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Title:	**Examples of web-based custom design in Dutch residential developments**
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Abstract:
The Web offers the means to reach out to potential customers and clients. It enables the establishment of a communication link that allows designers to probe the preferences of their customers, and potential clients to be heard in the design process. It also serves as a communication platform for customers and other interested parties to share and express ideas and concerns. Opening up the design process to future stakeholders and other concerned parties is particularly accommodating in the aspiration to a consensus model, as is the case in Dutch architecture. We present two residential development projects in which the Web serves to reach out to customers and clients, and discuss additional techniques to strengthen and nurture their role in the design process.

Keywords: *customization, residential developments, web-based, consumer input*

Introduction

At the core of an effective architectural design process is a dialogue between designer and client to ensure that the resulting artifact is conform to the client's needs. When the building client, whether a single person, a family, or a company, is also the future user of this building, then it is possible to accommodate the needs and preferences of the prospective users in the design. In the case of property developers as clients to the design process, such customisation with respect to the future users may not be possible. In the office market, reasonable assumptions can be made based on technological needs and the types of organisational structures accounted for. In the residential market, such assumptions are harder to make and can prove ineffective.

The Netherlands has a long history of government-initiated residential developments, and a clear evolution of the planning and building types can be seen. The 1960's are marked by high-rise apartment buildings, in an attempt to make effective use of the available land and create a feeling of buildings in the middle of green areas. Changing perceptions led to low-rise apartment buildings instead, and an attempt was made at offering most or all of the apartments a private ground level entrance, in order to alleviate a sense of insecurity that can be found in anonymous building circulation areas. As a result of demands for private outdoor spaces instead of public greenery, apartment buildings subsequently made place for row housing, with an increasing variety among neighboring dwellings. In recent developments, this urge for one's own house has resulted in disconnected bungalow-type housing, in a mixture with other forms of row housing and low-rise apartment buildings. These changes have happened partially because of concerns of monotony, variation, identity, and more practical construction issues such as prefabrication. The designers need to initiate and face constant progress, and work closely together with social scientists.

Dutch architecture is dominated by a consensus model; in contrast to many other countries, the Netherlands does not allow an even controlled anarchy to reign in the housing market [1]. This consensus model extends over the client, the developer, the architect, the municipality, and other powers of influence. Recently, the Dutch government has urged designers and developers to offer future users also more of a say in the final outcome. This evolution is already noticeable. Often, this is accomplished by increasing a customer's choice, for example, by offering the customer a larger variety of housing types, housing designs, or executions of the same design. In its simplest form, this may be a catalogue of instances a customer may choose from. On the other hand, the customer may be allowed the freedom to design his or her own home, though within a set of rules or constraints governing such aspects as type, size, colour, materials or construction techniques. Such rules may reflect regulations, a strive for quality, or cost management. Some development projects offer their clients this freedom in the design of the

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interior of their ('Do-It-Yourself') apartment or house. Clients may be required though to cooperate with an (interior) architect assigned and employed by the developer.

Without substantially increasing the costs of such a development, the Web is offering designers and developers the means to reach out to their future or potential customers and recreate the dialogue between designer and clients. This method does not require synchronous contact, and clients can be empowered to create schematic designs of their future home at different scales. In some cases users can be invited to exchange ideas and follow up on someone else's idea. These data and relationships can subsequently be analysed and the result used to influence the design in general ways.

This paper will describe two such projects in which the Web provides a communication link for designers to probe the preferences of their customers and for potential clients to portray their wishes to the designers. The first offers the potential customer a parametric housing design and allows her to "design" her future home within the constraints of this parametric system. The second attempts to get the future customers involved in the design process from the site planning phase on, by offering them a sequence of design "games". The resulting data is analysed and provided to the design team, and consequent design decisions find their way into subsequent games. The analysis and discussion of these projects will suggest ways to improve and extend on their functionalities in order to increase user input and interaction. The authors were involved in both projects for database design and integration into the Web site.

Variomatic.nl

A first approach to increase a customer's choice is in offering the customer a larger variety in executions on the same design. In its simplest form, this may be a catalogue of instances a customer may choose from. At the other end of the spectrum, the customer may be allowed the freedom to design her own home, though within a set of rules or constraints governing such aspects as type, size, color, materials or construction techniques. Such rules may reflect regulations, a strive for quality, or cost management. An alternative way of offering constrained freedom is through a parametric framework of design. The architect provides a single design with a possibly infinite variation as embodied in parameters that may take either a discrete or infinite number of values and govern such aspects as size, shape, color, materials, etc.

Variomatic is a parametric design by Dutch architectural office Oosterhuis.nl (figure 1). The Variomatic design is fully flexible in shape, size, and interior organisation. Its shape can be continuously altered in height, depth, and width, and the curvatures of the roof and façade surfaces can also be changed. Each potential customer can design her own instance of the Variomatic design, over the Web (figure 2; www.variomatic.nl). Because of the extended and fluid formal flexibility it is unlikely that any two designs will be identical.

Figure 1. Artist impression of the Variomatic residential neighborhood. Image courtesy of Oosterhuis.nl.

The Variomatic concept was originally developed as part of a study on the integration of landscape development, architecture, and consumer oriented building design. Variomatic also constitutes a demonstration project of the Industrial, Flexible, and Demountable (IFD) Building Program, an initiative of the Dutch ministries of Housing, Spatial Planning, and Environment, and of Economic Affairs. The

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Variomatic project has as its main goal the development of a direct line from the consumer through the parametric design to the final assembly. The interface with the future residents through the interactive Web site is one main aspect of this direct line. Other main aspects are the connection of this interface to a database in order to provide immediate feedback to the customer on changes in living surface, volume, and cost, and the direct translation of the three-dimensional model to production drawings for the suppliers of the unique construction and roof elements.
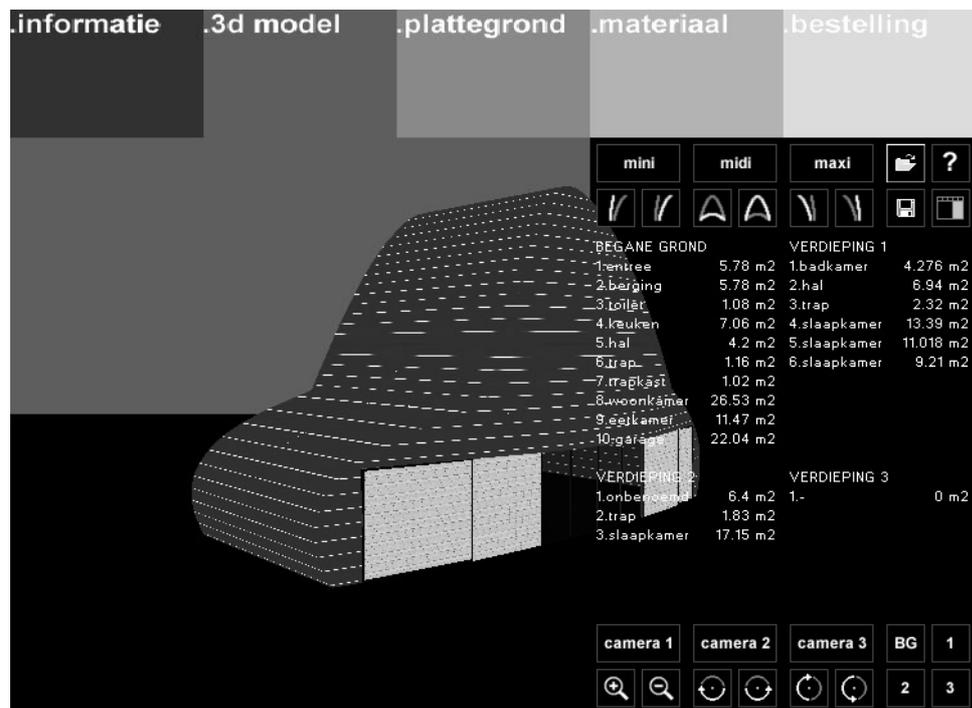

Figure 2. Snapshot of the Variomatic interface.

The Variomatic design is currently being implemented as part of two larger residential developments in the towns of Zoetermeer (8 Variomatic instances) and Deventer (9 Variomatic instances).

WoonWerf.nl

A totally different approach to increasing customer involvement in the design process is to identify a body of potential future residents and to determine both their collective and individual needs and preferences with respect to the overall development and the individual dwellings. The Web offers an outstanding medium to build up such a community of potential customers and to start a dialogue between the members of this community and the design team concerning all aspects of the planning and design process. Such a dialogue can be strengthened by enabling at the same time a discussion within the community on these same aspects.

WoonWerf.nl is a residential project of Dutch development company TRS Ontwikkelingsgroep at the location of a former shipyard near the city of Dordrecht. A Web site (www.woonwerf.nl) enabled the developer and the design team to communicate with interested clients on the development of the WoonWerf area. In particular, it presented the developer with an additional communication channel for informing the public various aspects of the project, including design results, and for inviting the same public to respond to specific queries for information on issues and aspects that were particularly relevant at that time in the design process. In a series of games and questionnaires presented on the site, on a variety of different themes, visitors were able to design their own master plan and elaborate on various aspects of this design in order to portray their preferences to the design team. The various themes are ambiance, layout, public spaces, facilities, safety, sustainable development, and services. These themes

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were consecutively activated, such that subsequent "games" could rely on design decisions made as the result of information received on an earlier theme. Based on all information gathered this way, the design team proceeded with the design of an urban plan for the site and presented the result to the public on the same site. Additionally, each participant received individual feedback on which of her choices were retained in the final plan and on the reasons why the other choices could not be upheld.

In the sequence of games and questionnaires, the user starts by making a selection from three residential ambiances: active, relaxed, and cared-for. The choice of an ambiance influences the program and defines the ratio between housing and work units in the site plan. In the next theme, the user is presented with a game offering an overview of the site and presenting a range of components with which to develop the site (figure 3). These range from different housing types, e.g., apartment buildings, row housing, and bungalow-type housing, over different working unit types, e.g., office buildings, shops, and individual live/work dwellings, to greenery, water, roads, and parks. The available components are also dependent on the ambiance. In order to assist the user in his or her design, four feedback sliders at the bottom-right of the game interface (figure 3) portray the fulfilment of various aspects that should be taken into account in the design. These include the number of housing and working units but also reflect on the financial possibility for realising the project and on the expected general satisfaction among the future inhabitants of this community. Financial realisation and satisfaction both depend on the selection of housing types and other elements, and often stand in contrast. High-rise is very cost-effective but detrimental to community satisfaction. Elements of nature on the other hand, such as ponds, trees, and parks improve satisfaction considerably but cost money. Only stores have a positive effect on both. In general, a balance needs to be sought in order to fulfil on all requirements. Figure 4 shows a possible layout design for an active ambiance: the number of units are sufficient with an expectation of fair profit and community satisfaction.
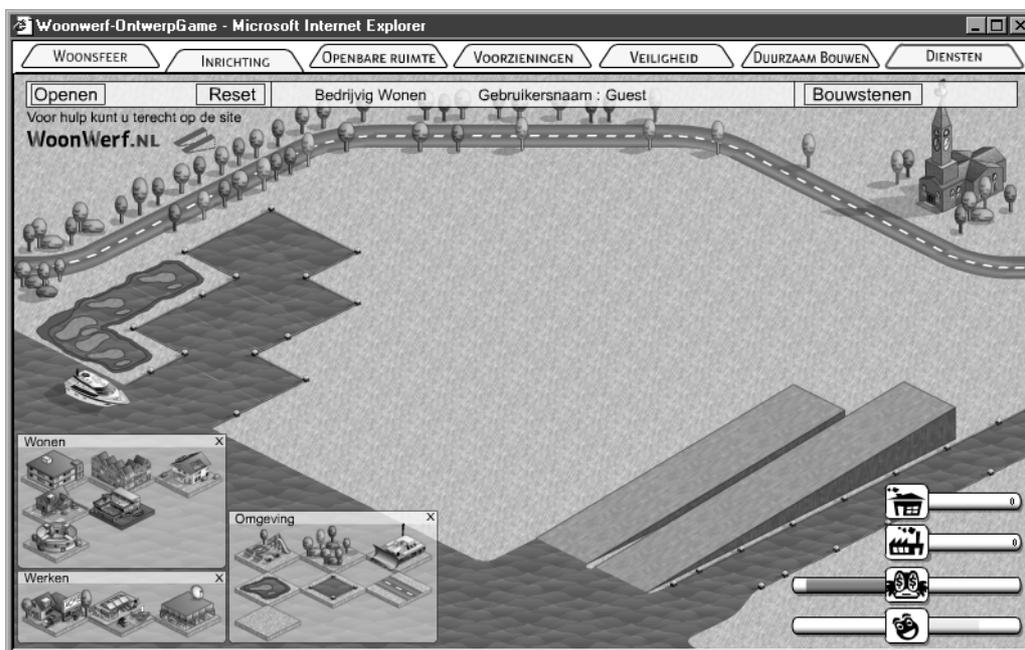

Figure 3. Snapshot of the WoonWerf.nl layout game.

The following themes invite information on various aspects of the built environment within the WoonWerf area. Within the public space theme, the user is queried on his or her preferences with respect to public spaces, and their components, characteristics, and qualities, in relation to water, greenery, and social space. Figure 5 shows the interface for the facilities theme: for each from a list of facilities including, among others, a pharmacy, a public pool, a childcare centre, and a theatre, the visitor can select to include this facility in the WoonWerf development or, instead, locate it outside of the area's boundary. The safety theme presents a questionnaire on aspects that may or may not increase a feeling of safety

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within the area. The sustainable development theme asks for people's interest to participate in environmental measures in the areas of energy, water, greenery, infrastructure, and waste. The user is always presented with three options ranging from a standard measure to a very environmentally-friendly measure, each time with an estimate of the investment cost and of the yearly savings. In this way, the user can value for oneself to which extent he or she wants to invest in environmentally-friendly measures and at what cost. Finally, the services theme attempts to assess the interest for extra services that can be provided to the future owners, such as surveillance, childcare, central delivery, etc.

Figure 4. Snapshot of an exemplar layout design.

Figure 5. Snapshot of the interface for the facilities theme.

All information gathered in this way for each theme was analysed and provided to the design team. From the selections of a residential ambiance, it became obvious that no single ambiance would satisfy a majority of the respondents. Instead, a mixture of all three ambiances was chosen in the site design. The result is an emphasis in the urban plan on low-rise housing with separate areas for cared-for as well as

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work accommodations (figure 6). All work units are collected in the southern part of the site in order to improve accessibility and reduce any inconvenience, e.g., because of traffic. Traffic is organised accordingly with on-site traffic kept to a minimum and including underground parking areas (figure 7). On the slopes of the former shipyard, a combination of different functions finds space in a high-rise construction (figure 8). As became obvious from the submitted designs, a large majority of users selected this area for high-rise construction and a mixture of functions.
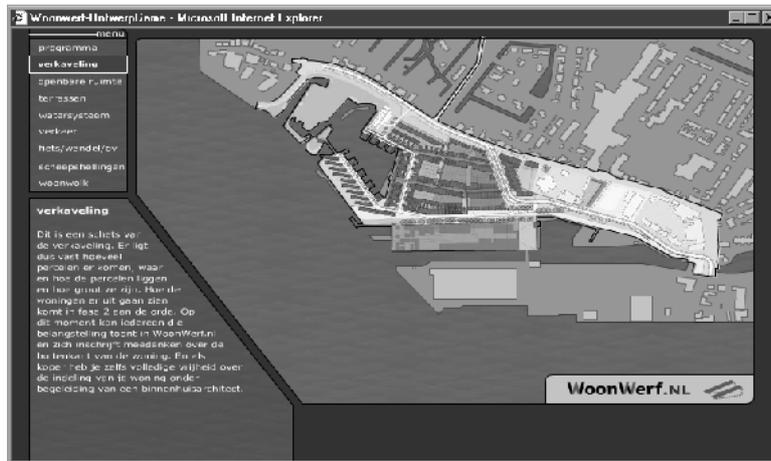

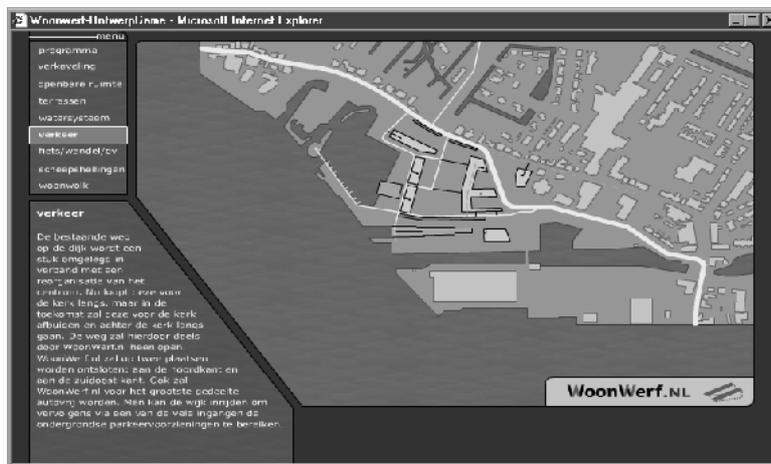*Figure 6. Urban plan for the WoonWerf.nl site.*

Figure 7. Traffic organisation for the WoonWerf.nl site

After the presentation of this urban plan and its choices, and the individual feedback to the participants, these were invited to think about the look of the building exteriors. In the mean time, an architect has been selected to translate the urban plan into an architectural plan for the entire site. The interior organisation of each dwelling will be up to the future owner, with assistance from an interior architect.

Discussion

Both examples fit within the consensus model that dominates Dutch architecture. In the WoonWerf.nl example, the consensus is established among the community of interested clients, the developer and the design team, and other powers of influence, such as the municipality. In the Variomatic example, the parametric design is created by the architect in cooperation with the developer and constructor. The role this Variomatic initiative plays in the larger residential development it forms a part of reflects another

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aspect of the culture of consensus: large projects are often reduced and split up, such that none of the parties involved is allowed to dominate (Ibelings 2000).

Figure 8. High-rise development on the slopes of the former shipyard.

Both examples are also representative of current attempts in the Netherlands to use the Web in an effort to shorten the distance of communication between the future owner and the architect or design team, and to offer the customer more input into the design process. The Web is particularly useful in reaching out to potential customers and in initiating and maintaining a communicative relationship with this customer. Not only is the user given the feeling that her input does matter, she can also keep up to date on the latest activities and changes with respect to design and design process. The approaches of both examples to the user differ dramatically: the former takes a purely individual approach, whereas the latter adopts a collective approach with respect to the design but also considers the individual in its communication. At the same time, both approaches impose common requirements on the development of the Web site: each user must be individually recognized, some or all of the user's actions must be recorded and stored, and the presentation of the website's content must be adapted to the specifics of the communication. As a result, user registration and authentication, database support, and dynamic web pages form a least common denominator in terms of requirements on the website's development.

At the same time, visitors must be enticed to participate and invest time in order to provide information that truly reflects their concerns and ideas. Designers are trained through education and practical experience to consider a wide range of aspects when making a design selection or decision, and to evaluate the impact of these choices upon different domains. Respondents, however, may form answers or decisions based on singular concerns that fail to take other aspects into account. In order to avoid such one-sided choices, users should be motivated to spend more time considering their answers more thoroughly, either on their own or in discussion with others. The former is difficult to monitor or support, the latter however can easily be supported within a virtual community.

Facilitating communication within a virtual community requires mainly two components. The first is a means for communication, e.g., through discussion groups, formed with respect to specific designs or issues. The second is an incentive for communication, e.g., in order to comment or react to other participant's designs. The latter can be facilitated by presenting respondents' choices and results to other visitors. In this way, the emphasis can be shifted from communication between the individual visitor and the design team towards communication among the virtual community of visitors and users. The result of this communication can be analysed by the design team in order to further support the design process.

Access to others' designs can be provided in the form of maps or lists, organized or ordered by various criteria. These criteria can be related to the information contained within the respective designs or its associated (authoring) information, such as, most recent designs, designs of a same author, designs that share some characteristic or have this characteristic the most, or the least, or designs that are most similar to a given one. At the same time, the ability to access other's designs, and to assess, comment on, or even

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use a design as a starting point for one's own design, all offer additional criteria to order and organize designs. These include the number of times a design has been requested for viewing, the number of derived designs, the number of comments, and the number of assessments, including the minimum, maximum, and average assessment value.

Obviously this is nothing new and has been successfully applied elsewhere, for example to support collaborative design in an educational context (e.g., [2]). Interactive critics facilities, where participants (and guests) can rate design products according to one or more criteria, and possibly annotate their assessments, can assist greatly in ensuring an objective evaluation of individual contributions. By publicizing at least the average of all ratings for a particular product in combination with these annotations, participants can be motivated to improve upon their work [2], or to argue their design with rationale.

We believe that with respect to a client's own house, there is another way in which the role of the Web can be further extended to increase the active role of this client in the design process. Some development projects already offer their clients additional freedom in the design of their own apartment or house, for example in the form of DIY apartments. However, in order to specify their wishes and develop the design, they are required to cooperate with an architect or interior architect assigned and employed by the developer. Though efficient, it does not enable the client to take center stage in the design process. Instead, a Web-based environment could broker a cooperation between client and architect to such extent that the efficiency is maintained while the client is offered a choice from among any number of interested architects.

The developer, or another organisation, designs the master plan and develops rules and specifications each dwelling has to adhere to, e.g., with respect to size, materials, or construction techniques. Interested architects can freely sign up, provided they are willing to work within the rules and specifications set out by the organiser. They present themselves, possibly with an exemplar design, on the Web site to potential clients. Each client chooses an architect from those presented, based on the presented information and on personal communication brokered through the Web site. Upon establishing a contract between both parties, architect and client create the design conform the rules and specifications provided on the Web site. Depending on the type of rules, these may be presented in various forms and (electronic) formats in order to enable an effective integration into the design process. The resulting design is submitted to the organiser in a specific format that enables the integration of all designs such that similar components from different designs can be bid upon by a single supplier or contractor. The bidding process can also be organised through the Web site.

Such a procedure permits the client to choose her own architect from a pool of interested architects, allows her to develop a personal design in cooperation with the architect that conforms to the rules set out by the organiser, and offers an efficient handling of the designs in order to allow for centralised bidding. The Web forms an indispensable link in this process.

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