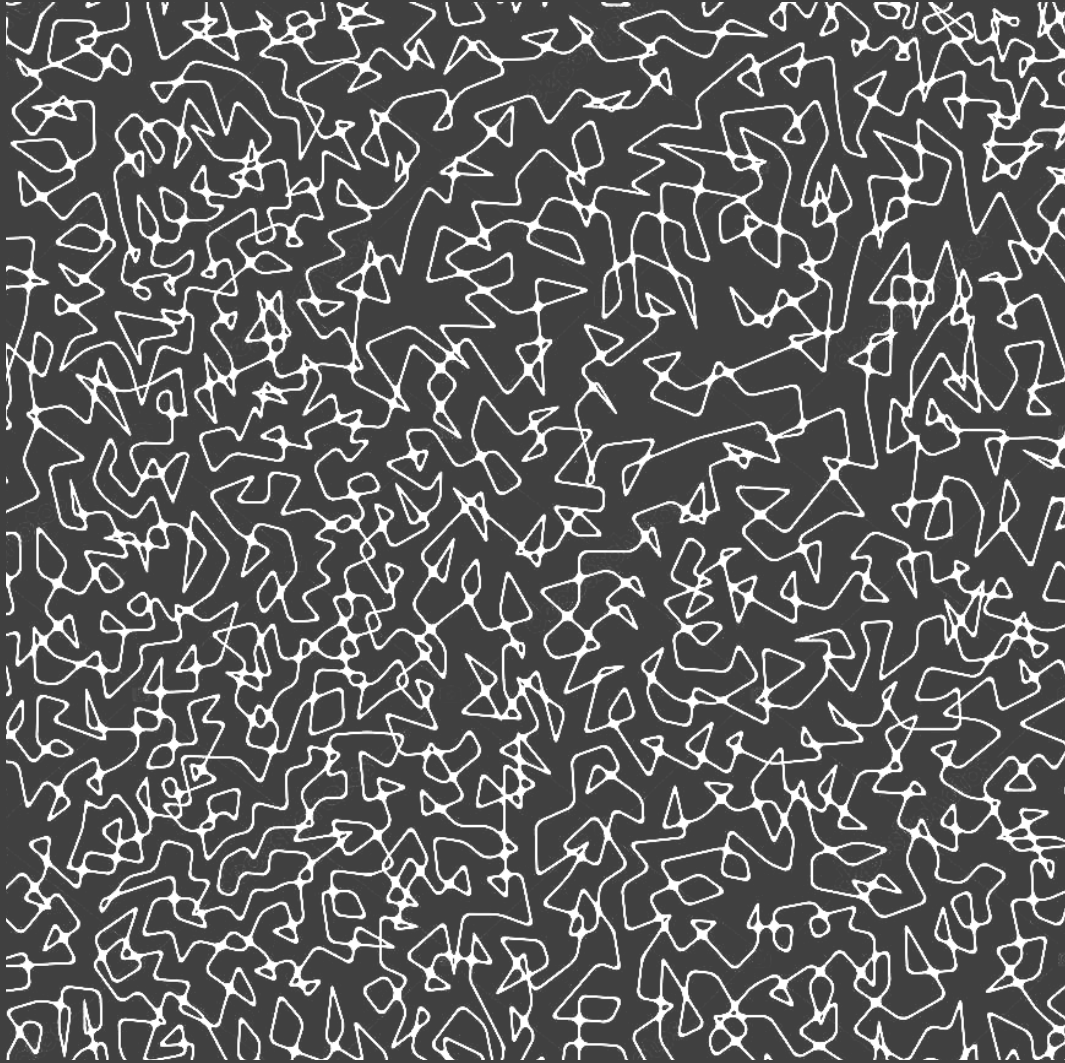


the Customisation of Urban Housing

user-involvement in housing development



a graduation thesis by

Nick Krouwel

“A good educator therefore does not tell a child not to touch anything, but teaches it activities such as construction, building, or maintenance and care. He gives a box of building blocks rather than a finished doll house.”

-

Nikolaas John Habraken

Preface

During the past few years I've experienced the benefits of digital fabrication. During my studies I was introduced to the benefits of combining digital and rapid prototyping techniques in the design process, as inspiring interchange between the virtual and real. Thanks to the ability to turn my ideas into physical designs, I was experiencing a freedom like I never had before.

While performing multiple extracurricular activities, I was exposed to the actual practice of our profession. I was struck by its inefficiency due to the limitations of budget and collaborative affairs related to these projects. While being a little dissatisfied by reality I thought; 'How can the innovative skills I have mastered be applied in the practice?' Although it clearly has potential to improve our practice, it seems hard to make these applicable due to various reasons. It raises my question:

Technology is here, what do we do with it?

-

Nick Krouwel

Abstract

The housing process in dense metropolitan environments experiences difficulties to adapt to the comprehensive needs and wants of the modern household. As a consequence of the increasing flexibility in daily-life, there is a growing diversity in the shape of households and their living patterns. In addition, digital developments enable and create more specific requirements among users for the products they purchase. Knowing the impact that these rapid developments have on consumerism, it is inevitable that users will create stronger preferences for their living environment as well. These tendencies in our society must be translated to its housing. To adapt to such diverse demands would be a difficult challenge for the housing market. Current processes make it labour-intensive and therefore a costly and unsustainable matter. It is of importance that both our existing and future housing is able to respond to these demands in an adaptive and sustainable manner.

A possible solution, responding to the diverse demand, would be to involve the consumers themselves in the development of their dwelling. When involved, consumers can directly shape the dwelling to their needs themselves; customisation. However, current practices make this an undoable matter. The over-complexity in (pre)construction processes and conservative mind-sets of real-estate developers and construction firms hinder any level of participation with the consumer. There is a need for smart processes and designs to involve the user in the realisation of the customised urban dwelling.

0. Introduction

This thesis is part of a master degree in Architecture at Delft University of Technology. The thesis, subjecting the potential of user-involvement in the realisation of customised housing in the Western Metropolis, is divided into two parts; theoretical research and applied design case. The theoretical research will start with the description of the problem, its relevance and formulate the research objective. In the succeeding chapter, a brief history on the user-involvement in housing development in relation to technological advancements is performed. In the second chapter, current processes are studied and assessed to ultimately formulate a series of barriers that need to be overcome to allow user-involvement in future practices. For the second part the research is implemented in a design concept that subjects an architectural method enabling inhabitants to be involved in the development of their habitat in an urban context. This section is still to be completed and will be added in the future.

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Research Questions

History

1. How can the industrial revolutions be defined?
2. What influence did these have on housing development?
3. More specifically, how was user-involvement (not) enabled in housing development during those periods?
4. What were significant projects for those periods?

User-Involvement

5. How and by who are current urban housing development processes initiated, controlled and executed?
6. What are precedent projects where users are involved in the development
7. How can these be categorised?
8. To what criteria can these precedent projects be assessed?
9. What cooperative form of housing development, provides the user the desired level of customisation while maintaining efficiency in terms of time and money?

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1. Problem Statement

the Urban Age

The world's population is becoming increasingly urban. Sometime in 2007 is reckoned to be the turning point when city dwellers formed the majority of the global population for the first time in history. Today, the urbanisation of society continues: it's thought that 54% of the world's population lives in cities – and it's expected to reach 66% by 2050. Scientists and experts are speaking of an 'urban age': the era of the metropolis, in which social and economical events will grow to focus on these large urban agglomerations.

Due to the progressive development of cities, solutions to solve the accompanying effects are needed.

To understand the impact of the effects that urbanisation has on housing in these urban areas, it is relevant to study how these work and accumulate. Although this urbanization is a global phenomenon where different cities are in conflict with similar problems, this thesis will focus on a highly urbanized country: the Netherlands. Whilst describing the overall influences to which this country is impacted, most studies will be directed to Amsterdam; its major metropolis. In doing so, this thesis aims to get more grip on the exact causes and consequences, effects and challenges related to housing in the region specified.

To arrive at powerful solutions, the phenomenon of urbanisation must first be thoroughly understood. As a start the problem and its causes will be indicated. Then its effects in relation to the housing process in this urban area will be addressed and carefully studied. Thirdly, a solution is proposed of which its potential will further be investigated in the succeeding chapters.

Urbanisation

First, the urbanisation of the Netherlands and its effects characteristic to this region will briefly be described. In the Netherlands, about three quarters of the population live in urban areas and most people work there. The largest metropolitan areas also show the strongest population growth. The effects are most noticeable at the four greatest cities of the nation: Amsterdam, Rotterdam, The Hague and Utrecht. These cities grow in three ways: through the natural growth of the city's population; (inter)national migration; and the reclassification of nearby non-urban districts. More detailed information on these phenomena specifically will be given in appendix A. As previously stated, the following will focus on the Netherlands in general and for more detailed descriptions it will refer to Amsterdam.

The effects of the urbanisation in relation to housing in the urban areas specifically, can be derived from two key factors. Firstly, these urban areas are subjected to a rapid densification requiring innovative solutions to build within the boundaries of the urban domain. Secondly, there is a growing cultural variety among the urban population creating a need for more diversity in housing types. Although both have their particular challenges, these can (and should) be considered as a twofold objective due to their similarity in context. These challenges, due to a rising environmental concern, should be tackled in a sustainable manner. The following sections will describe these two factors and their related challenges in more detail followed by the accompanying environmental goals.

Densification

The growth of the urban population stimulates the urban areas to expand and densify. However, due to the speculative nature of house building, affordable and qualitative house building is inaccessible for the majority of the urban population. The building sector fails to response to the high demand of new housing. This causes an imbalance to occur between supply and demand. As a result, house prices rise to extremities while the quality drops. It can be stated that there is a total miss-match between what is being (or not even) built by the building sector and the actual demand of the urban population.

In the past, the development of the majority of our existing housing stock was initiated by the government. It was their responsibility to provide qualitative housing for its population. Over the past decades, the government has withdrawn and set out the rules and guidelines to indirectly manage the housing process. Since market builders are the driving forces behind house building of which viability is the main objective, the urban dweller is left at stake. The speculative nature of current house building enables market builders to take advantage of the imbalance between supply and demand. As a result, house prices and rents rise to extremes. This makes housing in the dense urban centres inaccessible for the urban dweller.

There is the necessity for innovative solutions to counteract speculative house building in order to provide qualitative housing for all users.

Cultural Variety

Besides the densification of urban city-centers, it is the growing diversity in contemporary daily-life that challenges the building sector to keep providing qualitative housing that suits the needs of the modern household. Unlike the large household that was set as standard for most housing projects, the modern household has nowadays various forms. The dweller cannot be deducted into a single formula anymore. It is the influence of urban-life that makes the composition of the modern household and the patterns of contemporary daily-life change and ultimately, vary. The following will briefly describe the differences between past and present generations in further detail.

Camp briefly describes the general cultural aspects from the past generation in relation to its housing: “The past generation has built more than all other previous generations together. The reconstruction during the post-war era, baby-boom and a strong economy have added to an extensive building production. That given, a great part of our existing housing stock is the product of the ideas of a certain time frame, in a very specific context. Characteristic for this period is the large household as a norm and a welfare state that served its civilians in various domains”.

Meanwhile, fundamental shifts have taken place on various terrains. Camp explains it: “The amount of single households is growing to 40%, as a cause of migration there is no longer a homogeneous cultural background, the baby-boom generation is aging in vast amounts, the role of the Church and the union life has eroded, and one of the by-products of our technological developments is the growing divide in our society.” This means that much of our common culture has changed into a more culturally diverse society over the past decades. Furthermore, the increase in flexibility makes the shape of households and their living patterns differ. Thus, everything is different, except for our housing.

These tendencies in our society must be translated to its housing. However, the housing process in dense metropolitan areas is facing difficult challenges to adapt to these cultural changes. It is of importance that both our existing stock and future housing are able to respond to this diversity.

Environment

Besides feeding our direct human needs, another urgent matter is our planet impacted by climate change. The increasing world's population combined with increasing living standards results in great exploitation of the world's limited resources. In addition, the way these resources are consumed in the building sector, add greatly to the phenomenon of global warming (AIE, 2016). As our society is urbanizing and more housing is required, its construction will continue to add to its (self-)devastation. Since the effects will be most prominent at these urban settlements, society continues to become more vulnerable due to its own activities. However, it is in these cities that great strides towards sustainability can be made, as their density allows for more energy-efficient forms of transport, service provision and most relevant in this case; housing.

Research Objective

The latter describes the difficult challenges that the housing process, in an urbanising context, is facing. It indicates the relevance for our existing and future housing stock to become more effectively responsive and sustainably adaptive to the effects of densification and growing cultural diversity. Most stock is fully created by the government, developers and corporations. Are these still (or were they ever) able to accommodate society according to the comprehensive needs and wants of the modern household? Since the approach of top-down development seems to lose effectivity, their dominant role becomes arguable.

A possible solution challenging the densification and comprehensive demand would be to create customized housing. The process of customisation allows users themselves to be involved in the development of their living environment. When applied to housing, consumers can directly shape their habitat to their needs themselves, making housing development stock in terms of use more functionally and sustainably effective. Qualified parties and professionals from the building sector can regulate this process in order to provide qualitative housing accommodating the modern household while meeting sustainable ambitions. Key to the development of custom housing is the involvement of the user. However, current practices make this form of collaboration an undoable matter. There is a need for smart processes and designs to add to the realization of the customized dwelling in the Western metropolis. New forms of initiative in combination with technological advancements in design and production, often referred as the aspects of the fourth industrial revolution, seem promising means to make this happen. To further discover its potential, the following

research question is formulated:

How can users get involved in the realization of customized housing for the Western Metropolis?

Methodology

After the latter description of the problem, its relevance and the relating research objective, the following will describe the roadmap including the methods applied to generate this research. To answer the sub-questions related to the overall research objective, various methods are used to gain knowledge, analyse and deduct conclusions.

In the first chapter, a brief history of the involvement of the user (user-involvement) in housing is derived from an extensive literature study. Since technological advancements from the fourth industrial revolution might enable a realisation of customized housing, this study relates the present to the past by describing the aspects of each industrial revolution and its influences to housing development. In order to provide the necessary background information, the study will be supported by referring to precedents projects and innovations that are characteristic to the technological advancements of those periods.

In the second chapter, the research objective will be projected to today's housing development. Firstly, the process and actors involved in housing development are defined. To gain insight on this matter, interviews are conducted with various actors involved in the development of speculative, or either self-built, or a combination of both, which are processed in this research. Secondly, multiple custom-housing projects are compared to today's housing development. Case-studies describe various forms of housing development with users involved. These different forms will then be analysed, and assessed on the applicability in the specified context. The aim is to arrive at an efficient method to optimally engage the user in the realisation of customised housing. To conclude, recommendations for further exploration in the applicability in the process, design and production of urban housing are given.

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2. History

the Dweller and its Dwelling

Industrial Revolutions

Before the main industrial developments (<±1750), goods and constructions were produced locally with the local power and material resources available. These were manually distributed and available on demand. These ways of production were heavily embedded in local culture. “The First Industrial Revolution (±1750<) used water and steam power to mechanize production.” The introduction of the machine starts to standardize production, disconnecting itself from traditional craft. These processes become centralized. “The Second (±1860<) used electric power to create mass-production.” Technological developments start to have major impact on society. These production processes become mechanized and speculative. Goods and construction can be produced cheaper, quicker and in larger quantities. “The Third (±2000<) used electronics and information technology to automate production.” The mechanical production processes become digitalized. Goods and construction are still centrally produced and traded with speculative nature, yet they can be ordered, managed and transported globally thanks to the digital advancements. “Now a Fourth Industrial Revolution (±2010<) is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.” The digital advancements in design and product are that far reaching that these processes decentralize, allowing users themselves to design and/or produce goods and constructions themselves on demand allowing new-age variants of craftsmanship to evolve.

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User-involvement

The notion of user-involvement in house-building is not a particularly novel idea. Dating back from the advancements of the second industrial revolution, the theme knows a turbulent history. Ever since, the theme has been rediscovered by many architectural visionaries who endeavoured their theories in various periods. The following section will describe a brief history on user-involvement in housing in relation to the technological advancements of each industrial revolution, using visionaries and their work as reference. By studying these and the relating cultural circumstances, lessons can be learned for future explorations. Since technological innovations take time to be applied in the overall practice, the references used date back more

recently compared to the actual introduction of such novelties. In order to gain insight and derive concrete conclusions as a basis for the succeeding design case in Amsterdam, it will focus primarily on the development in the Netherlands, if relevant substantiated by international architectural references.

Before the Industrial Revolution

> 1750±

The Netherlands know a rich history of house-building. Known for its traditional architecture that is intertwined with the constructing and managing of water-systems, many of these canal-houses build in Amsterdam in the beginning of the 17th century still exist.

Local Trade

It was already in this period of time that the development of housing is performed with a top-down approach. Within these towns, house-building was primarily initiated by its local governments. In order to maintain and stimulate the towns wealth and prosperity, the availability of land for housing was initiated and managed by its councils. Due to the complex process of land preparation in these areas, for which major investments were required, local governments were obligated to precisely plan the expansion of its urban fabric at a large scale. In order to earn back investments, the land was divided into plots that available for sale. These where bought by local housebuilders, who then initiated the build of a house, which would then finally be sold or rented. The home as a trading object has been of Dutch house-building culture.

Craft

These structures where build and designed with the local materials and resources available. The main materials of traditional construction, timber and brick, where obtained, processed at local workshops into useable materials and equipment. Houses were build by local craftsmen, mainly masons and carpenters, each with their own expertise. Although details differ from town to town, due to the similarities in material resources and building methods, the outcomes are relatively alike. The resulting vernacular architecture is still enjoyed and lived by inhabitants today.

Custom

The designs for these houses are unique since the houses are built custom for their eventual use. Since work

is fulfilled at home, the interior is adjusted to the activities practiced within the house. Although many of them are highly subjected to renovations and modifications, the essence of these structures still perform the purpose today; housing its user. Although our live-patterns, including our needs and wants, have drastically changed over 300 years, the dimensions of these structures still seem to fit. If requirements alter, there is the opportunity to modify and adjust the structure and its interior to its new function. Apart from its structural flexibility, there is a level of proportional versatility applied in the dimensions of these structures. Width, length and height seem to be adjusted in a manner in such a manner that the various functions of a basic household fit in various compositions. These dwellings allow a degree of structural and proportional versatility creating an ever-lasting functionality.

The user is involved in the development of housing since these need to fit the domestic and work-related requirements of the household. As illustrated in figure 2.1, the production of housing is singular, decentralised and on demand, and requires a fair level of involvement of the user.

the First Industrial Revolution

±1750 <

Halfway the 18th century an industrial revolution takes place. The introduction of the machine starts to speed up production. During this period, the development of house-building becomes more centralized and therefore starts to disconnect itself from local craft. Although it takes at least another century to impact the construction industry, the rise of industry has a large impact on how and where people live. The industrial factories mostly arise at the outskirts from city. Since there is no long-distance transport available yet, houses for the factory workers arise in the areas near these factories. The impact of the industrial revolution changes the relation between life and work from local craftsmen scattered around the town into large working communities near such factories.

Institutions

After the industrial revolution, the top-down approach in housing development of the local initiators evolve into large private parties that invest in larger projects. Before, merely individuals initiated builds in a fair quantity. While these seek to continue to develop the historic city-centres, large investments are made by

the industrial institutions in order to provide housing specially fitted for its workers in the outer skirts of town. Either existing parts of the city are transformed or new land is tenured to become territorial areas owned, managed and maintain by these industrial institutions. The scale in housing development is drastically increasing.

Machine

In terms of production, local building methods start to evolve into more regionally standard ways of constructions. It is the starting point of centralised production processes. Since houses are being built in greater quantities, the production methods become planned to maintain economical viability. Towns start central distribution centres for material resources and workshops to practice each particular profession. Here, the processing materials are optimized for greater quantities. These were eventually distributed among the various construction sites around town. The actual houses were still produced manually by masons and carpenters.

Typology

The upscaling of housing development has an effect on the architectural outcome. This changes from custom housing fitted, each for their unique purpose, into more standard designs allowing to fit any working family. Housing designs seek to find a generic solution for a common problem. Although every industry creates its own housing typology, the quantitative build of these living units leads to a standardization of each community. The introduction of the machine starts to standardize production, disconnecting itself from traditional craft.

During this period, the development of house-building becomes more centralized and therefore starts to disconnect itself from local craft. As illustrated in figure 2.1, the input from the user is not longer relevant in order to speed up production.

the Second Industrial Revolution

±1850 <

Near the end of the 19th century, a second industrial revolution takes place. The introduction of the water and steam engines have the power to mechanize the production. Due to the poor living qualities near these factories, and the innovations in long-distance transportation, living communities move away from the industrial areas. As an effect of mass-production, the population grows explosively in the following decades resulting in a serious housing shortage. Impacted by two World Wars, society is desperate to leave the past behind and reshape the urban environment to modern living standards. Overall, modern society is in quest for a better future.

Decentralisation

Due to the magnitude of the housing shortage half-way the 20th century, house-building has become a major challenge on the political agenda. It is primarily driven by the national government in order to speed up production. Large mass-housing projects are initiated by the government aiming to overcome the deficiency of housing for the nation's population.

Mass-Production

The impact on actual house-building becomes greater since innovations find their way in the construction industry. Characterized by various technological advancements, it is a productive era in which many new construction methods and design schemes are introduced. The introduction of new building materials such as iron, steel and concrete find their way in the construction industry. However, the complexity of the production processes requires specialized factories and workshops speed up the centralisation of production processes. In addition, the mass-quantities that are required for production of mass-housing, results in highly effective, yet standardized production methods.

Standardisation

Enforced by the large scale in which housing needs to be produced, designers are stimulated to find large-scale solutions for qualitative housing with low production costs. To illustrate the global impact of the notion, the Wichita house was designed and produced in the United States by Buckminster Fuller. This minimum living unit aimed to shelter and comfort a single family according to American cultural standards.

It was technically optimised for mass-production and fast deployment. In the Netherlands in the early 20th century, architects started to focus more on the workers' living conditions. Architects and designers, were studying living patterns to create schemes and principles to understand the maximum but most importantly the minimum requisite space for the activities performed in a common living. The outcome was that social housing became one of the main themes in housing design. In order to create affordable but qualitative housing, costs were reduced to design and built according to the minimum dimensions required for the activities within an averaged workers' household. In line with Henry Ford's statement "One size fits all", these 'optimised' dwellings could now, thanks to the technological advancements in the construction industry, be produced in great quantities. Mass-housing was seen as the outcome for the housing problem.

Flexibility

Apart from the production efficiency seen as the primary innovation in the construction industry, the introduction of new materials enabled architects and designers to also arrive at new more architecturally appropriate outcomes. By the amount of space to its functional minimum, the dynamic nature of habitation was problematized (van Eldonk & Fassbinder, 1990, p. 11). To escape from the restrictions accompanied with social house-building, architects started to focus on more flexible housing typologies that offered users more functional freedom. To embrace the individual identity of the inhabitant a quest was set out for more flexible living schemes. Before, in most traditional building systems, all space defining elements functioned as load-bearing elements. These elements can not be (re)moved since they are inseparable of the structure as a whole. The permanency of this structural approach is limiting any different use apart for which it was designed, as it was in most mass-housing designs.

Minimizing the amount of space defining structural elements in the interior enabled the modification of the interior. This happened with the advent of cast-iron and steel load-bearing structures at the end of the nineteenth century. A spectacular project resembling these innovations is the revolutionary Rietveld-Schröderhuis built in Utrecht in 1924. This project, resembles many principles of Japanese traditional architecture. Of which the traditional house "has no chairs or beds, one sits and lies on the Tatami and uses folding tables, pillows or mattresses. The different rooms are connected by sliding walls, and may be used in a variety of ways" (van Eldonk & Fassbinder, 1990, p. 11). Similarly, the interior of the Rietveld-Schröderhuis enables the dynamic nature of habitation. "A system of sliding panels allows the large space to be subdivided into

a living room and three separate sleeping areas for Mrs. Schröder, her son and the two girls. This enabled the space to be used as an open single whole and also subdivided in a large number of different ways, so that the layout could be altered several times daily, depending on the various wishes of the members of the family as regards accommodation” (van Eldonk & Fassbinder, 1990, p. 13-15).

Structuralism

At the peak of the mass-production of housing halfway the 20th century, the notion for more user-friendly architecture starts to manifest itself stronger among architects and designers. The mechanical mass-production has led to a standardisation in house-building, resulting in a total disengagement of the individual. According to several designers and architects, the profession has disentangled itself from its actual goal; embracing the identity of the unique individual. Instead, architecture was subjected to the political and economical powers behind the production of mass-housing. “Mass-housing reduces the dwelling to a consumer article and the dweller to a consumer. Man no longer houses himself: He is housed.” (Habraken, 1970, p.?). This rationalistic approach to house-building, was seen as the mere outcome of the machine, not that of an architect.

As a counteract against the rationalistic approach of house-building that continued to be practiced and promoted by members of the Congrès Internationaux d’Architecture Moderne, a group of architects and designers sought for an approach that embraced the identity of the unique individual. This was the start of the Structuralist movement, by which the unique and ever-changing characteristics of human culture were embodied in a large supporting structure. Although Structuralism maintains the notion to structure urban habitation, the core principle is that the structure allows the freedom of interpretation, adaptability and transformation to occur, and thanks to guidelines, could act as a framework for freedom.

This movement knows various visionaries of which most originate from the Netherlands and Japan. In the Netherlands, works by Herman Hertzberger and Aldo van Eyck such as the Kantoorgebouw in Apeldoorn and the Burgerweeshuis in Amsterdam, seek to find functional diversity in a contiguous overall structure. In housing however, this approach has hardly been used. As a follow-up, a movement emerged in Japan known as Metabolism, that found inspiration in the biological systems of circulation. Kenzo Tange proposed the Tokyo Bay plan to realize a variety of housing typologies together with a contiguous floating

infrastructure. In the centre of Tokyo, Kisho Kurokawa design a minimum living capsule that are plugged into a central structural core known as the Nakagin Capsule Tower.

Despite their more humanitarian approach in solving the housing shortage, the notion of the Structuralists and Metabolists seem to lose credibility due to the lack of realism in their utopian plans. As a response, John Habraken wrote his theory “Supports – An alternative to mass-housing”. Habraken had a more strategic approach to counteract the realization of mass-housing. Using the language in the written form, he sketches a method in which the principles of mass-production and the identity of the unique individual go together, instead of seeing these as opposites. “In the first place, he reasoned, the occupant had to be re-introduced as an actor in the building process in order thus to restore the natural relation between the user and the dwelling. On the other hand, technical solution had to be evolved which would give both man and machine – the natural relation and mass production, hand in hand – the opportunity for full development. In other words, what he wanted was a procedure for the design process and for the building process which would guarantee the central role of the occupant.” (van Eldonk & Fassbinder, 1990, p. 13-15). To enhance credibility, he proposed a conceptual system existing out of the support and the infill. He describes the supports as “structures which would contain dwellings as a bookcase contains books which can be taken out and put in separately”. These books symbolise the infill’s that serve as the domain for the occupant to create his or her personal habitat.

Although Habraken’s theory on user-involvement strikes to the core of the problem of mass-housing, it is not adopted in house-building. Nevertheless, it has a great impact among architects and designers. Future disciples adopt his concept into housing designs, even though, this is limited to a modest number of particular housing projects. An example is the project Molenvliet designed by architect Frans van der Werf. Representatives of mass-housing among the building sector do not acknowledge the potential of user-involvement in the housing process since it is in conflict with the two key-factors of mass-housing; time and money. Since the participation of the user slow down the process and requires additional costs, it was not considered as a realistic approach. For Molenvliet it took 3 months for the design phase to apply all unique needs and wishes of future inhabitants in the overall design. The urge to built fast and cheap is greater than the overall architectural quality.

As illustrated in figure 2.1, the user is entirely disengaged from the development of housing. Instead, the dweller is deduced into a single formula, a consumer, while the dwelling is transformed into a commercial product adapted for mass-production.

the Third & Fourth Industrial Revolution

±2000 <

In the last two decades the web has transformed our economy and society. That same digital revolution is now beginning to transform the way we design, regulate and produce physical things, especially our built environment. Digital tools and open data can be used to make complex, multi-stakeholder processes more transparent, more replicable, less bureaucratic and simpler for everyone involved. This rapid evolution is also referred as the the fourth industrial revolution.

Decentralisation

The way we design, make and sell things is strongly influenced by our digitalizing society. The speed of current breakthroughs has no historical precedent. Enabled by this digital revolution is the availability of more personalised or customized goods and services. Companies use Big Data to systemize clients demands and translate these into customised offers. This customisation is achieved by supply chain management with a collection of few standardized parts. Together with the accessibility offered by the Internet, which enables firms to compete in the global market, customisation enables clients to have ‘what they want profitably, any time they want it, anywhere they want it, any way they want it’ (Hart, 1995). Thanks to the world-wide-web, the entire world is virtually connected and collaborating, allowing each individual to contribute. By the availability of open-source design and production tools, individuals can now contribute to the development of products from any place at any moment.

Digital Fabrication

Recent advances in product development enable individuals to customise their purchases to their needs and wants even before production. Since production machines become more versatile, unique parts can be fabricated with a similar production efficiency as standardised parts. Digital fabrication techniques even allow users themselves to produce their own high quality goods. ‘Combining a few of today’s digital fabrication tools creates a fully functioning factory – a Fabrication Lab (FabLab) - for the price of an average

car’ (Stoutjesdijk, 2013). The possibilities for individuals to create customised goods, either by themselves or others, are endless.

Customisation

Technological advancements from the forth industrial revolution allow smaller private parties or even individuals to counteract the greater system via the web. The Wikihouse is a small party that stimulates a bottom-up approach by providing the necessary tools for individuals to start a project. Wikihouse is an open-source building system that is shared by a community of individuals. The community consist from layman to experts with various background, all eager and willing to participate in the bottom-up development of house-building. According to initiator Alastair Parvin, the ‘upscaling of the citizen sector’ would have beneficiary effects for the not only for the unique individual but would also complement the deficits of the housing process in general (Parvin, 2017).

Complementary to the main objective of this research, consumers will create a stronger demand for customization when purchasing their dwelling as well. The desire for customization is not yet served in house-building, since economical factors are still dominating the housing process. Most households are not at all involved in the development of their future dwelling. The over-complexity in current (pre)construction processes and conservative mind-sets of real-estate developers and construction firms hinder any level of participation with the consumer. Even in the private sector the commissioning of self-built homes is a complex, time-consuming and expansive matter which is hardly feasible. Instead, the sector is building for overgeneralized demands, failing to answer the specific needs of the individual. Rather than purchasing a dwelling customized to its users’ needs, the user is limited to the supply of the housing market, obliging the customer to make sacrifices instead of complementing their wishes. The building sector should play a more proactive role in the housing process to create suitable offers for the different requirements of the consumer.

The digital advancements in design and production are that far reaching that these processes decentralize, allowing individuals themselves to design and/or produce goods and constructions themselves on demand, allowing new-age variants of craftsmanship to evolve. This shift is depicted in figure 2.1.

Economy | Involvement

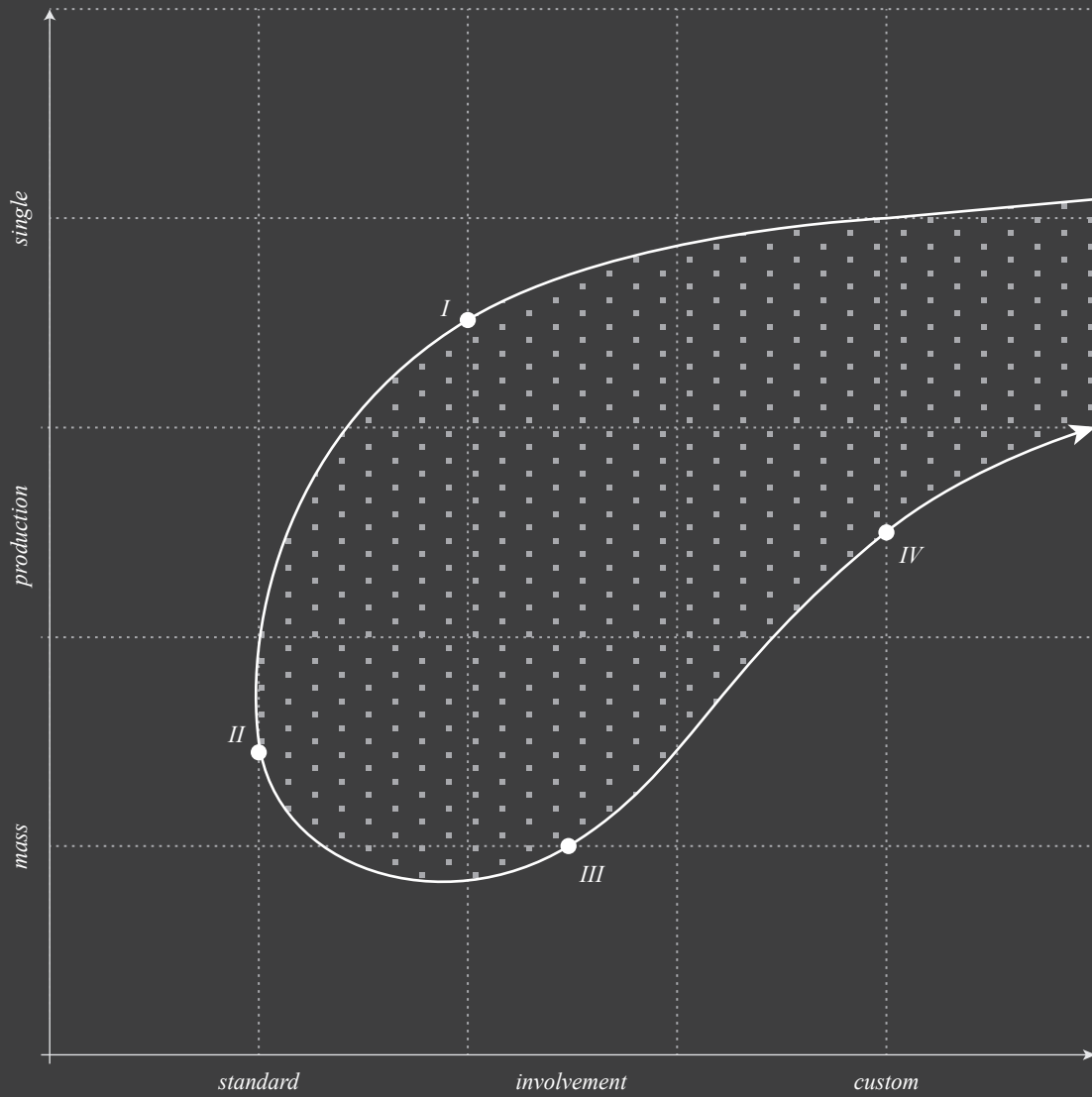


figure 2.1

Synthesis

The latter study describes a brief history on user-involvement in housing in relation to the technological advancements of each industrial revolution by referring to visionaries and their work. It reveals that there is a shift in the involvement of the user in the housing process in relation to the technological advancements through history. This changing relationship is illustrated in figure 2.1. By relating the research objective to current technological advancements, the study aims to justify its relevance.

At the beginning of the Dutch civilization, the housing process was decentralized, individuals were given boundaries for the self-development of housing. With the introduction of the machine, these processes started to decentralize and became, at the same time, more complex. Therefore, they had to be practiced in specialized factories located far from cities.

Halfway the 20th century, the mass-production of standardize housing was seen has the most effective solution to overcome the housing shortage. Mass-housing problematized the dynamic nature of habitation. In parallel, Habraken proposed to involve the user in the mass-housing process to regain their unique identity.

His notion was not adopted as it conflicted with two key factors; time and money.

Today, technological innovations, in design and production, make user involvement possible. The digital advancements helped to decentralize these processes and therefore permitted individuals to design and produce themselves, allowing craftsmanship to re-evolve. The world is now virtually connected through the Internet, which enables individuals to contribute to the development of products from any place and time. For house-building however, due to its complex process, a self-built dwelling stays unaffordable hence inaccessible for the private-sector. Yet, there is the potential to democratize housing development by successfully involving the user, as in times before house-building industries started to dictate the appearance of urban habitation.

3. User-involvement

Methods for Customisation

The previous chapter has provided elaborated background information regarding the past. In this chapter, this knowledge is projected to current housing development. The process, along with the actors involved, is described. Subsequently, different forms of user-involvement compared this process using characteristic precedents. These are then analysed according to criteria aiming to determine their qualities and interesting relations reciprocally. In doing so, new potential solutions will arise to successfully involve the user in the realisation of customised housing in the Western Metropolis.

the Development Process

Since the industrial revolution, the assumption has been that the only entities capable of procuring homes at large scale are professional developer, either of the market, state or third sector. As described in the previous chapter, this was intensified by the build of mass-housing as a solution to the severe shortage of sheltering during the post-war era. Due to the high risk linked to this complex process of producing homes, we rely only on large capacious companies and institutions. In the Netherlands, 88 % of all permits granted in 2013, is given to the market, state and third sector (CBS, 2017). However, the exact amount of new homes being produced per permit is unknown. By taking the average completion time of 1,2 years, we can deduct that of all 26.200 permits given in 2013, 45.200 new house builds were completed in 2014 (CBS, 2017). Expecting that private parties build merely one unit per permit, only 8% percent is being developed by the private sector (CBS, 2017). (Not to mention that housebuilders usually develop more projects at the time.) Especially in a country, in which its land is almost entirely man-made and centrally organised, the state's urge to control the production of housing for its nation is still strongly noticeable.

Top-Down

The over amount of housing development is characterized by a top-down approach. In this case, actions and policies are initiated by the highest level: the capacious developers from the market, state or third sector. With 88% of all housing development, it is evident that these dominate the production of housing (CBS, 2017). Although these large companies have the capacity to deliver qualitative housing, the speculative nature of the top-down approach in housing development enables market builders to take advantage of the imbalance between supply and demand. 'It is in the nature of their business model, that developers are not able to fulfil their duty of supplying the nation of sufficient homes' (Parvin, 2017). In more detail, this is due to the following reasons. Firstly, housebuilders control the rate at which they purchase land, build and re-

Domains of Involvement

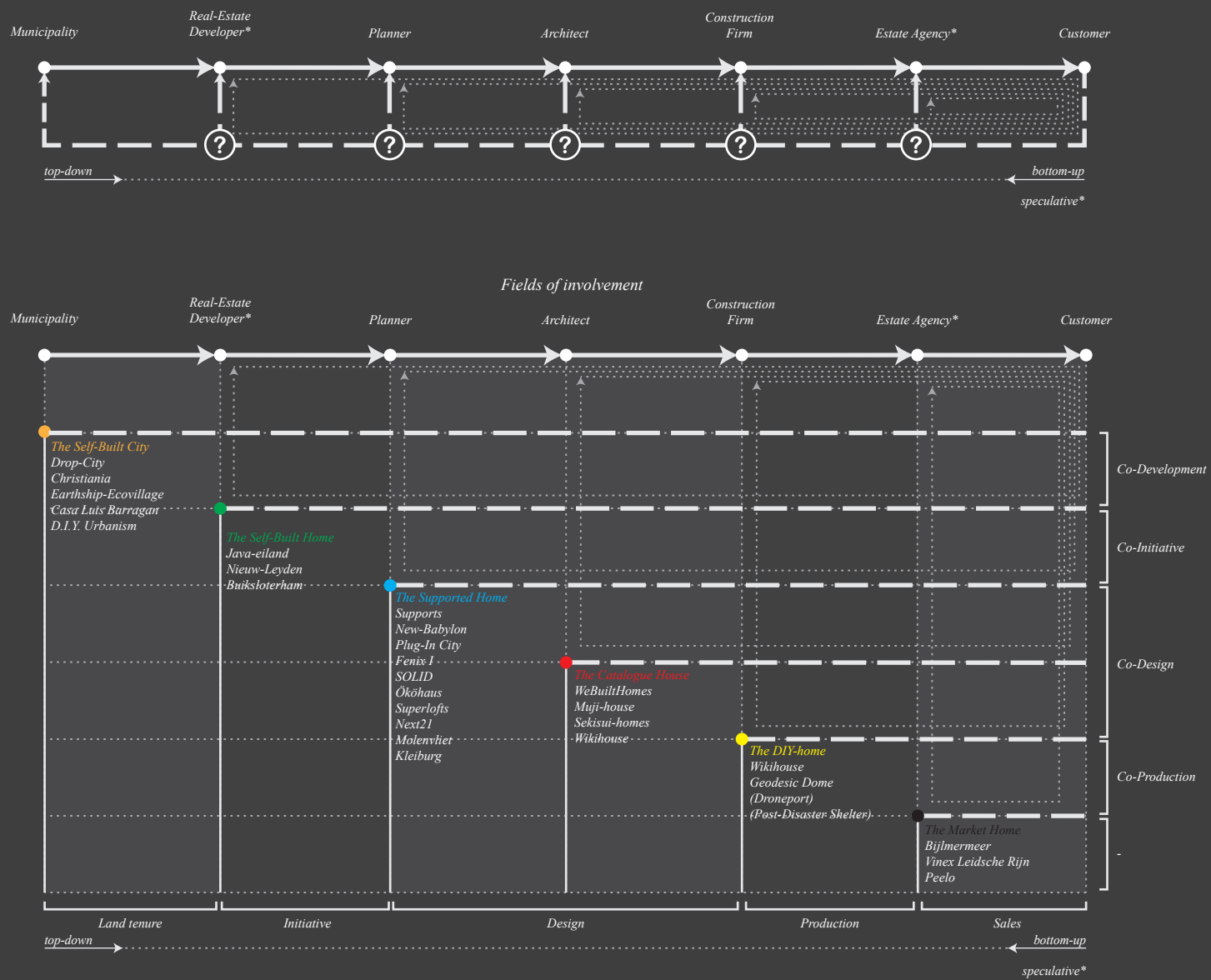


figure 3.1

lease homes in order to keep development opportunities instead of supplying the need. Secondly, the scope of development is limited since merely viable sites are developed, leaving many non-viable areas inaccessible. Thirdly, speculative development at scale tends to produce neighbourhoods with a lack of overall quality (Parvin, 2017). A complete domination by speculative house-building limits the unique individual and therefore affects the overall quality of the urban environment.

Bottom-Up

Not only capacious developers are able to develop housing. Also the individual is able to initialise housing development, which is referred as a bottom-up approach. This type of development has several positive effects to the housing process. ‘With no profit margin or marketing costs to pay, direct development is viable long before speculative development would be, especially on small sites or in areas where land prices are not rising. It also means any cost savings through innovation are passed-on to the homeowner’ (Parvin, 2017). Furthermore, the costs related to this type of development are seen as direct investments, resulting in a higher quality output and thus an upgrade of the build environment. Apart from the overall housing process, the bottom-up approach has multiple advantages for the unique individual. Since the individual is in charge and directly linked to the development process, it offers the opportunity to build up the project entirely according to his or her needs and wants. Moreover, the engagement in the realisation of a project adds to personal value of resulting outcome. When well planned and executed, the overall projects cost might turn out more affordable, in some case profitable for the initiator (Parvin, 2017).

Despite these advantages, there is a problematic issue involved with the applicability of the bottom-up approach. ‘Actors from the entire housing process, from the layman to even professionals, believe that a mass small-scale development is simply ‘too difficult’ (Parvin, 2017). This is due to two major barriers; the inexperience of the individual and the financial limitations. The inexperience of clients would resemble in high communication overheads and little transparency in the process. Projects are usually limited to the local resources available, resulting in poor quality of construction. In addition, there is a lack of capital reserves to accommodate the overruns. The high levels of risk cause an uncertainty among investors before initialising a project. Moreover, the high per-project overhead costs such as professional fees, meeting regulations and site preparation, can have disadvantageous effects for the initiator. In short, the process is opaque, risky and costly –in money and time- which makes it difficult to gain certainty in to replicate and scale.

Domains of Involvement

Both approaches have their advantages and deficiencies. However, these are resembling the extremes of a versatile process in which many other forms of collaboration are possible. After the description of both their advantages and deficiencies, it might turn out valuable to look for a cooperation within the development of housing. However, a cooperative approach of the developer and individual together, is hardly being practiced in large scale. To gain insight in the different forms of cooperative housing development, a study is performed and discussed in the following section. As a start, a general developing process is sketched along with actors involved, which is shown in figure 3.1. Then, multiple projects are plotted on this process creating different categories. These categories could be referred as the different domains of involvement. Ultimately these categories are further analysed using criteria, aiming to determine their qualities and interesting relations reciprocally.

the Market Home

This category is characterised by a complete top-down development. The entire process is initialised and controlled by the capacious developers from the market, state or third sector. To secure viability, these builds aim to respond directly to the market demand. In order to remain a long-term value, these are fitted to the standard requirements of a dwelling, resulting in a standardized outcome. Still the risk of misinterpreting the demand by the developer remains. When mass-produced, these (scars) can clearly be recognized in the urban landscape. The ‘cauliflower neighbourhoods’ mostly realised in the 60’s, of which Peeloo is a significant example, aimed to provide a peaceful habitat offering great amounts of vegetation and recreational facilities. Started in the Leidsche Rijn located near Utrecht, these were succeeded in the 90’s with several VINEX projects. These strategically planned suburbs create a higher amount of diversity in the supply of the limited housing market of urban city centres. Within this category, the client is entirely disengaged from the development of housing.

the Self-Built City

The extreme of bottom-up development is categorized as the ‘self-built city’. This category represents slight utopian forms of civilisations since all aspects of the build environment are initialised, planned and realised by the unique individual. An interesting example characterised by this approach is Drop City in Colorado, USA. The structural biospheres that Buckminster Fuller originally designed, are used to construct

a small community far-located from western civilization. A local example is the D.I.Y. Urbanism designed by MVRDV for Almere Oosterwolde. As MVRDV writes, ‘it is a revolution in Dutch urban planning as it steps away from governmental dictate and invites organic urban growth in which initiatives are stimulated and inhabitants can create their own neighbourhoods including public green, urban agriculture and roads’.

the Self-Built Home

A method that allows unique individuals to directly participate in the development of the urban environment, is categorised under the ‘self-built home’. In this case, the urban fabric is planned and provided within the necessary infrastructure. Zones destined for habitation are divided into plots and offered for self-development of housing. Complementary to the overall urban planning, various rules and guidelines serve as a frame-work in which the client has its freedom to create his or her living. In this manner, the overall quality of the build environment is controlled. Examples in the urban context are the masterplans for Java-island produced by Sjoerd Soeters and Nieuw-Leyden by MVRDV. This approach requires a high level of involvement of the client but at the same time offers the possibility for clients to realise their unique dream within the urban context.

the Supported Home

This category is characterized by a strong collaboration between the developer and the client. The developer takes initiative and manages most complex issues related to house-building such as financial investment, building permit and the built and maintenance of a load-bearing structure. With this supporting (with a literal and figurative meaning) structure, the domain for the individual is created. This is in line with Habraken’s theory on the support and infill. An iconic example of a mass-housing project, that is now upgraded using this plan of attack, are the Bijlmermeer flats. Long after its failure, the structural remaining’s are currently rehabilitated using a bottom-up approach. The former flats are divided into plots and sold to private parties who take up the responsibility for the renovation of the interior. More recent examples from this category are Casco-Lofts by Marc Koehler architects and SOLID by developer Frank Bijdendijk. Casco-Lofts is a formula that is being realised in multiple urban city-centres throughout the Netherlands. The supporting structure offers loft-apartments in various sizes. When purchased, it’s the client responsibility to design and build a living within the naked structure. The SOLID formula takes collaborative development to the extreme. In this case, the domain of the user is not fixed in terms of size and program. During an auction,

the ‘plots’ can be sold to any individual with any function. The realisation of the resulting configuration is partially the responsibility of the developer (separating walls and installations) and the clients (the actual interior). The category of ‘The Supported Home’ could be referred as the most direct form of cooperative housing development.

the Catalogue Home

As a response to the inexperience of the client, designers and contractors offer various pre-made designs. These can be categorised under the term ‘the catalogue home’. A local example is the website WeBuild-Homes, which is a digital platform serving as an intermediary between the designer and the client. Like in a catalogue, this website shares various housing designs from which the client can choose different options for different building plots. These designs are in a way representations of what the final design might look like, since these are adjustable to the specific needs and wants of the client. Overall, this approach allows the client to choose what is being built on their plot specifically without the requiring a high amount of involvement.

the D.I.Y. Home

This category allows the client to be involved by making; the ‘do-it-yourself home’. In doing so, costs for the client are reduced. A recent example is the Pioneerhouse which is a product from the Wikihouse Community. This project serves a test-case build, in which the technical possibilities of a versatile building system for DIY development are investigated. Although there is little or no freedom to adjust the design to his or her needs and wants, the client is able to participate in the construction of the house.

As we can see in figure n. there exist many variations on cooperative development. Each has its own particular qualities for the applicability for a certain context with different desires. In order to find a method to get users successfully involved in the realisation of customised housing for the Western Metropolis, the following section will analyse these categories in further detail.

Analysis

The customisation of housing means that it is specifically adjusted or – crafted – towards the needs and wants of the unique individual. Key to the realisation of custom housing, is the involvement of the user. This proves that the outcomes of all cooperative (including the user) forms of housing development are all customised housing. For this reason, custom housing has not a single appearance. It is the result of a method that is characterised by the involvement of the client in the development of housing.

To arrive at the successful realisation of custom housing, two different criteria need to be valued. First, there is the desired level of personification of the unique individual. Secondly, there are economical factors –time and money– that need to be respected in order to be accepted by construction industries. Since, these two criteria are in conflict, there will never be a perfect solution on both grounds. However, there is the possibility to find an optimum that respects both criteria. Therefore, in the following section, the cooperative form of housing development will be looked into in order to identify how it can provide the user the desired level of customisation, while maintaining efficiency in terms of time and money.

Criteria

To find the optimum, the different forms of cooperative housing need to be carefully studied in relation to these criteria: the level of user-involvement, the level of personification and the level of economical efficiency. As a start, these will be described in the following. How these relate is set-up in figures 5 and 6.

Level of Involvement

The level of involvement resembled the ability for the user to engage in the process of housing development. With a low level involvement, the client is unable to contribute to the development of his or her habitat. As a compensation the user is not engaged in the complex issues related to house-building and is not in any way financially depended or responsible. A high level of user-involvement allows full engagement of the user in the process whom therefore has the ability to express his or her needs and wants. In addition, the client is involved with the complex issues related to house-building. Despite the fact that the user is unskilled and is limited financially, he or she is self-depended for the final quality of his or her habitat, and ultimately responsible for the overall quality of the build environment.

Level of Personification

The level of personification resembles the ability of the unique individual to implement his or her needs and wants in his or her habitat. With a low level of personification, the client has no influence on the final output and is therefore depended on the supply of the housing-market. The housing process is controlled by state market or third parties and takes full responsibility for the supply of qualitative housing. When a client has full ability to customise his or her habitat, a high level of personification is apparent. Most specific requirements by unique individual find their way in the appearance of their own utopian living environment.

Level of Economic Efficiency

The level of economic efficiency refers to the aspects of time and money in the development of housing. An essential factor since viability has been and will (most likely) always be (one of) the main drivers for housing development. No or little economic efficiency results in a high cost and lead-time per project, which can negatively influence investors and ultimately the resulting quality. A high economic efficiency is characterised by a low cost and lead-time for the final outcome to be produced. This will positively add to the overall quality since investment savings turn out profitable for the investor, client's wishes are realised faster and trust for reproduction is gained.

How these criteria relate is set-up in figures 3.2.1 and 3.3.1. These will be described in further detail in the following section. In the additional studies, the previously described categories of user-involvement will be projected to these relations, aiming to determine their qualities and interesting relations reciprocally. Ultimately, a new method to successfully involve users in the realisation of customised housing for the Western Metropolis will be derived.

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Personification | Involvement

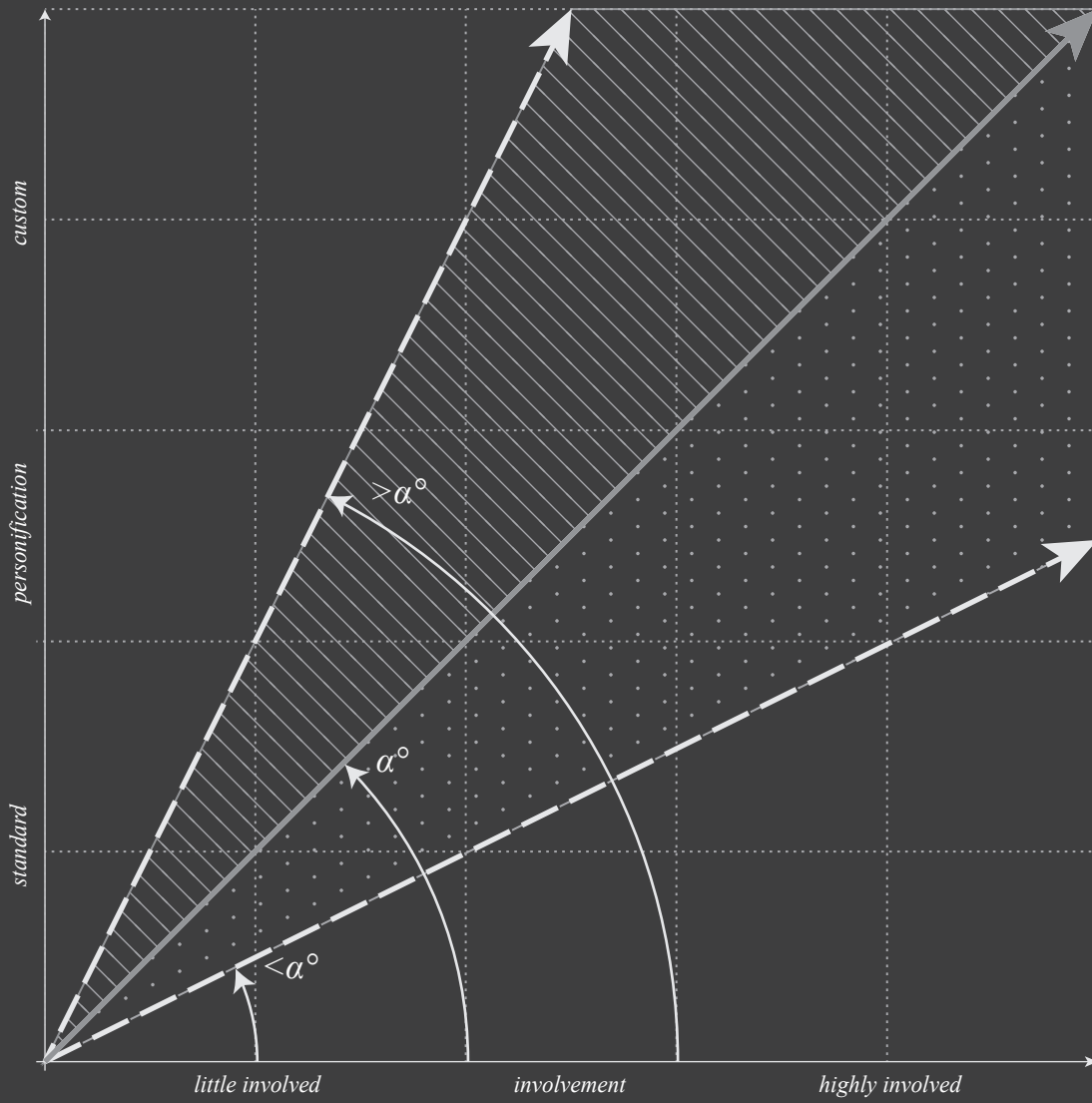


figure 3.2.1

Personification | Involvement

First, the various categories are projected in relation to the levels of user-involvement and personification, illustrated in figure 3.3.2. To arrive at the highest level of personification in today's housing development, a high amount of involvement is required. However, due to the client's lack of expertise and financial limitations, a low level of involvement while maintaining a high level of customisation is preferable. In order to achieve this, the client needs to be professionally and financially supported in the process. In addition, minimizing the amount of involvement would eventually reduce the conflict between the levels of user-involvement and economic efficiency.

The category characterized with lowest level of involvement and personification is the Market House. For this reason, the category is not of interest for the study.

The Self-Built Home and Catalogue Home perform well on both grounds. Within the urban plan and guidelines, the client is fairly free to create his or her own dream house. Still a high level of involvement is required. As a response, the catalogue projects require less involvement since these offer support in the design and production phase.

The Supported Home performs good on both grounds. It provides supports for complex issues related to housing development while maintaining the ability for customisation. It provides support to complex issues related to housing development such as taking initiative, willingness to invest, building permits, structural requirements and jurisdictional matters. The client is in a smart way helped from matters in which he or she has no skills and experience. It therefore stimulates the client to focus on the actual matters desired; shaping the personal habitat according to the specific needs and wants of the unique individual.

With the highest level of involvement and personification are the Self-Built City and the D.I.Y. Home. These require the highest level of involvement, while the ability to fully customise the project is not provided. This is due to limitations related to bottom-up development, that withhold the ability to fully realise the wishes and wants of the unique individual. The Self-Built City resembles the extreme of bottom-up development. However, complete involvement is likely to deduce the coherence of the build environment and it could create frustration if too much responsibility is put on the client. Nevertheless, the potential of the

Personification | Involvement

distribution of projects

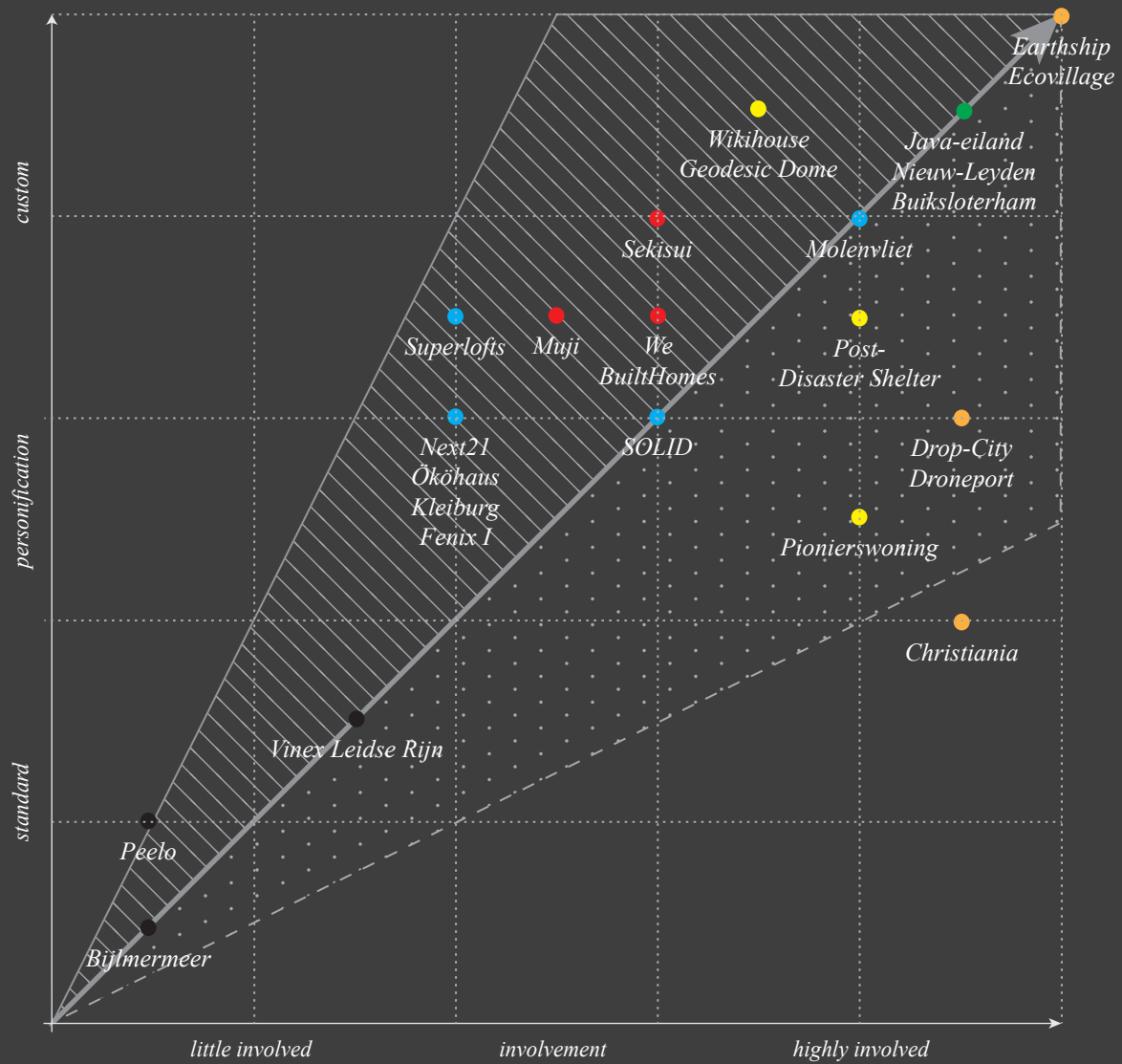


figure 3.2.2

Personification | Involvement

analysis of projects

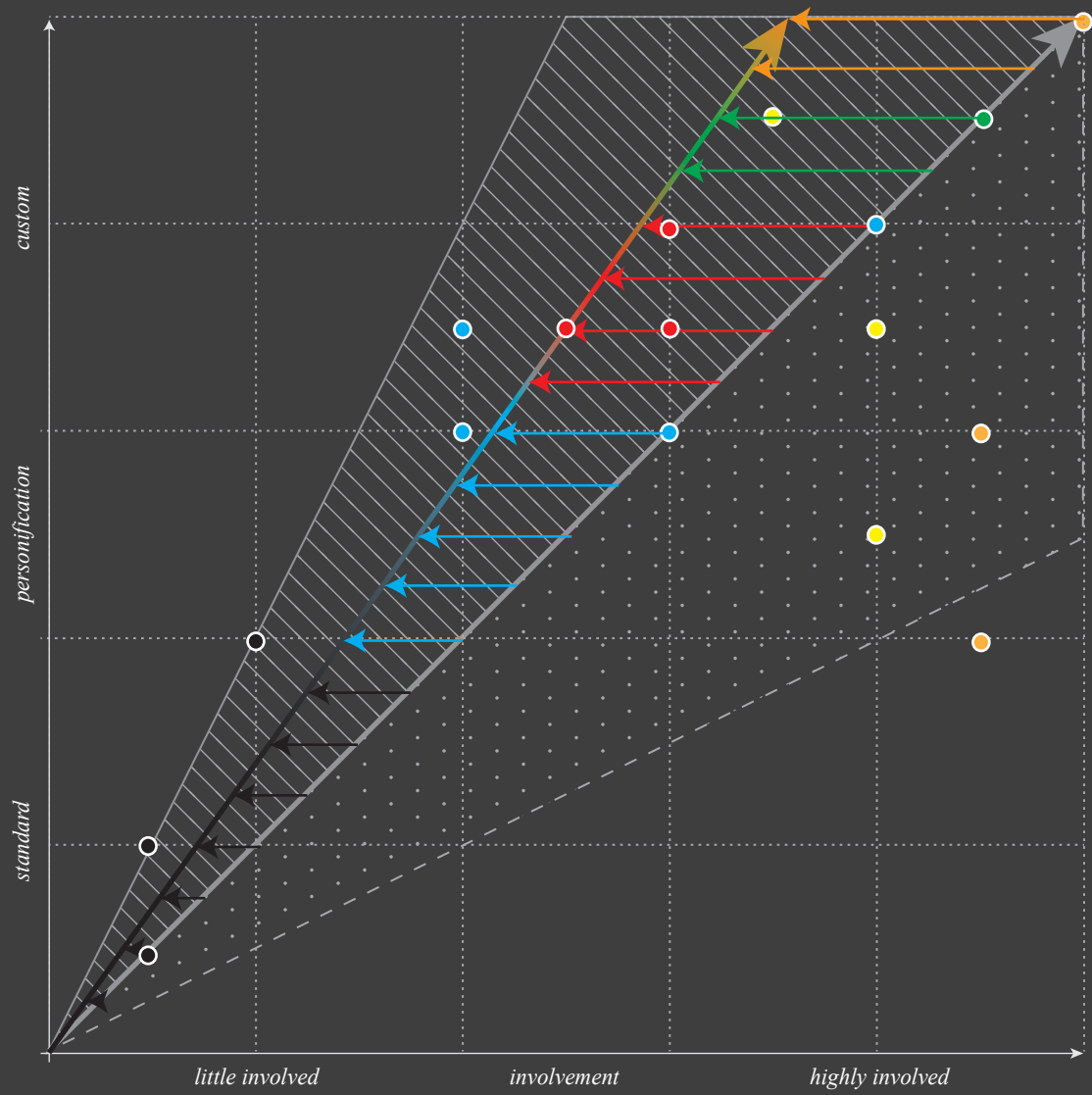


figure 3.2.3

D.I.Y. Home is not yet fully exploited. The Pioneerhouse is primarily executed as a test-case, as explained in the previous section, but a technological building system using very innovative technical design and production techniques as Wikihouse is aiming to achieve, might perform best for both criteria.

As shown in 3.2.3, all categories have resulted in outstanding projects that proof the client is able to engage in various phases in the process of housing development. The benefits are clearly understood and can be achieved with a requisite amount of patience and motivation. Although the D.I.Y. has the potential to offer full freedom of customisation for the client and support on all complexities related to house-building, it will need to be further be developed to achieve its objective. However, three categories seem to obtain more potential to be adapted in the urban environment. The Self-Built Home, Catalogue Home and the Supported Home offer all-three an adequate amount of freedom for the client to create his or her custom habitat. The Catalogue home and the Supported Home in particular, deliver the best support to complex issues related to house-building.

Economy | Involvement

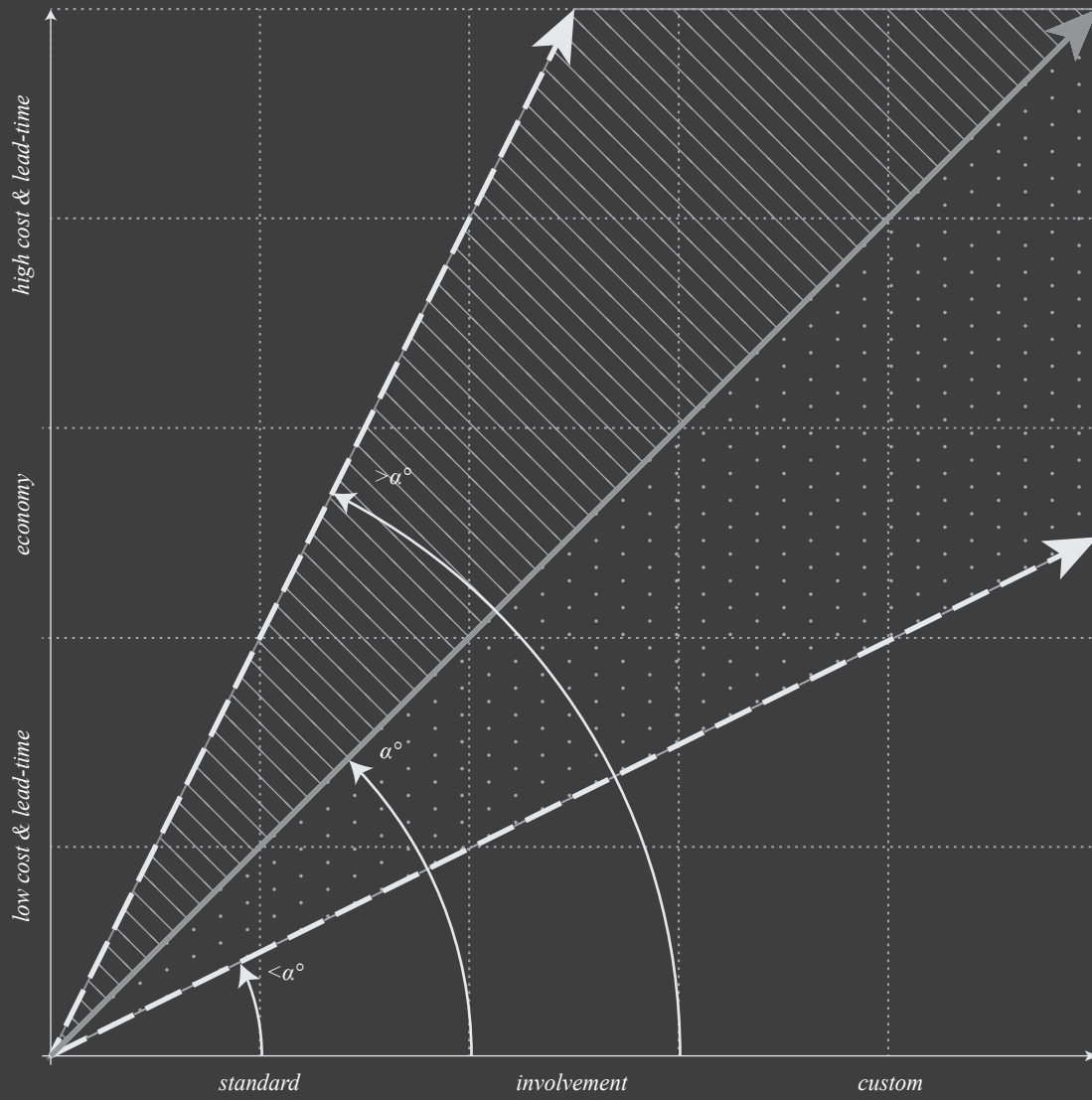


figure 3.3.1

Economy | Involvement

To complement the previous study, the categories are projected in relation to the levels of user-involvement and economical efficiency which is illustrated in figure 3.3.2. As previously described these criteria are in conflict, meaning a higher level of user-involvement would result in a lower economical efficiency and vice versa. The goal is to find an optimum between the two.

Since the Market Home is not a direct form of customised housing, this study will not further focus on this category in particular.

As previously described, The Self-Built home requires an exceeding amount of involvement in order to realise a project. Since the client is not experienced, additional costs are likely to be created. This results in a low level of economic efficiency.

The Catalogue Home offers supports in the phases that have the highest impact on economic efficiency. It therefore performs rather well for both criteria.

A ‘Do-It-Yourself’ building approach leads to a drastic decline of production and design costs. Meanwhile, it requires exceeding research and development in order to be successfully implemented. Currently, the design freedom is very limited.

In future, this might be overcome by further development of the building system.

Since most complex issues regarding housing development are fulfilled by the expert, the Supported Home offers the best support to the client deficiencies. In doing so, the projects can be realised with a lower risk of additional costs. Although the domain of the client to customise is limited, it still offers some essential freedom for the client to make adaptations to the given domain.

From all categories, the D.I.Y. Home and the Supported Home are the most economic efficient as can be seen in figure 3.3.3. However, due to the limitations in customisation and the high level of involvement required for the D.I.Y. Home, it will on the short-term be not a successful method to be adapted in the urban context. At present, the ‘Supported Home’ offers an optimum level of customisation with economic efficiency. It offers the best support towards clients while maintaining the freedom for customisation. To uplift the level of personification for the Supported Home, it might be worth investigated the possibilities of an infill developed with a D.I.Y. approach. Since the D.I.Y. approach fails due to the complex issues related to house-building, a successful combination of the Supported Home and the D.I.Y. Home seems valid.

Economy | Involvement

distribution of projects

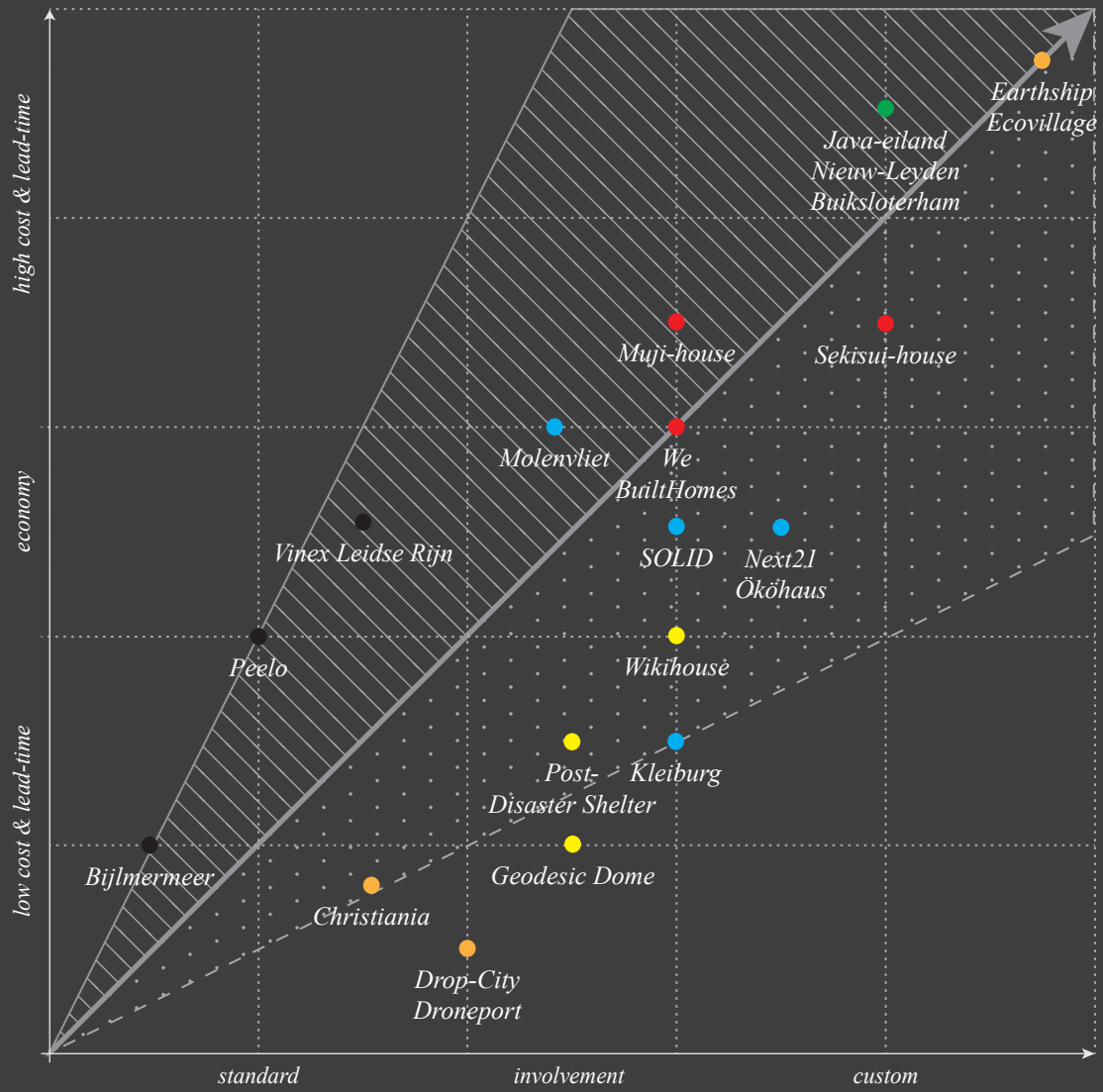


figure 3.3.2

Economy | Involvement

analysis of projects

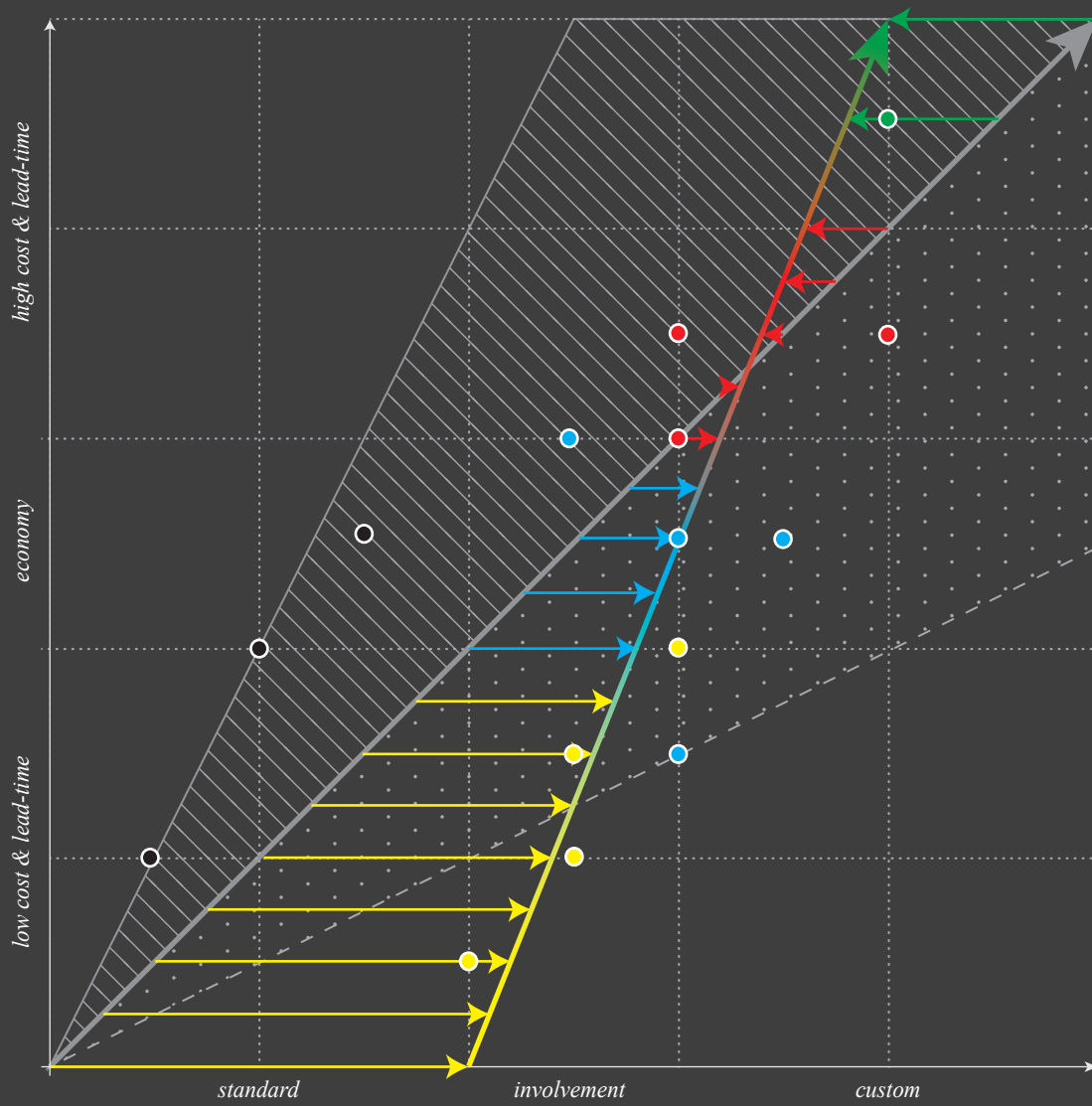


figure 3.3.3

4. Conclusion

To conclude, this paper aimed to find a solution for the problematic arising from the phenomenon of urbanisation influencing the housing process. As a potential solution for the densification and the growing cultural diversity in the Western metropolis, customised housing was introduced. Key to the realisation of custom housing is the involvement of the user. In order to be successfully implemented in current practices, knowledge on how users can become involved in the development of housing in the Western Metropolis was required.

As a start, a study was performed on the involvement of the user in the housing process in relation to the technological advancements through history. It confirmed that today, technological innovations in design and production should make user-involvement possible. Subsequently, by relating different projects with users involved to a general housing development process, different categories of user-involvement are derived. Furthermore, the levels of personification and economic efficiency are formulated as criteria to which the different categories of user-involvement are analysed.

The analysis clearly reveals that the ‘Supported Home’ and ‘D.I.Y. Home’ have the potential to successfully involve the user in the realisation of custom housing for the Western Metropolis. At present the ‘Supported Home’ offers an optimum level of customisation with economic efficiency. Although the D.I.Y. Home performs less compared to the Supported Home, it has the potential to evolve in the future. For future explorations, it is worth investigating the possibilities to combine the qualities of the Supported Home together with the D.I.Y. Home.

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