

Managing quality of design for an ageing -in -time project

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Abstract—A method for measuring suitability of the dwelling for pursued independent living by persons with chronic disabilities was developed in an earlier PhD research thesis [1]. That measurement consisted in drawing up an inventory of the technical provisions, made for nine aspects of the dwelling plan. Its output is the Score for Potentially Prevented Burden-of-Disease in a building-Plan (Score P3Z). One remaining research question was the application of the method for managing design quality in the architect's practice. For a new housing project "Maaswaard"[2] the principals aimed to apply the Score P3Z for enlarging dwelling quality. A pilot-plan was constructed. This paper reports how the score P3Z influenced the design output during the design process. Concluded is that using Score P3Z from the initial brief phase until building-in-use conditionally provides an effective tool for managing dwelling-quality. Discussed are the conditions for achieving this goal "independent living for life span" in housing projects, learning from practice of pilot-plan Maaswaard. This pilot run from 2005 until 2008.

Ageing-in-time; independent housing; design decisions

Ageing-in-place in non-residential housing offers an opportunity for ageing well without extreme rising costs for protracted assistive care and social security. Preventing inhabitants for leaving the own dwelling [3] in favor of assistive housing avoids automatically given care. Besides, as a result of not moving away from the own neighborhood, social networks stay intact, including mutual help and voluntary help. Thus avoiding institutionally given care [4]. For an inhabitant that suffers chronic disabilities and impairments, the dwelling itself often becomes a barrier for extended independent living. In a recent history these persons would have been moved home to assistive living or nursing hospital [5]. In the Netherlands the number of Institutional Assistive living will not grow any more, despite its growing gray population [6] ,[7]. A growing part of persons that for recently would have been moved to assisted living, are nowadays committed to extend the stay in their less suitable dwelling, despite occurring impairments. Which is whether provoking a higher

consumption of (inefficient) care assist or coping with a decreased well-being of the impaired inhabitant[8]. This situation indicates that the design of the current prototypes for family dwellings does not yield yet appropriate solutions in "Housing for All" inhabitants[9], including those with chronic impairments.

Motives for Ageing in time dwellings

In the last three decades the changing standards for assistive housing [10] resulted in a couple of large des-investment waves for the involved non-commercial assistive housing foundations. Besides, as a result of typical Dutch housing production [11] this supply sided market is very slow reacting on changed demographics. From another point of view, the quality-level of standard dwellings and for assistive living are growing together. According to Houben a paradigm shift [12] is coming: from supply-sided (living in residential apartments with automatically given care) [13] towards a continued participation in society (independent housing with care, that is given on individually settled level of demand [12]). Assistive housing foundations and housing foundations are eager to accept this concept [13]of dwellings that facilitate an extended independent living for life span. The motives for establishing a higher building quality (inclusive Ambient Assistive Technology) [14] consist in:

- Avoidance of long lasting renewal construction-works in the inhabited dwelling for disabled [15];
- Decrease of the amount of required assistive care[1];
- Stimulation of empowerment of disabled citizen[12].

The momentum for innovation in the dwelling- concept is present. Large scale production of dwellings that facilitate independent living for life-span has an important *strength*: it provides an alternative for rapidly rising care-costs. High public benefits are expected from a conversion of dwelling production towards Ageing –in–Place [16].

It lacks a clear method to determine whether new concepts for dwellings will provide appropriate solutions for independent living for life span. A second problem is the production of additional requirements itself. Designers and initiators are overwhelmed with laws, building code, shortlists, etc. Since at the end architects are converging all decisions in one design, in case of conflicting demands they stick to formal given demands. The *weakness* in the management of dwelling design is that during the design process- given by repeated design decisions [17]- the "soft requirements" get lost. At the end will only remain the formally described demands.

So, formally describe "soft" healthy housing features! Doctoral thesis "Independent Living for Life Span" [1] ran this strategy for housing demands of senior citizen. Its system provides a ranking score, based on measuring the suitability of a building plan for pursued independent

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living. The method is giving a Score for the Potentially Prevented “Burden of Disease” for housing Projects, “**Score P3Z** “. Burden of Disease is expressed in Disability Adjusted Years of Life (DALY). *Score P3Z* acts as a shell for qualitative aspects (features) that are applied in dwellings above the Building Code standard. Usability of this method is simple. The input of the score P3Z exists in recognizing the presence of provisions in a dwelling plan, yes or no. Thus enabling a more transparent steering of design decisions through relating scores P3Z from first sketch towards the final plan. Although the method is available, it lacked testing in the design practice: a pilot plan of a housing-project.

Towards a pilot application

Housing corporation “Venlo-Blerick”, a regional Assistive Care Corporation “Zorggroep Noord Limburg” and a construction firm Van Wijnen together initiated in 2005 a diligent building project in Venlo, the Netherlands: project “Maaswaard” on the borders of river Meuse [2]. Their building program is combining ageing-in-time dwellings with a relocation of a residential housing project. In 2005 *the challenge* for their project [18]was “...to realize a housing project with a surplus value. ...that has special interest for the well-being of its inhabitants. Besides, the dwellings are to facilitate independent living for life span for its inhabitants”. Therefore this building complex “Maaswaard” is to stimulate the competence to act as independent citizen [] Which was fully in line with foreseen new Dutch WMO 2007 legislation [19]. The initiators of project “Maaswaard” recognized in the *Method Score P3Z an opportunity* to catch a number of housing requirements in one general shell. The *Score-P3Z method* was assumed to be an appropriate management tool for steering the aim. A pilot-plan Score P3Z was born.

Aim

This paper discusses the role in the design process of rating with the Score P3Z the establishment of health-supportive provisions in a pilot plan Maaswaard, Venlo.

Research questions were:

The ‘*Efficiency*’: does the use of the Score P3Z indicate transparent discussion about foreseen design decisions?
The “*Efficacy*”: does repeated run of Score P3Z in the design process result in higher quality level of the plan?

II. METHODS

Hypothesis is, that in cyclic design process in each design phase the motives for applying a design-feature have to be clearly promoted, else the feature will sink in priority[20]. A method that in every phase confirms the importance of a design-feature, will result in an improved quality of design. For this reason, conducting a repeated Score P3Z during the design phases will promote the Ageing-in time design.

Lay out paper

The “Maaswaard” project has a complex brief program. In this paper the general line for plan-evaluation is given. However, the illustrations always concern one (of 9) aspects of Physical built Environment in the Method P3Z: Feature sunny private outdoor space of the dwelling.

Available pilot project

A site in Venlo, Netherlands on the east boards of the river Meuse, with the bridges and the town center in the North. A neighboring industrial complex Nedinsco is nominated as an industrial archeological monument.

Used method

Used was a Architectural Analysis Method [1] , published in 2004 that is Weighting Suitability for Independent Living for Life Span of dwellings. The score P3Z analyses the architectural design-plan of a dwelling on the presence of provisions-features- []that are preventing for assistive care in case the inhabitant gets a chronic disability. This Score P3Z values the level of implementation of provisions “A” for 9 determinants of the *physical built environment* by counting its features. Four features that define functions, location, size and shape of dwellings are relevant for the first design phases. Ergonomic, Visually clear, Social secure, Sunny(balcony). Five other building features are relevant for phases of the design that define “ a composition of building materials”: (Ergonomics and Visibility), Stable warmth, Emission free, Sound friendly, Allergens-free and Well ventilated.

Measuring implementation levels

The interventions A in the dwelling plan will consist in whether prevention for dwelling-related diseases, in compensation for lost abilities, in facilities that are easing assistive care or in provisions that are enabling other social roles[IGT, 1997]. Levels of implementation of provisions where chosen similar on the study [21] GeDuBo :

- Level 1 on level of standards in *Building Code*;
- Level 3, *complete package of provisions A* that prevents for disabilities in registered patients A;
- Level 4, provisions A, *Installed in an Intrinsic way*. Bad behavior of inhabitants cannot overrule anymore the effect of the intervention A. The dwelling as a butler, who knows “by instinct” what is best for you.
- Level 2, in between level 1 and 3. Possibility to rapidly install the provisions of level 3, without the further need of structural construction works in the dwelling. During the building-in-use, attributes that are providing an intervention A are simply clicked-in. What requires a flexible way of *Intentionally Installed* building structures: foreseen, not installed yet.

Step 1. Achieving consensus about brief program

In the initial phase the initiators was asked for their ambition level concerning implementation of health supportive provisions in the project-plan. Besides, it was recommended to search for higher levels of implementation of health supportive aspects that needed no additional large investments. With this instruction an implementation level was no directive, but a reference. A starting point for negotiation and discussion was opened. Data for a “Reference Score P3Z” level were produced. The design- and the selection process were steered by a management consultant office that guarded the general design decisions process. According to their ISO 9000 way of working all information in the design process had to pass their general project-manager.

Step 2. Architects contest

Four Dutch architects-firms were invited to join an architects-plan contest. Invited were four architect-offices:

- *Architecten aan de Maas*, Maastricht specialists in assistive housing and nursing homes
- *Loxodrome architects*, Venlo, regionally operating
- *Bentham Crouwel Architecten* Amsterdam/ Aachen office of the national supervisor, specialized in offices
- *Herman Herzberger* architects, Amsterdam, Herman, eminence grise, well known for his housing projects

For the contest an extended brief program was written. The architects were invited to present their view in a conceptual plan. The architects were instructed about the criteria for the contest-evaluation, including the Score P3Z. The architects became oral- and written information of the ins and outs of the Score P3Z in a first kick-off meeting. After 5 weeks the 4 plans were gathered and distributed over three evaluators (urban lay-out, economics of design and Aging –in-time Score P3Z). The evaluations of the “Score P3Z Architect’s contest” for the four architectural aspects were executed by the first author.

Next to the achieved Score P3Z also was constructed a maximally retrievable “Score P3Z improved level”, after implementing the written abbreviations, within the given/ accepted plan-concept. The scores P3Z were kept secret.

Each of the 3 initiators had delegated two decision-makers. In a general meeting of all initiators, its advisors and the chief urban planning of the community the four architects gave oral presentations of their architectural concept plans. Afterwards the evaluations- including the “achieved Scores P3Z Architect’s contest” and “Scores P3Z-Improved level” for the plans- were communicated with the plan-initiators. The selection of the winning plan out of the four proposals was based on a typical “Dutch protocol”, accepting a veto-right for each of six decision makers, discussion until a choice is made; reasoning that the choice is the best.

Step 3. Tentative Design phase

The project team of the chosen plan started a period in which the contest-plan was elaborated and improved. The chosen architect was enabled to elaborate his plan-concept according to the assignments of the 3 above aspects *urbanism, efficiency building-layout, Score P3Z*. In the meantime, the project content was slightly changed. The construction firm left the initiators-group. All independent-living dwellings for sale became rental.

In the improved plan conceptual starting points for the 5 “materials composition” aspects had to be constructed. Therefor the architectural design was embedded in a design task-force []. In a couple of meetings the “materials composition” aspects of the dwelling were discussed, mostly in relation to the aspect “energy savings”. These meetings were also used to discuss the importance of healthy housing, possible contradictions between healthy building and state of the art energy- savings in the dwelling design. After finishing the construction of the new architectonic concept, a repeated evaluation session was done.

Main issue for the evaluation was the acceptability of the developed *tentative design* as a proper elaboration of the aimed imago of the project. Again the initiators was asked to confirm their commitment with the earlier chosen reference-scores P3Z and its drive: Ageing-in-time. All nine aspects of the Score P3Z were taken in account for this plan-phase tentative design. Besides the initiators asked for abbreviations that are increasing the Score P3Z level until at least the “Reference Score P3Z Level”.

Step 4: Final architectonic design

During the presentation some remarks were made about the indirect way of communication between the evaluators and the design team resulting from the ISO 9000 way of working. Dual-partite meetings were inserted in order to improve the quality of the dwelling lay-outs. The advisors-incl. the author- gave directive instructions to the design team in order to enlarge design quality to the standard. This intervention in the design was not planned before. In the architectural plan were integrated provisions for the building construction, heating, cooling, ventilation, fire-protection . After running this final architectonic design, a third repeated evaluation-session of the plan was done. Criterion for evaluation consisted in: “the acceptability of the plan as a fixed starting point” for the elaboration of technical detailing and preparation of a definite building-construction license, including an urbanism- check. In a final rapport was given the evaluation of several design aspects, including the Scores P3Z for all 9 aspects.

III. RESULTS

The example of the sunny balcony in the process

As an illustration of the variety of choices, that are connected with the optional implementation levels, the set of provisions is given for “sunny balcony”. In the Netherlands elderly are staying in home in average more that 95 percent of time. Lack of exposure on sunshine indicates several disabilities.: osteoporosis [22]. depressions [] and dwelling related diseases, i.e. asthma The Netherlands have a moderate mild sea-climate. When sheltered against cold northwest to east winds, a micro-climate can be established that suits for an outdoor stay during almost all seasons. North-oriented balconies suit only in high-summer, they suffer shadow and wind.

How implementation level is recognized: balcony

For this pilot-project Maaswaard, the levels of implementation for a sunny outdoor balcony consist in:

- Level 1: building code, no private outdoor space
- Level 2: balcony, on the sun-side of the dwelling
- Level 3: the balcony at least 2,5m x 2,5m .Thus enabling a longer stay over a longer period of the year.
- Level 4: outdoor stay, despite the changing weather conditions. By sheltered (infrared) heated balcony.

Step 1. Achieving consensus about brief program

In the extended Brief Program the initiators confirmed with the Score P3Z method, being a part of the Imago of the project []. In the initial program phase the initiators set their ambition on the following implementation levels:

- For assistive living implementation level 3;

- For independent living dwellings level 2. These levels were used as an average score. The initial program of the project Maaswaard consisted in 40 assisted living apartments, 5 group-nursing modules, 65 rental apartments, 40 apartments for sale. The resulting “Reference Scores” for a whole project and its composing parts “Assisted dwellings” and “Independent dwelling” is given for the partial Score P3Z, see table 1.

Step 2. Architects contest

In a kick-off meeting the program of the contest was presented and discussed in detail with the four design-teams. The management consultant office produced the Facts and figures of the brief program, urban layout and “Method Score P3Z”- including its relation with new developments in housing the ageing persons- were introduced and discussed.

In figure 1 are given small sketches of the the four plans. As foreseen, the plan of “Architecten aan de Maas” was combining three apart building volumes for assistive homes, independent housing and nursing hospital facility. All apart building volumes were optimized for their function. Depending of the possibilities the balconies were situated on south- or north orientation. This plan had the largest Score P3Z, what was not surprising.

“Loxodrome Architects” layout was strictly following the instructions of the urbanist. However, they oriented the balconies on the north facades of the building, since this location was offering the inhabitants an excellent town-sight. But no sun. Their motto “Stairway to Heaven” however got the lowest achieved Score P3Z. “Improving Score P3Z” was easy: re-allocate the balconies.

“Benthem Crowel” produced a snake-like, four storey height volume. On this basement 4 towers were positioned that interacted with a neighboring apartment complex and the Nedinsco Tower. Their scope was to generate simple, smooth industrial volumes, in which the balconies became loggias. As a result of the snake-like volume a cascade of

Fig. 1 Four sketches of plans in Architects contest

Table 1: Table with (partial) Scores P3Z of the Architects contest with 4 architects firms

Ergonomics, Visibility, Sunny, Social security	Partial Score P3Z	
	Achieved	Improved
Reference Score	62 (+92)	
Architecten aan de Maas	75	78
Loxodrome architects	42	72
Benthem Crowel Arch.	59	74
Herman Herzberger Arch.	59	59

dwelling types was produced. However, their score P3Z was nearly as low as Loxodrome. A large incline of the achievable Score P3Z was also achievable.

“Herman Herzberger Architects” produced a strong vision on the location. The components: A large 18 storey tower on the border of the Meuse; a court with assistive housing; in between a park around the monumental tree. The tower had a three storey high “Balcony” that was overhanging 15m1. In the tower was positioned a mix of nursing hospital facilities, rental homes and residences for sale. The apartments in the tower became loggias that were positioned at random over the four walls. Thus resulting for several apartments in an inferior positioning, whether under the overhanging, whether on a north orientation.

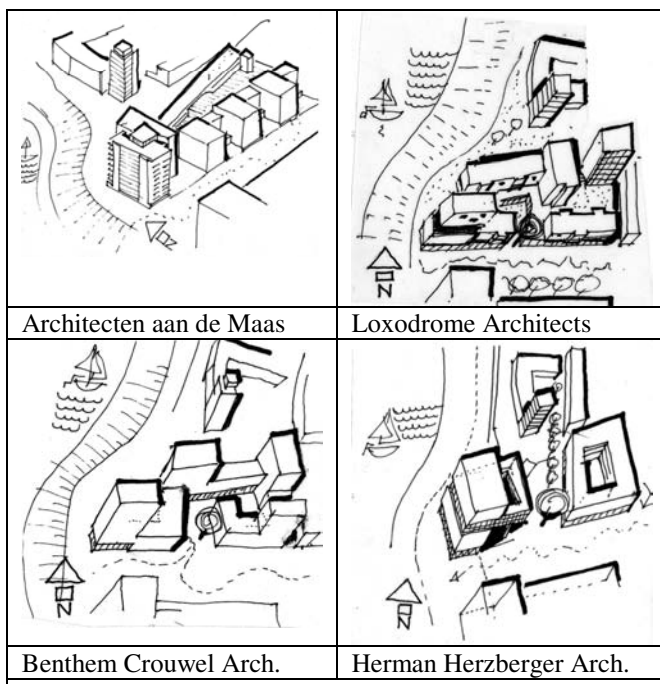
In Table 1 are given the “Reference partial Score P3Z”, for each of four project proposals both the “Achieved partial Score P3Z” and the “Improved P3Z score“. The theoretic ability to “improve the Score ” resulted in a close finish. The proposal of Herzberger scored whether most positive- or most negative sentiments in the audience. Which indicates that a serious architectonic statement was made. However, the height of the tower was problematic. As a result of the Dutch way of decision-making, the plan: that did not get a veto from one- or more decision-makers, that was in line with the directives of the urban planner, survived. Chosen was Benthem Crowel Architects. However, It is the plan with the lowest (partial) score P3Z.

Step 3: Tentative design phase

Indicated was a high ability to improve the Score P3Z within the given architectural concept of the plan towards the Reference Score. The winning team however consisted in German designers, not trained in dwelling design nor in the Dutch legislation. The conversion of the architects contest plan into a Tentative design-plan took a long time [23]. In November 2006 the tentative design was evaluated again with the *Score P3Z* for all 9 aspects, see table 2. Since the scores did not meet the Reference Score P3Z, during the presentation comments were made about the results and the lack of interaction with the design team.

Step 4: Final architectonic design

An intensified communication between architects and involved advisors was re-structured. Economics caused to integrate the storage into the dwelling lay-out in the same volume. Which caused large discussion about the necessity of balconies in the assistive housing. Besides, in the larger apartments the depth of the balconies was discussed. For most frequent used apartments ultimately were sketched



directives in order to enlarge design quality. In June 2006 was presented the definite version of the final architectonic plan. Again Full Scores P3Z were made, see table 2. In January 2008 the final architectonic plan was presented to the community Venlo and all actors involved.

Progress in Project Benthem Crowel Arch.	Scores P3Z			
	4 Archi	7 techn	Indep. Dwell.	Project
0. Maximal theoretical	141	198	339	339
1.Reference Score	47	66	113	154
2.Architects Contest	--	--	--	59
3.Tentative Design	66	58	124	140
4.Final architectonic	65	87	152	172

IV DISCUSSION

Step 2: Given the urban context and the brief program that asked for one-storey apartments, the difference in Achieved Scores P3Z in the Architects contest is merely resulting from both Variety of orientation of the balconies and in applying apartments with small depth.

Step 2: Usability of the Improved Score P3Z above the achieved Score is questionable, since the improved score is conditional. Will the architects-team fully accept advice?

Step 2: The lack of experienced designers in the winning architects team was not a major problem. Training effects in discussing the health-content and feed-back by using score P3Z indicated the efficacy in professional education.

Step 3: A large part of the Score P3Z is retrieved from the heating/ cooling system. In this project energy for central heating is retrieved by warmth-pumps that whether get warmth out of river-water or cool down by returning energy. It is combined with floor-heating and -cooling.

The design-process from step 1 to step 4, as given in tabel 2 shows few progress in score P3Z for architectonic Features. Most improvement of the score is realized by using state of the art technical installations. Sustainability and healthy housing strengthened each other.

The lack of tuning between the management consultant office and the method P3Z advisor resulted in a formally well done process ISO 9000. The intention to establish a direct interaction with the architect-team to incline quality-level of the plan was hindered. The ISO 9000 approach was again a drag on progress and true innovation.

CONCLUSIONS

The Score P3Z merely is a method that stimulates the discussion about quality- levels that are optionally to be established in a plan. Repeatedly produced scores P3Z during the design process however produce a decision tool for steering the design-output. The performance of the physical living environment is set on the agenda by using the Score P3Z method in this pilot. As a result of this pilot run of a design-process the involved housing corporation is using the Score P3Z method in another project. In this new plan the Score P3Z method will merely be used for recognizing problems and for stimulating design quality. Abbreviated is thorough information and individual motivation of the involved parties in the design, general management, design-team, decision-makers.

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