

Sustainable Performance Optimization for Digital Housing

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Abstract

With natural resources depleting, sustainable solutions are becoming more and more a necessity. To deal with the depleting resources, the Dutch government aims to generate 14% of country's energy consumption through natural resources by 2020. The Dutch built environment is estimated to be responsible for 38.1% of the total energy consumption. This means that investments and innovation within this area have high potential.

However, there are some indications that these goals cannot be met. New houses often meet these requirements but, with a growth of 0.8% per year, these only make up for a small portion of all projects. As a result, a strong focus lays on improving and renovating the existing housing market towards a sustainable and low energy environment. For this transition, information on the current housing market, possible renovation options and insight on the investments costs are required.

Within this PDEng-project the aim is to further develop WoonConnect, a digital tool that can help to speed up this transition for both renovation projects and new buildings.

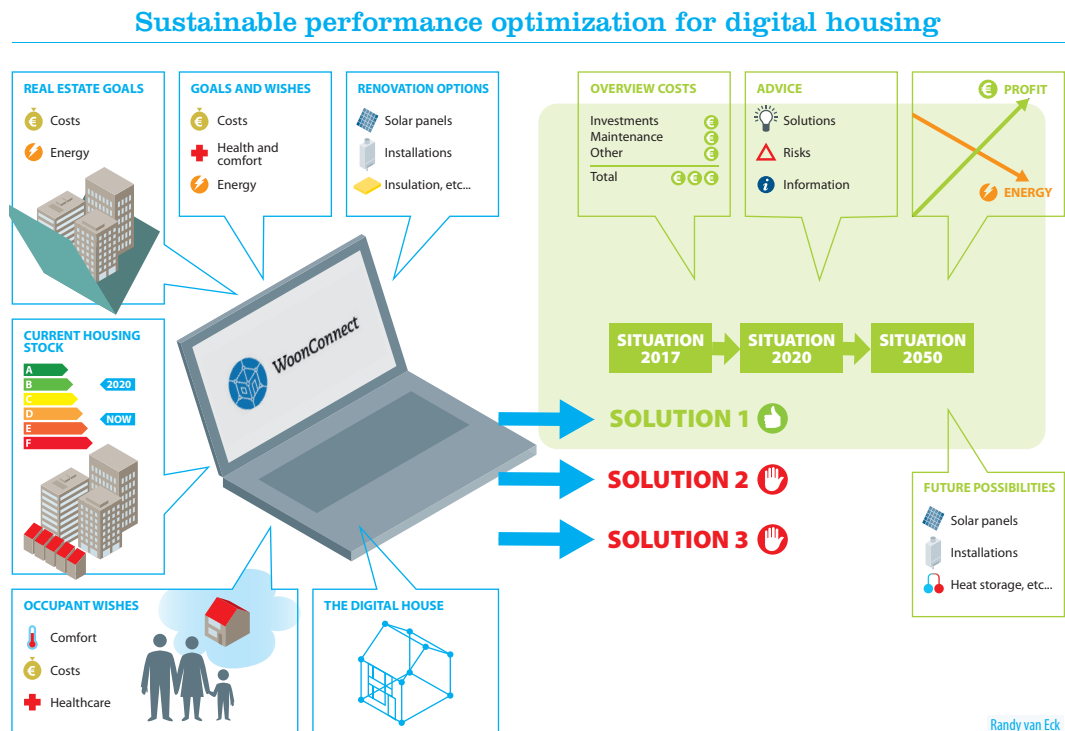
Keywords

building, different, WoonConnect, users, tool, interface, digital

Expanding WoonConnect

To further develop this tool the aim is to integrate the following aspects within WoonConnect:

- 1 The software should be able to display how the existing building performances in terms of different (sustainable) criteria. The tool should do this in a way that it provides relevant information for the users.
- 2 The software should be able to display the (maximum) potential of the building. The tool should indicate in what areas the performances of the building can still be improved. Furthermore the tool should display what investments the user can still make and how it affects the performances of the building with regards to different criteria.
- 3 The software is able to take into account the goals and wishes set by the users. For example, if goal is to develop a building with an energy label of at least label A, the tool should check if the design meets these requirements. Furthermore the tool should also display what the investment costs are to reach this goal.



Approach

WoonConnect in the current state uses BIM-software, a digital building component database (BouwConnect) and the input from onsite observations and drawings to create a digital house. Based on this digital house WoonConnect can already calculate several criteria and compare them to building regulations. Within the tool people can already adjust these digital houses with different renovation options. These renovation options are mapped by de Twee Snoeken in cooperation with the users. These users range from housing corporations, government, real estate groups and project developers. The residents can also use the tool to indicate what type of renovations they find important and to get more information about the project, planning and costs.

To expand WoonConnect we first aim to add additional calculation methods to assess multiple criteria (e.g. CO₂-emissions, material consumption or comfort). Within WoonConnect self an interface will be added in which the outcome of these criteria and the investment costs will be displayed for the different types of users. This interface should be able to provide advice both for now, for long term investments and will help people to express what they find important in their dwelling. In the background calculations will be added that combine different building components that can look for scenarios that meet these wishes. Sensitivity calculations aim to give the users an indication about which building components will influence the performances of the building the most. In the end the model should summarize these calculations within a (printable) interface.

To expand this software we first performed a study about the different criteria, (sustainable) assessment tools and buildings concepts that exist on the Dutch building market. Within this study we also focused on further developing the system requirements. In the second stage interviews were held with different types of users. These interviews are used to understand what criteria are interesting for which users but these also help to understand how these users would interact with the software. The outcome of these two studies will be used to design the interface for WoonConnect. The second part of this project aims to implement cost-performance effective solutions, optimization techniques and sensitivities analyses. These calculation can take into account the different building components, the available budget and the wishes of the users and look for scenarios that meet the different requirements. For the last part we aim to test the interface, if possible, within a case study.

