Life in Kit Form. Mass Customization in Playful Housing Experiments (Belgium, 1968–1983)

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Introduction

In May 2021, the Luxembourg pavilion is inaugurated at the Venice Architecture Biennale.[1] Entitled "Homes for Luxembourg," it exhibits a modular wooden structure, a habitat of the future, easy to build and accessible,[2] which could be an answer to Luxembourg's, and more generally Europe's, housing crisis. Central to the exhibition is the curators' exploration of a possible "customization" of this architecture by its inhabitants by allowing them to assemble housing units as they please.

This exhibition is no isolated case, and it sheds light on an architecture based on a frugal use of resources, where a significant part of the decision-making shifts from the architect towards the inhabitants. Inhabitants become part of the conception process, by choosing elements in a kit of possible choices, and putting their DIY skills directly to use. Are these ideas so new? To find out, we need to look at a particular period in the history of architecture.

While the early twentieth century saw the emergence and growth of architectural interest in everyday housing and its production on a large scale, the postmodern turn upended established theories, often vigorously, sometimes humorously. CIAM IX brought out the voices of some of its participants,[3] who denounced a monotonous and repetitive style of architecture that left little room for appropriations by inhabitants. An interesting shift in the thinking of housing was brewing. In the face of growing needs, how was it possible to merge two inescapable but opposing objectives: mass production, on the one hand, and the individual experience of the inhabitant, on the other? Housing took the form of bubbles and cubes, it soared, it clustered, it was weightless and could be dismantled: an architecture in kit form.

These alternative forms of housing were intertwined with the emergence of participatory processes in architecture. It gave rise to experiences where the innovative constructive techniques met the idea of incorporating the input of inhabitants in the process of decision, design and construction.

Many of these projects never got off the drawing board, however, luckily, several fascinating yet little known prototypes were built. These prototypes, as the architectural latest news shows, are still very pertinent today. Indeed, they address a series of issues that are still relevant for a socially and environmentally sustainable architecture: the challenge of simplifying construction,

1 "Homes for Luxembourg" was designed by the delegated curator Sara Noel Costa de Araujo (Studio SNCDA).

2 Carlo Menon and Sophie Dars, "Homes for Luxembourg," *Accatone* 7 (2021): 106-111.

3 Daniel Pinson, "De l'échec d'une charte à la poursuite d'une réflexion" [Of the failure of a charter to the continuation of a reflection], in *La Modernité critique, autour du CIAM 9 d'Aix-en-Provence, 1953* [Critical Modernity, around the CIAM 9 of Aix-en-Provence, 1953], ed. Jean-Louis Bonillon (Marseille: Imbernon, 2006), 242-257.

the need for evolving buildings, etc. More importantly perhaps, they offer a reflection on the transfer of knowledge between architects and inhabitants, empowering inhabitants through dwelling. By studying these prototypes, we can explore this central question: do these singular creations, designed to meet mass demand, produce a qualitative bond between house and inhabitant? Did they succeed in creating a socially sustainable living environment?

To address this question, we turned to three quite unknown and unfinished Belgian experiments (1968–1983). In these utopian architectures that were imagined in kit form, repetition and variation are not incompatible. As a result, mass production and individual appropriation by the inhabitant can go hand in hand. A Meccano-type architecture that did get off the drawing board, materialized in the inhabited prototypes, which the inhabitants are still happy with. Facing an important amount of archival – both paper and video – and oral sources, the research methodology included the shooting of a documentary film that brings together the points of view of the architects and the users.

Integrating Inhabitants' Desire for Differentiation

Repeat and Vary

The following historical contextualization aims to shed light on a period of intense reflection on the issue of "mass personalization," an oxymoron that opened the way to an architecture in kit form meeting a variety of needs. Before finding out how this concept takes root, it is worth re-discovering Yona Friedman's "flat-inventing machine," a creation he describes with conviction, in preparation for the 1970 world's fair in Osaka:

> "It's a machine that offers choices. In practice, let's say that there are a great many possibilities in terms of flats. We can make millions and millions of them. If I had made a catalogue (...) from which people could choose what they want … it would have been a huge book with small plans. Instead, I made a typewriter (...) and this machine possesses a keyboard which represents the different configurations, the different shapes, the different positions of the kitchen, bathroom, toilet. By hitting different keys on the keyboard, people can print out for themselves the flat they prefer."[4]

Although Friedman ultimately did not make his invention a reality, he pointed out an interesting hypothesis: the inhabitant's freedom of choice would only be possible if the role of the architect was reinvented. This hypothesis is rooted in the gradual emergence of architectural ideas about combinatory systems and components, from the 1920s to the 1970s. The threat to the profession was a serious one: if housing is subject to parametric logics mastered by any kind of user, what becomes the role of the architect?

This was a major issue for the profession, which had been confronted with housing mass production since the interwar period already. The solution was no longer individual but collective, leading to a new question: Multiply the unit or respond to a diversity of needs?

Repeat or vary? While the definition of decent and accessible housing was discussed at the CIAM in 1929,[5] heavy industry appeared to be an indispensable support since it enabled optimal pricing, living surfaces optimization and modern technical equipment. Faced with this new reality, repeating or varying proved to be a design problem that architects would struggle to rid themselves of.[6] While identifying industrialization as the architect's great challenger,

4 "Eureka," 23.09.1969, ONRTF, https://www.ina.fr/video/I07362170, accessed 15.06.2019.

5 Martin Steinmann, *International Congress for Modern Architecture. CIAM: Dokumente 1928-1939* (Basel: Birkhauser, 1979).

6 Christian Moley, *L'architecture du Logement. Cultures et logiques d'une norme héritée* [The Architecture of Housing. Cultures and logics of an inherited norm] (Paris: Anthropos, 1998), 180.

Le Corbusier himself, in the publication related to the congress, sought to reassure his fellow architects as regards repeating:

> "In seeking to build model houses (...) and spread them across the country, it could be that modern architecture is pursuing a wrong track. This would do away with the raison d'être of countless architects (...) but don't worry (...), the profession of architect will not disappear; rather, it will disseminate, will dissolve into a considerable number of branches."[7]

As for *varying*, Le Corbusier does not rule it out, as can be seen from the initial reasoning on combinatory systems in his utterances from the year before:

> "Research into the application of housing to the current social and economic conditions must focus, not on the chimerical fixation of a model plan, but rather on that of a new system of structure designed in such a way that it can make possible all imaginable combinations and thus meet the varied needs of many categories of individuals."[8]

The repercussions of this claim about shifting the architect's role towards that of systems' inventor – the only solution allowing for both *repetition* and *variation* – would be felt throughout the following decades, intertwined with the emergence of participatory processes, and sometimes leading to demands as extreme as the outright termination of architecture.[9]

A Postmodern Turn in the Industrialization of Housing

As announced by Le Corbusier, structure was the key to allow variations. In this respect, some saw the independence between framework and infill,[10] made possible by modern construction methods, as the lever for a transfer of expertise: the architect, in charge of the framework, could just hand over the responsibility of the infill to the inhabitant. Auguste Perret was among the first to suggest, in 1951,[11] that heavy industry could give way to the industrialization of smaller elements that could easily be handled by non-experts. As quoted by Dalloz, he opened up a reflection on the freedoms offered by light infill:

> "it seems conceivable to reconcile the obligation to gather many inhabitants in a single building with the freedom left to each of them to live there in their own way. (...) We could imagine that long empty structures with columns and slabs could be developed on the plot (...) Each inhabitant (...) would erect their own walls and façades with their doors and windows, and they would place their equipment at the required places. Industry would enter the building through the provision of this equipment."[12]

This quote prefigures the advent of open industrialization, which was to be advocated in many writings on architecture 15 years later.

Industry appears to be a vehicle through which architects allow the inhabitants to take part in the decision-making. It is a lesson in humility: spatial forms resulting from the complementary

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7 Le Corbusier, "Analyse des éléments fondamentaux du problème de la 'maison minimum'" [Analysis of the fundamental elements of the 'minimum house' problem], in *Die Wohnung für das Existenzminimum: auf Grund der Ergebnisse des II. Internationalen Kongresses für Neues Bauen, sowie der vom Städtischen Hochbauamt in Frankfurt am Main veranstalteten Wander-Ausstellung*, ed. Victor Bourgeois et al. (Frankfurt: Englert&Schlosser, 1930), 24.

8 Moley, *L'architecture du Logement*, 172.

9 Jacques Lucan, *Composition, non composition. Architecture et théories, XIXe-XXe siècles* [Composition, Non-Composition, Architecture and Theorie in the Nineteenth and Tewentieth Centuries] (Lausanne: Presses polytechniques et universitaires romandes, 2009), 457.

10 Bernard Leupen, *Frame and Generic Space* (Rotterdam: 010 Publishers, 2006).

11 Authors such as Davies trace the history of this thinking on prefabrication of housing and locate its origins in the early 20th century. Le Corbusier's Dom-Ino house (1914) is often mentioned as a precursor project in this field. Nevertheless, what Perret mentions here announces a collective and not individual solution, which constitutes a turning point in this thinking, a turning point that echoes the writings of Habraken some fifteen years later.

12 Moley, *L'architecture du Logement,* 197.

expertise of architect and inhabitant presuppose uncertainty, and relinquishing the control of architects over the end result. A few years later, in 1959, this shift was at the heart of the debates at the CIAM in Otterlo[13] and in Aix-en-Provence a little earlier.[14] The critique of modernism, and with it that of heavy industry, created a tension between the three forces involved. While the tail of the modernist comet was still visible and the Italian historicist trend was rising on the horizon, a third way, that of open form, was also represented. John Voelcker, one of the participants who chronicled the events, cites the work of Oskar Hansen of Team X, which, he wrote, includes "a housing project [which] makes use of interior partitions and exterior openings by means of which the inhabitants, unknown to him, shape the identity of their home."[15] What was being questioned was how industrialization could be used to include the inhabitant in the design and construction process, and to help the inhabitant occupy and alter it in the future. The theories about "system" architecture and "open form" percolated even more in the 1970s and took on more official configurations. They were implemented in competitions,[16] or were officially endorsed by the profession, as in the Netherlands, where John Habraken's studies on load-bearing structures with flexible infill[17] were translated and disseminated throughout Europe.

A new way of addressing housing takes hold through these different historical milestones: from Perret to Hansen, progress is what could be gained by the inhabitant becoming an actor in the design of his or her dwelling. Industrialization takes a post-modern turn, and the notion of mass customization is taken a step further. It is no longer a question of proposing multiple choices from a catalogue, it is a question of including the active participation of the inhabitants in a simplified construction process. What was hoped for is a relation of cause and effect between the use of components and a transfer of expertise to the future inhabitant. Could this new theoretical type of housing, conceived as a participatory-friendly system, take shape in concrete experiments?

A Cinematographic Focus on Three Case Studies

While much of their work did not get beyond the stage of paper architecture,[18] the theoretical field of mass personalization was nevertheless absorbed locally and gave rise to tangible prototypes that are still little known, isolated and wholly dependent on the contexts in which they emerged. In particular, the relation of cause and effect between the use of components and the transfer of expertise to the inhabitants can be observed in three case studies in Belgium: the Sart Saint-Nicolas designed by Paul Petit, Jean Englebert's Patze-Englebert houses and Lucien Kroll's Mémé. Imagined on different scales – that of the house, the neighborhood and collective housing – these experiments attempt to combine industrialization and recognition of the inhabitant's individual desire by means of the use components and combinations: an architecture in kit form.

These prototypes are still inhabited, and their authors are still alive. Hence, the access to all the protagonists of these adventures places human sources in the foreground. This research material requires a qualitative approach, and the chosen method relates to visual anthropology. It is located at the crossroads of cinema and social sciences, and, as practiced by Jean Rouch, among others, it does not exclude an element of fiction. The final output of the research – still ongoing

13 Oscar Newman, *CIAM'59 in Otterlo* (Zürich: Girsberger, 1961).

14 Pinson, "De l'échec d'une charte."

15 John Voelcker, "D'Aix-en-Provence à Otterlo, ou l'agonie et la mort du C.I.A.M." [From Aix-en-Provence to Otterlo, or the agony and death of the C.I.A.M.], *Le Carré Bleu* 4 (1959).

16 Monique Eleb-Vidal, Anne-Marie Châtelet and Thierry Mandoul, *Penser l'habité. Le logement en questions* [Thinking the inhabited. Housing in questions] (Brussels: Mardaga, 1995)

17 John Habraken, *Supports. An alternative to mass housing* (London: Architectural Press, 1972).

18 Moley, *L'architecture du Logement*.

– will include writings and a documentary film, intertwining conversations in the present, long-term observation and activation of archives by manipulating them with their authors and recipients. This "research by filming" experiments filming as a means for data gathering and for "de-archiving" unexplored archives. This paper discusses intermediary results of this long process.

Global Ideas, Local Absorption: Three Circumstantial Prototypes

The local absorption of architectural theories about mass customization is observable in the three chosen cases, where it was interpreted as a tool to respond to the housing crisis in a very local context. Investigating this local impact starts in Wallonia – the French speaking part of the Belgium – where, in the late 1960s, the crisis preceding the "oil shock" threatened the coal and steel industries. Economic anxiety was coupled with an unprecedented crisis between Belgium's Flemish and French-speaking communities, forcing French-speaking academics living in Flanders to move out. The collapse of industry, on the one hand, and the displacement of the French-speaking part of the Leuven university, on the other, proved a stimulus to creativity. As everything was collapsing, the crisis became an ideal opportunity to develop industrialized and participatory housing theories blending with very pragmatic concerns: reviving Belgian factories and materials, alleviating the financial difficulties of citizens, preserving the community spirit. This collision of contexts – the theoretical (the reflection on new combinatorial systems) and the concrete (a multifaceted crisis) – had a considerable impact on three Belgian architects: Jean Englebert, Paul Petit and Lucien Kroll.[19] Without consulting each other, they each took up the same challenge — to achieve the impossible marriage between industrialization and the individual aspirations of the inhabitant. Just as, in Molière's *Le Bourgeois gentilhomme*, Monsieur Jourdain discovers that he has been speaking prose without knowing it, they implemented the open form without labelling it as such and included it in actual experiments. Between 1968 and 1983, Jean Englebert conceived some forty "Patze-Englebert system" wooden houses that were built between Liège and the Ardennes, Paul Petit supervised the construction of 14 steel houses in Sart Saint-Nicolas in Marcinelle, and Lucien Kroll built the Mémé, home to 300 student housing units in Woluwé Saint-Lambert (Figs.1, 2, 3).

Concerned about the collapse of the steel industry in Liège, Jean Englebert worried about the future of the Ardennes wood industry. This wood was cut and calibrated before being used to shore up the galleries in the mines, which were on the verge of being shut down.

> "After the war, my spruce-wooded region supplied elements for reinforcing and shoring up the mine galleries. And when the mining industry gradually slowed down and then closed down, the market for spruce in my region diminished, and that's when I thought, well, if I invented a wooden construction system, I would help my region!"[20]

His encounter with a carpenter – Patze – enabled him to create a system with a wooden skeleton and flexible infill. The Patze-Englebert system was a simplified system resting on the use of *travées*, identical bays that can be added to one another until the desired size has been reached. The houses are conceived by combining a series of individual parts listed in a catalogue (Fig. 4), whose last page, gridded and detachable, encouraged inhabitants to pick up a pencil and make the system their own.

Paul Petit for his part, as he witnessed the decline of steel factories in his native Hainaut, dreamed of houses being produced industrially, imagining that steel columns and beams could be produced and then assembled in three dimensions in multiples of 1 m 20, like an

19 The definition of the field of investigation is based first of all on a community of thought between the three men, confirmed by their interest in each other: while Kroll read Englebert's academic research, Englebert visited Petit's construction site and Petit visited Kroll's construction site, etc. These intersecting trajectories hint at affinities that have not yet been studied in depth. The subject of only a few critical or scientific publications, the three selected case studies appear mainly in heritage inventories, local architectural guides, partial monographs, or works published by the architects themselves.

20 Jean Englebert, interview, 21.03.2017.

Fig. 1: Daily life nowadays in a Patze-Englebert house.

Fig. 2: Daily life nowadays at Sart Saint-Nicolas.

inhabitable Meccano construction: "What interested me was the desire to diversify almost to excess, to do something that was necessarily different. Voluntarily. And also, by leaving a certain freedom to the inhabitants."[21] To simplify the design and entrust it to the inhabitants, he came up with the idea of playful models and on-site trainings about building techniques. Lastly, Kroll believed in the emergence of an open, almost artisanal industry that would produce compatible components. He understood the use of components as a political statement: "before being a mode of construction, the components are a redistribution of powers and roles, a reversal of the meaning of the building."[22] He was commissioned by the French-speaking students in medicine who had been expelled from Leuven to design a large number of dwellings on a new campus in Woluwé. It was a heaven-sent opportunity to experiment with a new construction system that met the need for a design that, as requested by the group, was participatory and could evolve. He developed a concrete load-bearing structure capable of accommodating light, compatible and easy to handle walls and façades in an endless variety of combinations.

Despite the obstacles, Englebert, Petit and Kroll, at once confident and assertive, tackled the idea that *repetition* and *variation* were not incompatible, as did influential and international personalities before them. They developed astute systems that produced surprisingly rich spatial and relational possibilities. In their view, components, inventoried in a catalogue, constituted a lever towards a shared language for architects and users, from which a clue can be found in the inhabitants' discourse. With what mastery as a result, what effects?

21 Paul Petit, interview, 8.03.2017.

22 Kroll, *Composants*, 91.

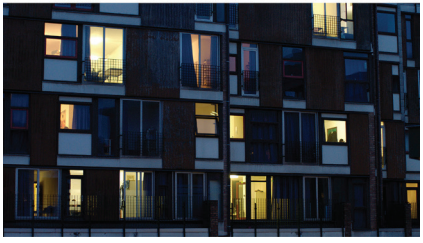

Fig. 3: Daily life at La Mémé: Lucien Kroll guiding a group of architecture students.

Fig. 4: De-archiving and re-archiving the Patze-Englebert catalogue, Jean Englebert and Cécile Vandernoot visiting a Patze-Engelebert house.

A Film-Based Investigation: De-Archiving / Re-Archiving

Many things remain unexplored of these three case studies, starting with the buildings themselves, which are still inhabited nowadays. Sources are varied and complete, as most of the protagonists are still alive and their personal archives are intact. This material allows for a complete reconstruction of the story of these projects, from their conception to the present day, after being inhabited for more than fifty years.

The research uses filming to reconstruct and understand this story and relate the density of the available sources. Data collection, in this cinematographic process, consists of "de-archiving/ re-archiving. We de-archive one narrative world in order to archive another."[23] Research into the architects' personal archives - libraries, plans, articles, etc. - and of the inhabitants - photos, administrative files, press cuttings - is supplemented by research into the archives of Belgian national television, which provided a lot of media coverage at the time. The use of filming, and particularly the filming and editing processes, allows the "de-archived" archives to be activated by not looking at them as inert objects, but as documents that can be manipulated in the present by their authors, who can comment on them a posteriori. The combination of their manipulation and commentary creates a new archive, "re-archived" by the film in another form. This is all the more relevant as the shooting, spread out over time, followed the three architects, all over 80 years old, who are confronted with the future of their own archives. By accompanying this archaeological process, the film ultimately leads to rearticulating the archives with the present (Fig.5).

23 Eyal Sivan, "Contre L'archive, pour L'archive" [Against Archive, In Favour of Archive], *POLI* 6 (2012).

Fig. 5: De-archiving and re-archiving the Mémé archives with Lucien Kroll.

Fig. 6: De-archiving and re-archiving the Sart Saint-Nicolas building site photographies, Paul Petit and his daughter commenting the Sart Saint-Nicolas' building principles.

One of the outcomes of this research is a documentary film, which structure is drawn in parallel with the discussion on the research results. This type of "arts-informed" or "arts-based research" is defined as follows by Cox and Lafrenière:

> "An arts-based work is an arrangement of symbols, such as words, forms or gestures, designed to convey experience, ideas or emotions emerging from research data in a meaningful, vivid and imaginative way through the use of literary, visual or performing techniques with the aim of provoking some effect in a reader or audience."[24]

This approach can be found in a number of recent research "diptychs" composed with films and writings and produced by researchers. For instance, Guillaume Meigneux, who, with *Habitations légèrement modifiées*[25] [Slightly altered dwellings], gives us a rich and rare overview of what inhabitants have to say while articulating a position on how architecture can be told. Or Manon Ott, who, in *De cendres et de braises*[26] [Of ashes and embers], draws a portrait, illuminated by the past, of a working-class neighborhood in the Paris suburbs.

The film is built in several chapters: first, it illustrates the past utopias, which still "inhabit" the minds of their authors. In contrast, their actual built prototypes are shot in the present, inhabited and in all seasons, in the form of *tableaux* – still shots – both inside and outside.

24 Susan M. Cox and Darquise Lafrenière, "'If you can call it a poem': toward a framework for the assessment of arts-based works" in *Qualitative Research* 13, no. 3 (2012), 318-336.

25 Guillaume Meigneux, "Habitations Légèrement Modifiées - Tour Bois-le-prêtre, chronique d'une métamorphose," Celluloprod, 2013, 76 min.

26 Manon Ott et Gregory Cohen, "De cendres et de braises," *Les Alchimistes*, 2018, 75 min.

We observe the users in contact with the architecture they inhabit: daily life movements, playful diversions of architecture, house maintenance, personal objects, etc. The second chapter deals with disillusion: the failure of large-scale construction and its social promises. It shows the architects wrestling with their archives, a legacy they seek to pass on. Finally, the last chapter confronts their visions with our contemporary world, and focuses on what their oeuvre teaches us about the role of architects in housing design. Illustrations in this article give life to this structure and are imagined as excerpts from the documentary in progress. In short, the film depicts the research context, its case studies, its results and limitations, and the questions it raises.

Archival and Oral Sources

Like any investigation in traditional research, the fieldwork at this stage relies on a series of sources, which we can categorize in three groups. The analysis of these sources led to a first series of results.

Source 1: Personal Archives / reconstruction through writings, images and sound

The investigation led to an important number of "paper" archives (books, photographs, articles from the specialized and non-specialized press, plans, specifications) and TV archives, in which inhabitants and architects have a voice. Paper archives made it possible to reveal historical influences and verify the facts and timelines gathered through the interviews, while also shedding light on administrative and construction procedures. In particular, the book collections of the architects are largely intact, and are a first source for understanding the influences and origins of the three architects' beliefs.

Among their important readings, some titles were formulated as questions: *Préfabrication, mythe ou réalité?*[27] [Prefabrication: Myth or reality?], *Le logement peut-il être une industrie?*[28] [Can housing be industrial?], *Composants. Faut-il industrialiser l'architecture?*[29] [Components: Should architecture be industrialized?]. In the work *Série industrielle et diversité architecturale* [Industrial series and architectural diversity], the authors positioned themselves: "We want to show that industrialization is only possible if it takes diversity into account."[30] Beside the books, each of the three architects acknowledged their international influences during repeated interviews. In contact with Prouvé and Schein, Englebert took a close interest in Kristian Gullichsen's work. Gullichsen was busy at the time working on a modular wood construction project, and recently re-assessed the international dimension of his interests: "The MoMA exhibitions and architectural magazines around the world were showing some new DIY house or prefab options."[31] Numerous publications found in Englebert's archives demonstrate the intellectual effervescence on the topic in the 1970s. Englebert was interviewed alongside Schein, among other thinkers of the movement for a special release of A+. In this publication, Ionel Schein presents himself as a defender of industrialized and libertarian architecture. He advocated "the all-out industrialization of the built space which is then to be managed and conceived by the inhabitants themselves."[32] Petit on his side stayed in the United States until 1971: He was a pupil of Louis Kahn but developed different interests through travelling during several month across the country. He set out to revisit the Levitt houses observed in Pennsylvania. Proposed by a property developer seeking to industrialize housing, made up of components selected from a

27 Marc Wolff, *Préfabrication : mythe ou réalité ?* (Brussels: Design Centre, 1970).

28 René Mayer, "Le logement peut-il être une industrie ?" in *Ponts et chaussées et mines. Spécial Logement* (1972): 42-56.

29 Lucien Kroll, *Composants* [Components] (Brussels: Socorema, 1984).

30 Bernard Hamburger and Jean-Louis Venard, *Série industrielle et diversité architecturale* (Paris: La documentation française, 1977).

31 Anna-Mikaela Kaila, *Moduli 225. A gem of modern architecture* (Helsinki: Aalto University, 2016).

32 Jean Barthélémy, "L'architecte face à l'industrialisation" [The architect facing industrialization], *A+* 14 (1975): 28–34.

catalogue, marketed in the US and then in France, they took the form of small suburban houses designed according to a classic model of middle-class dwelling. Although they allowed for variations in both size and appearance, to Petit's eyes they were neither sufficiently progressive nor contemporary, and he thought they could lead to a better version of which he could be the author. Finally, Kroll developed an early interest for Dutch architecture and studied Habraken's theories, published in English in 1972. He borrowed his tartan grids:

> "We followed a cold and mathematical system of a grid to be placed on the ground, which was 30cm, divided into a strip of 10 and a strip of 20. It was a Dutchman, John Habraken, who developed this, and it went around the world. We don't use it anymore, but the intention was to allow change, to allow variety, and to allow choice for the inhabitants."[33]

The literature reveals both the recurrence of questions concerning the industrialization of housing and a concern for the individual recognition of the inhabitant's wants and desires. How did the three architects appropriate these theories for their own projects?

Source 2: The Architects / a verified awareness for repeating and vary

The architects' voices are collected during the location scouting and filming, by means of qualitative interviews conducted in accordance with the method described by Jean-Claude Kaufman.[34] These repeated interviews took place on several occasions over the past four years. Returning to the architects' homes several times allowed us to cross-check sources while examining the archives, to re-examine the concepts put forward in the light of current events, and to establish a relationship of trust. The words collected reveal the reasons behind the strong interest of architects in solving the "repeat and vary" challenge. Firstly, "vary" appears a strong conviction. According to the three architects, the mass production imposed by the rise of heavy industry was to blame and it left a traumatic impression on a whole generation:

> "The inhabitants are an important element in the framework of architecture, but there is something odd: they are all different. And we were busy preparing heavy prefabrication during those years. Camus, who worked as an engineer for Citroën, had been put in charge of the well-prepared concrete cast panels with fixed places for the doors and windows. (...) He made a first model of the house, which was quite brutal, but well thought out. In order to be general, and not specific since it was prefabricated. There was no poetry to it, there was no differentiation that triggered a discussion."[35]

Secondly, besides being sensitive to housing needs and diversity, Kroll, Petit and Englebert's objective was to "repeat." They were acutely aware of the fact that housing was lacking and that it was part of a broader system. As a result, they articulated their intentions on the scale of the city. "My role is to design the shelter. That's the foundation, but it's also to see how to bring the shelters together, to link them, to organize them so as to make a city."[36] It is this awareness of the multiple, of the need to *repeat*, that led the three architects to formulate, each in their own way, and each influenced by their predecessors, the intention to link architecture and industrialized components.

> "We were teaching about Neutra and all that gang. I wasn't interested in them because they were rich and made things for rich people … The problem laid elsewhere! The idea was to position myself in the field of architecture like Ford positioned himself in the field of the automobile. How to make cars faster, cheaper … and I told myself that's how you should practise architecture."[37]

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33 Lucien Kroll, interview, 8.03.2017.

34 Jean-Claude Kaufmann, *L'entretien compréhensif* [The comprehensive interview] (Paris: Armand Colin, 2011).

35 Kroll, interview.

36 Englebert, interview.

37 Ibid.

The use of manufactured and commercially available products was naturally in line with the accessible character sought for housing. Housing was to be built using catalogues, with architecture becoming

> "Yellow Pages architecture. That means not investing, not having your own production infrastructure. Either you find people who make what you need on a customized basis, or, and this is even better, you find people who make what in the jargon I call 'compatible components' and which you can therefore buy directly. Today you would turn to the internet, in the past you turned to the Yellow Pages."[38]

These sources overlap with the numerous paper sources, which reveal the architectural tools used to frame the conception and construction "game" allowing to repeat and vary, such as the Patze system's catalogue, the parts inventories of Sart Saint-Nicolas, or the tartan grids of La Mémé.

Source 3: The Inhabitants / the clue of a shared expertise

TV and newspaper archives belong to a specific category of data: providing a lively account of an era, but also particularly revealing of the constructed nature of the discourse, or communication strategy, surrounding the projects. They embody the message that must be conveyed to win people over and bring the experiment to fruition on a large scale. In order to evaluate if a transfer of expertise took place in these architectural experiments, we investigated the discourse of the inhabitants in the past, as it appears in TV archives and newspapers, as close as possible to the date of construction, as well as a more recent discourse, after several decades of occupation. Do the words of the inhabitants reflect an understanding of architecture and housing? The clue of inhabitant expertise arises from a television interview taking place at Sart Saint Nicolas in 1980. A couple is seated at a table. Behind them, their interior, punctuated by metal columns and beams. On the table, an ashtray, a model and a bowl with sugar cubes. The man speaks:

> "One day, one of our friends came by and told us that he knew an architect who made houses that were made up of modules … Well, it was easy to represent a housing module like that, and anyway we had it to hand [he brings the sugar cubes closer]. Well, he told us, we can have as many modules as we want: if we want three floors, we'll just put three modules on top of each other [he stacks the sugar cubes] … We can … multiply that. We can … make half-modules. We can basically do whatever we want."[39]

When Gérard,[40] the man with the sugar cubes, welcomed the Belgian TV broadcaster into his steel house, he and his wife had been living there for just two years. On the table, the design of a carefully preserved model brings to mind the stacked sugars. These objects used to project a future dwelling are accompanied by a specific vocabulary and the use of one word in particular, "module." The discourse, the objects and their handling are all clues to Gérard's mastery over his dwelling: he is familiar with its building method and its compositional variants. This proficiency of vocabulary is verified in several interviews, where we observe the occurrence of words such as grid, section, bay, module. The presence of this kind of vocabulary and architectural concepts in the discourse of residents who, for the most part, have no connection whatsoever with the field of architecture, is a source of curiosity.

Meccano, a Child's Game and Some Precise Rules

The semantic analysis of the accounts makes it possible to identify the elements of architectural vocabulary shared by the inhabitants and the architects as clues of a transfer of expertise. This prowess is revealed by a recurrent vocabulary that relates to the very fabrication of housing

38 Petit, interview.

39 "Autant Savoir," directed by Michel Lemeret and Manu Simon, 18.12.1980, RTBF. All quotations in this text are from French and their translation is the work of the translator of this article.

40 In this text, the first names of the inhabitants have been changed to preserve their anonymity.

(grid, section, bay, module, etc.) and to the dimensions of the elements used for the construction. This understanding proven by the use of professional language is already interesting in itself, but once the analysis is taken further, it reveals notions that relate to the relationship between inhabitant and habitat. This analysis can be extended to a series of singular architectural tools which were used to effect this transfer of expertise. Surveying the discourses and tools leads to an important operational question for the architecture of tomorrow: does this prowess establish a qualitative link between inhabitant and dwelling? The answer is twofold.

Firstly, observing architectural design, representation and communication tools reveals a strategy of shared expertise based on play. Indeed, these projects all rely on a certain playful simplification of architecture. This, in turn, was meant to contribute to a redefinition of the architectural idiom and to allow learning and transmission. The architects literally describe architecture as a child's play: "These are Meccano constructions we're making. It's Meccano, quite simply."[41] The TV archives used in the documentary clearly show that the journalists sometimes exaggerated the playful nature of the project, as can be seen from the staging of the sugar cubes, mentioned above. A recurrent theme in the accounts and archives is the manipulation of concepts by the inhabitants using drawings, scale models, or common objects (the sugar cubes) as symbols. The main architectural tool used to achieve this result is the grid, the common denominator of components with compatible dimensions.

> "It was easy since the system originated in a grid. So we had large squared notebooks made, and I'd give them to people and say: Here you are, draw your house yourselves! Bearing in mind this and that … and some did it."[42]

The grid marked an era and crossed borders, as demonstrated by the SAR experiments or PAN competitions organized in France during this period.[43] Kroll readily claims: "The grid was a trend, a little outdated, but it was a good trend."[44] Rigid, it is always used with its counterpoint: "You have to look for the exception in the grid."[45] The use of the catalogue was complementary to it: "To a certain extent, the aim was to say: We sell spare parts at Ikea, and we buy our house and bolt it together."[46] The catalogue is also an effective way of showing the infinite number of possibilities in terms of the infill. For example, in the Patze-Englebert system, the façade panels, windows and furniture are detailed in a didactic, color sales brochure:

> "It was important to show that a system didn't freeze, didn't define once and for all a shape that had to be the same all the time. It's like in the car industry. Cars are all the same, but in reality, they're all different and they're all the same. They differ slightly, enough for people to say: This one's mine."[47]

Adopted by the inhabitants, terms as Meccano, grid, bay, module, were borrowed from the architects, who developed their terminology in their studios.

> "When I was working with him, there were grids. Everything was based on 60 by 60 grids. We almost kept the squared paper underneath the tracing paper. Everything had to correspond to the module" (Christine Fontaine, architect, employee of Lucien Kroll, interview 12/07/17).

For the inhabitants, the architects developed a playful thought mechanism around the subject of the room, imagined as an element of a game that is easy to manipulate:

> "The basic element is the bay. 1.20 m by 9.40 m and that is what is multiplied, so it is automatically possible to enlarge, alter... and as a bay slightly exceeds 12 m², 12 m² is 3 by 4. In a house, rooms measuring 3 by 4 are quite standard. So every time you add a span you

41 Petit, interview.

42 Englebert, interview.

43 Eleb-Vidal, Châtelet and Mandoul, *Penser l'habité*.

44 Kroll, interview.

45 Ibid.

46 Petit, interview.

47 Englebert, interview.

add 12m². So if I know that I have a house with 10 bays, I know that it contains 10 rooms measuring 3 by 4 m."[48]

Through this playful simplification of architecture, what is passed on to the inhabitant is an ability to understand the making of his or her home.

Secondly, the personal accounts reveal that this understanding is part of a lasting pleasure of inhabiting, a value that is difficult to assess despite its vital significance. This pleasure relies both on appropriation of space and on projecting future evolutions of the dwelling. Take the account of this former inhabitant of the student housing designed by Lucien Kroll, housing that could evolve thanks to the use of light, removable partitions:

"It was the concept of architecture that could change. You could take out anything you wanted and put it where you wanted. (...) The idea of being able to arrange a space yourself was great because, when you've never done that, when you've lived at home with your parents, in a room with your brothers and sisters, I can tell you, it's rather nice."[49]

The personal accounts also reveal the effects of an adaptable and flexible architecture on its users and their appropriation of this concept. An interesting televised flashback reveals the powerful capacity of the inhabitant to imagine and project themselves in their dwelling. A young man in his twenties, looking a little disheveled, with long hair, in front of his very small cubic steel house. His name is Pierre-Yves, a resident of Sart Saint-Nicolas. The journalist asks:

"- Is it enough for two people to live in?
- It's enough, quite enough.
- Even for three people, if necessary?
- That would be more difficult. But the mechanical system is designed in such a way that you can expand it as you see fit. That's why I left enough land to double, if not triple, the volume."

This small house shows that the owner's satisfaction is directly related to the growth possibilities of the constructions. After having built the house himself, he actually took advantage of the simplicity of the system to extend it fifteen years later.

"Ultimately, there are only a few houses in Sart that have not undergone transformations (...) Pierre-Yves has never stopped extending, expanding, tinkering … It is of course much easier, and much cleaner, to take down a Gyproc drywall than to break a wall and get dust everywhere."[50]

La Mémé, Sart Saint-Nicolas and the Patze-Englebert system proposed a flexibility of use which was appreciated by the inhabitants. New words had to be invented to reflect the indefinite character of the rooms, and thus, a potential for change and future appropriations:

"What is remarkable is that the people who engaged in DIY building or completing didn't reduce the costs but increased the number of square metres! You saw Gérard's house, with useless rooms which they called 'the shambles' … People needed undesignated spaces."[51]

This flexibility of use and space seems to have left a strong impression on the users of the Mémé:

"Nothing is permanent in my home, I still like this flexibility, maintaining this flexibility! There are no doors upstairs, so I can adapt it as I like. Lastly, I hate things that are permanent. The first year, when I started working (I'm an anaesthesiologist), the head of the department said to me: Marianne, I don't understand why you haven't signed your contract yet, I've never seen that before. In the end I left without ever having signed a contract. I felt that if I signed a contract, it would be permanent! And so, anything that is permanent annoys me … So, was I influenced by the fact that my first home was flexible?"[52]

48 Ibid.

49 Marianne, doctor, former resident of the Mémé, interview, 22.06.2017.

50 Petit, interview.

51 Ibid.

52 Marianne, interview.

This link between inhabitant and habitat is not exclusive to the original residents: Myriam bought her house at Sart Saint-Nicolas several years after it was built. But the mythology of the Sart, its flexibility and the imaginative realm that opens up, was passed on to her by her neighbors. And even though she says she has given up on her house's growth potential, knowing that this potential exists and being able to imagine how this operation would work in practice is a source of satisfaction for her.

Conclusion: How to Inherit?

Failed Success and Successful Failure

Demonstrating that repetition and variation are not incompatible, and thereby, include the future and unknown inhabitants' desires, is what was at stake in these little known and unfinished Belgian experiments. The unearthing of archives and the analysis of the protagonists' discourses shed a new light on these little-known experiments. At this stage, the research made it possible to reconstruct the story of these three experiments and their roots in an international theoretical field. More precisely, it has sought to find the trace, in tangible elements as well as in the words of the architects and inhabitants, of a transfer of expertise and to verify the effects of the architectural tools put in place to that end.

Should their success be put into perspective? Certainly. Authors such as Davies,[53] Schneider and Till[54] help us observe objectively the prototypes and the failure of the bigger scale hoped-for models. Colin Davies for instance points out the incompatibility between authorship architecture and industrialization and thus tells us that part of the failure lies in the way the profession is structured. The testimonies of the three architects mentioned in this paper leads us to another explanation: marketing a product cannot be improvised, and architects are not prepared for it. As Jean Englebert often regrets, "I am not a trader."[55] More obstacles are invoked by the three figures: a powerful industry lobby, a timid administration, and short-sighted public authorities.

> "Once we had reached the end and had already made a prototype based on these ideas, the decision was made: there would be no continuation. And no reason was given. But the reason may be that the people responsible for these investments were not ready to accept this."[56]

It is still difficult today to determine to what extent the proposed utopias were inadequate: were the ideas too far-fetched, or was the reception obtuse? To go further, we would need to keep categorizing the tools of the transfer of expertise and to continue measuring their effects on the inhabitants, but also to observe more precisely the evolution of the built prototypes over time. And we would need to remain cautious: the transfer of expertise, if it has indeed taken place, is also the result of legal voids, singular forms of ownership, and highly specific ideological and economic frameworks that cannot be reproduced but that must be analyzed. Several yet untapped archival sources could help us retrace the exact legal context in which these experiments took place and would certainly show the permanence of a legal pitfall that many self-built or co-housing initiatives face today.

Perspectives

What can an unfulfilled utopia reveal about our future? The history of architecture, and that of housing in particular, has provided us with fascinating experiments that have amply demonstrated the value of what Paul Petit calls "unfinished symphonies" and that today seem to call for a continuation. According to our three protagonists, the initial utopia has dissolved: it adapts itself to the contingencies of our time, allowing us to question our contemporary condition.

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53 Colin Davies, *The prefabricated home* (London: Reaktion books, 2005).

54 Tatjana Schneider and Jeremy Till, *Flexible housing* (Oxford: Architectural Press, 2007).

55 Englebert, interview.

56 Ibid.

By showing us that the handling of architectural concepts and the command of a discourse about one's own house can demonstrate an expertise shared by the architect and the users, they stimulate the empowerment of residents,[57] and contribute to the debate on the role of architecture in our society. Could architecture enable its users to develop their own projects? This allows us to continue questioning the definition of the profession through architectural designs, which, as their author takes a step back, contain the levers of inhabitant expertise. It seems certain that in the current context, in which resilience and frugality are pushing us towards architectures that consume less material, are more participative and can evolve according to the inhabitants, these architectures have not finished revealing their potential. It is an investigation that is certainly worth conducting while the protagonists are still here to talk about it.

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