspective of the patient. For example, the design of the space plan also has to support the care for patients with dementia. This requirement leads to a number of questions that have to be answered during the design process. How to design the space plan that the patients will not lose their way? How to design the living room to prevent that social interaction will result in too much stimuli for the patient? How to design the dining room that the patients "know" that they have to eat? How to design the garden that elderly with dementia can experience the beauty of flowers and trees? How to design the chapel or a spiritual nook that stimulate religious and spiritual experiences? This step is the most fundamental step in the whole design. Basically, for every technological system, these types of questions have to be asked.

*Step 4: Specify the requirements of technological system from the perspective of values or basic beliefs.* In step 3 we have defined the specification of the technological systems from the perspective of the (care for the) patient. In this step the specification will be refined from the perspective of the (shared) values that have to underlay the design. As shown above, values can have different sources or backgrounds. Especially, shared values can evolve in dialogues between different stakeholders, e.g., patients, families, health-care professionals, and so on. The basic question in this step is: What does this value mean for every technological system? For example, what do the values 'feeling at home' and 'closeness' mean for the designing the space plan fo the facility? Or for the different materials that are used? If necessary, all 15 aspects can be checked off.

*Step 5: Specify the requirements of the technological system from the perspective of the justified interests of different stakeholders.* In step 3 we have defined the specification of the technological systems from the perspective of the (care for the) patient and in step 4 from the perspective of (shared) values that have to underlay the design. In this step the specification for the technological systems will be further refined from the perspective of the justified interests of different stakeholders. Above we have shown that most stakeholders have one or two justified interests and that these interests can be qualified by using the theory of modal aspects. For every stakeholder the question is: What is the influence of his or her justified interests on the design?

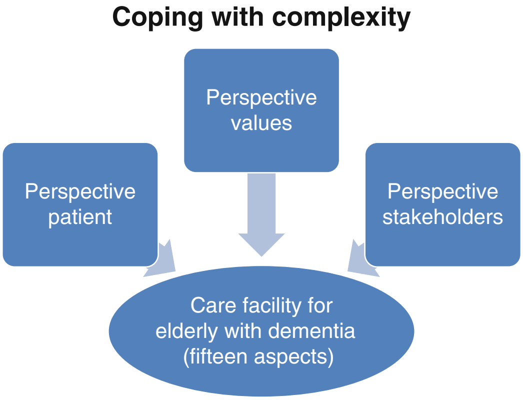


**Fig. 1** Coping with complexity in designing homes and facilities for frail and dependent elderly

The design process is summarized in Fig. 1. It goes without saying that in the steps 3, 4, and 5, the process of specification and the process of creative design are strongly intertwined. Additionally, the steps 3, 4, and 5 will easily get mixed up.

## Conclusions

Demographic changes, technological innovations, and plurality in values place architects and consulting engineers for large challenges. This chapter illustrates the need for a philosophical model that unravels complexity in designing homes for frail elderly and facilities for adults with dementia. Five types of complexity are identified as follows: aspectual complexity, contextual complexity, stakeholder-related complexity, value-based complexity, and technological complexity. These types of complexity function as a pair of glasses: they highlight specific topics of the design. One pair of glasses is not enough: we need all five pairs of glasses to understand the full complexity of the design.

The first conclusion is that this model guides architects and consulting engineers in understanding the different aspects involved, the nature of the context, the justified interests of stakeholders, the values that shape the design, and the different technologies involved.

The second conclusion is that the technical systems (technological complexity) have to be developed successively by the requirement of the specific context, the values involved, and the justified interests of the different stakeholders.

The last conclusion is that this model does not only support the design of homes and facilities for frail and dependent elderly but also other complex designs like the electrical infrastructure of the future.

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