ONLINE INTERACTIVE PUBLIC PARTICIPATION FOR THE BUILT ENVIRONMENT

GRADUATION THESIS
Flora Bai
April 24th, 2019
# COLOPHON

## PROJECT

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<tr>
<th>Project</th>
<th>Graduation Thesis</th>
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<td>Title</td>
<td>Online Interactive Public Participation for the Built Environment</td>
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<td>Subtitle</td>
<td>A Case Study on Inner-City Street Redevelopment Projects</td>
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PREFACE

The submission of this thesis marks the completion of my master’s study in Construction Management and Engineering at Delft University of Technology.

For the last few months, I have been entirely devoted to this research, and it has been the most challenging and rewarding experience in my life.

This thesis would not have been possible without the help and support I received. I would like to use this opportunity to acknowledge my gratitude to the following people:

I would like to firstly thank the members of my graduation committee: Hans Bakker, Sander van Nederveen and Martijn Leijten for their invaluable guidance and continuous support.

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I would also like to thank Mariska Overkleeft and Erik Jongenotter of Witteveen+Bos, Jan Josten and Michel van Hout of the Municipality of Eindhoven, and Rob Admiraal of the Municipality of Haarlem for sharing their precious time and experience with me.

Lastly, I would like to thank Paul van Eeghen for the emotional support through this journey.
SUMMARY

The public participation processes currently used in the construction have many drawbacks. Effective participation was not achievable due to the public's lack of knowledge of the participation objective, lack of open communication channels, insufficient level of involvement and limited decision-making powers granted to the public (Creighton 2005; Dola and Mijan 2006; IAP2 2018; Rowe and Frewer 2005).

To resolve these issues, Witteveen+Bos B.V. had been developing an online interactive public participation process (also referred to as the new process in this research). Inspired by the concept of electronic participation, an online platform was constructed to digitalise the public participation process. Concepts of group decision-making and interactive design were used to integrate the public participation process into the design process. In the new process, the public can submit requirements, follow the design progress and comment on the design drafts using the online platform. Furthermore, a systems engineering tool was used for information management and virtual reality techniques were used for design illustrations.

This research was set up to advance the development of the online interactive public participation process. The objective of the research was to introduce, evaluate and improve the new process. The main research question was How does the 'online interactive public participation process' influence the intra-city street redevelopment projects? The research sub-questions were:

1) What are the characteristics of traditional public participation processes?
2) What is the ‘online interactive public participation process’?
3) How does the ‘online public participation process’ influence project performance?
4) Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not?

The research contained three main steps. Firstly, the new process was introduced by conducting a literature study on the relevant theories and describing the design process and the characteristics of the new process. Secondly, a case study was carried out to evaluate the new process’s influence on the intra-city street redevelopment projects’ performances. Thirdly, because a drawback in information processing was discovered during the case study, an evaluation process was developed using the House of Quality method to make up for the drawback and improve the new process. Afterwards, conclusions were drawn from the previous research steps and the main research question was answered.

A literature study was used to set down the theoretical context for the research and to provide an explanation for theories that were used in the later stages of the research. The literature study started with the introduction of the disciplines of stakeholder engagement and public participation. Then the design procedure of a typical public participation process was explained. Various traditional public participation practices were introduced and categorised. Other theories used to develop the new process were introduced and practices similar to the new practices were also described.

The first research sub-question (What are the characteristics of traditional public participation processes?) was answered by the conclusion that the traditional public participation processes
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were characterised by many factors, where the face-to-face mode of information transfer is what has been limiting the development of public participation methods. Therefore, the development of online public participation methods was needed.

An independent chapter was devoted to the introduction of the new process. The concept behind the process was to establish direct links between customer requirements and design formations. The process was designed to involve the public throughout the design process. The interactive design feature was realised by allowing the public to view and comment on the designs directly and by granting the public decision-making power. The design procedures of the new process were described with reference to the typical design procedures in the literature study. Then, the characteristics of the new public participation process and the characteristics of the online platform were discussed respectively.

The second research sub-question (What is the ‘online interactive public participation process’?) was answered by the conclusion that the online interactive public participation process is an improved public participation method. By answering the first two sub-questions, the research fulfilled the objective to introduce the new process.

In the second research step, a comparative case study was carried out next to investigate the new process’s influence on project performance. Four intra-city street redevelopment projects were chosen for the case study. Two of the projects adopted the online interactive public participation process, whilst the other two adopted traditional public participation methods of stakeholder meetings and stakeholder interviews. In order to evaluate and quantify the impacts on the project performance, a set of criteria with regards to design process, design quality, client satisfaction, public satisfaction, schedule and budget was set up.

The projects were analysed respectively. In the first project, the Vestdijk project conducted street redevelopment with the objectives of reducing traffic flow and improving air quality. An online public requirements collection was carried out for this project followed by monthly stakeholder design sessions where members of the public worked in cooperation with the municipality to create the final design. The project realised online public participation and offline interactive design.

In the second project, Heezerweg, Korianderstraat and Mimosaplein were redeveloped because the infrastructure was outdated. The project adopted traditional public participation methods. Selected stakeholders were invited for interviews about their requirements. The project design was developed by the municipality independently. The general public was only informed when the finalised design was published in a stakeholder meeting.

In the third project, the square of Houtplein and its neighbouring streets were redeveloped to resolve the traffic congestion problem. The updated online interactive public participation process was used in this project. The stakeholder design sessions used in the Vestdijk project was added to the online platform and become the online interactive design process. Three design solutions were developed based on the public’s initial comments. The three design solutions were published on the platform for further participation. The preliminary design was created with reference to the second round of comments. Both public participation and interactive design were realised online in this project.
Online Interactive Public Participation Process | Flora Bai

In the last project, Nieuwe Groenmarkt was redeveloped to increase bicycle parking capacities. The project was carried out with traditional public participation methods. Finalised design options were presented during a stakeholder meeting and the public voted for a different design direction. The project had to be delayed for a year while new design solutions were developed and were then put indefinitely on hold to wait for funding.

Quantitative evaluation was carried out on the performance of the case study projects. The Vestdijk project scored 27 out of 35, the Heezerweg project scored 21, the Houtplein project scored 27, and the Nieuwe Groenmarkt project scored 17. It was concluded that the new process had exerted a positive influence on project performances.

After cross-comparison of the projects, the following conclusions were made to answer the third research sub-question (How does the ‘online public participation process’ influence project performance?):

1) The online interactive public participation process increases the efficiency of the design progress and reduces the waste of design resources.

2) The online interactive public participation process has a positive impact on the design quality because it can identify and resolve more issues.

3) The online interactive public participation process does not affect client satisfaction.

4) The online interactive public participation process increases public satisfaction.

5) The online interactive public participation process shortens the public requirements collection phase.

6) The online interactive public participation process increases the project cost.

7) The online interactive public participation process has a higher level of involvement in public participation.

8) The online interactive public participation process is only suitable for projects with a high degree of design freedom.

During the case study, it was noticed that the online platform was attracting too many incoming public comments for the design team to handle. There was a need to create a structured information processing structure for the platform. An evaluation process built on the House of Quality method was proposed by the researcher. The House of Quality is a method taken from the Quality Function Deployment Process developed for the manufacturing industry. It is a design process that translates customer requirements into engineering specifications. The essence of the House of Quality method, a weighted decision matrix, was used to develop the evaluation process.

To answer the fourth research sub-question (Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not?), the following conclusion was made:

The online interactive public participation process can be improved by adding a clearly defined information processing and evaluation process. The House of Quality method was chosen to be the theoretical basis for the evaluation process. A selection process was carried out to find the theoretical basis for the evaluation process. Out of three decision-making methods, the decision matrix was found to be most suitable for the design of the evaluation process. The House of Quality method, an improved version of the decision matrix, was used in the actual evaluation process design.
Furthermore, the evaluation process created with the House of Quality method can help the project team make design decisions. The evaluation process starts with setting up evaluation criteria and assigning weight distribution on criteria aspects. All public comments are assessed against the criteria. The preference scores are calculated as the weighted sum of all aspect scores. After the evaluation, public comments with the high positive evaluation scores were most recommended to be added to the design because their value outweighs their efforts. Comments with low positive scores should be treated with care because they could lead to adverse project impacts. Comments with negative scores should be avoided.

Finally, a general conclusion was drawn to answer the main research question (How does the ‘online interactive public participation process’ influence the intra-city street redevelopment projects?). The general conclusion was that: As a public participation tool with a high level of involvement, the ‘online interactive public participation process’, when used in intra-city street redevelopment projects, will improve the efficiency in the design process, increase public satisfaction, shorten project time and raise the project cost.

At the end of the research, hypotheses that were not tested, research steps that were not carried out and case study analyses that were not completed due to the time limit were discussed. The researcher’s reflections and learning in the research were documented, and ideas for further studies were listed.
# TABLE OF CONTENTS

COLOPHON .................................................................................................................... II
PREFACE ........................................................................................................................ III
SUMMARY....................................................................................................................... IV
LIST OF FIGURES ........................................................................................................... X
LIST OF TABLES ............................................................................................................... XIV

1. INTRODUCTION ....................................................................................................... 15
   1.1 Problem Description .......................................................................................... 15
   1.2 Research Context .............................................................................................. 16

2. RESEARCH DESIGN ............................................................................................... 17
   2.1 Research Objective .......................................................................................... 17
   2.2 Research Questions ......................................................................................... 17
   2.3 Research Framework ....................................................................................... 18
   2.4 Research Methodology .................................................................................... 19
   2.5 Research Scope ............................................................................................... 22
   2.6 Research Relevance ......................................................................................... 22
   2.7 Thesis Structure ............................................................................................... 22

3. LITERATURE STUDY ............................................................................................. 23
   3.1 Public Participation ......................................................................................... 23
   3.2 Traditional Public Participation Methods ...................................................... 26
   3.3 Other Theories Used to Develop the New Process ........................................... 29
   3.4 Practices Similar to the New Process ............................................................... 31

4. THE ONLINE INTERACTIVE PUBLIC PARTICIPATION PROCESS .......... 32
   4.1 Concept of the Process .................................................................................... 32
   4.2 Design of the Process ..................................................................................... 33
   4.3 Characteristics of the Process ......................................................................... 35
   4.4 Chapter Conclusions ...................................................................................... 37

5. CASE STUDY ......................................................................................................... 38
   5.1 Case Selection .................................................................................................. 38
   5.2 Empirical Data Collection .............................................................................. 40
   5.3 Project Performance Criteria ........................................................................ 41
   5.4 Test Case 1: Vestdijk, Eindhoven ..................................................................... 42
Online Interactive Public Participation Process | Flora Bai

5.5 Baseline Case 2: Heezerweg, Korianderstraat and Mimosaplein, Eindhoven........58
5.6 Test Case 3: Houtplein, Haarlem .................................................................65
5.7 Baseline Case 4: Nieuwe GroenMarkt, Haarlem..........................................83
5.8 Project Performance Evaluation...................................................................98
5.9 Case Study Discussions................................................................................100
5.10 Case Study Conclusions...............................................................................104
6. THE HOUSE OF QUALITY..............................................................................106
  6.1 Choosing the Evaluation Method.................................................................106
  6.2 Introduction to the House of Quality...........................................................110
  6.3 Role of the House of Quality in the new Process.........................................112
  6.4 Evaluation Process Using the House of Quality..........................................113
  6.5 The House of Quality Discussion................................................................118
  6.6 The House of Quality Conclusions..............................................................119
7. RECOMMENDATIONS.....................................................................................120
  7.1 Recommendations for Witteveen+Bos.......................................................120
  7.2 Recommendations for Clients......................................................................122
8. CONCLUSIONS...............................................................................................123
  8.1 The General Conclusion...............................................................................123
  8.2 Detailed Conclusions....................................................................................124
9. REFLECTIONS AND FURTHER STUDIES.....................................................127
  9.1 Reflections....................................................................................................127
  9.2 Learnings......................................................................................................128
  9.3 Further Studies..............................................................................................129
BIBLIOGRAPHY..................................................................................................131
APPENDIX 1 REJECTED BASELINE CASES.............................................137
APPENDIX 2 INTERVIEW TEMPLATES......................................................140
APPENDIX 3 INTERVIEW TRANSCRIPT A..............................................144
APPENDIX 4 INTERVIEW TRANSCRIPT B..............................................153
APPENDIX 5 INTERVIEW TRANSCRIPT C..............................................158
APPENDIX 6 INTERVIEW TRANSCRIPT D..............................................163
APPENDIX 7 INTERVIEW TRANSCRIPT E..............................................167
APPENDIX 8 INTERVIEW TRANSCRIPT F..............................................169
LIST OF FIGURES

Figure 1 Research Framework ................................................................. 18
Figure 2 Research Framework – Research Objective I .................................. 19
Figure 3 Research Framework – Research Objective II ................................. 20
Figure 4 Research Framework – Research Objective III ............................... 21
Figure 5 The Spectrum of Public Participation, retrieved from (IAP2 2018) .......... 24
Figure 6 Theoretical Concept of the Interactive Public Participation Process .......... 32
Figure 7 Current Situation (left) and Design Plan View (right) of Vestdijk, Eindhoven, modified from (GemeenteEindhoven 2018k; GoogleMaps 2019e) .................................................. 42
Figure 8 Motorist Planning Strategy of Eindhoven, with red marking Vestdijk and purple marking air pollution zone, modified from (GemeenteEindhoven 2013) ............................................. 43
Figure 9 Process Diagram of Participation and Design Phases of the Vestdijk Project, reproduced from (Witteveen+Bos 2017b) ................................................................. 45
Figure 10 Comparison of Street Views (left) and Screenshots from the Virtual Reality Model (right), retrieved from (GoogleStreetview 2015b, 2015c; GemeenteEindhoven 2018k; GoogleStreetview 2015d). .............................................................................. 46
Figure 11 Distribution of Customer Requirements by Objectives, PoR1, Vestdijk .......... 48
Figure 12 Status of Customer Requirements by Objects, PoR1, Vestdijk .................. 48
Figure 13 Distribution of Customer Requirements by Objectives, PoR2, Vestdijk ........... 50
Figure 14 Status of Customer Requirements by Objects, PoR2, Vestdijk ................. 51
Figure 15 Example of the Stakeholder Design Sessions, retrieved from (GemeenteEindhoven 2018e) ................................................................. 52
Figure 16 Phased Construction Plan of Vestdijk Project, retrieved from (GemeenteEindhoven 2018j) ................................................................................................. 53
Figure 17 Current Situation (left) and Final Design (right) of Vestdijk Road Design, retrieved from (GemeenteEindhoven 2018k; GoogleMaps 2019a) ................................. 54
Figure 18 Current Situation (left) and Final Design (right) of Junction Vestdijk - Ten Hagestraat – Kanaalstraat, modified from (GemeenteEindhoven 2018k; GoogleMaps 2018b) ......................... 54
Figure 19 Current Situation (left) and Final Design (right) of Junction Vestdijk – Bleekweg – Bleekstraat, modified from (GemeenteEindhoven 2018k; GoogleMaps 2018a) ......................... 55
Online Interactive Public Participation Process | Flora Bai

Figure 20 Tree Preservation at Junction Vestdijk – Geldropseweg, retrieved from (GemeenteEindhoven 2018k) .................................................................56

Figure 21 Current Situation (top) and Final Design (bottom) of Heezerweg, Korianderstraat and Mimosaplein, Eindhoven, retrieved from (GemeenteEindhoven 2018f; GoogleMaps 2019b) ......58

Figure 22 Motorist Planning Strategy of Eindhoven, with Heezerweg, Korianderstraat and Mimosaplein marked in red, modified from (GemeenteEindhoven 2013) .........................................................59

Figure 23 Example of a Reaction Form Used in the Information Market, retrieved from (Linden 2017) ................................................................................................................60

Figure 24 Final Design Heezerweg, retrieved from (GemeenteEindhoven 2017b) ...............................................61

Figure 25 Current Situation (left) and Design Visualisation (right) of Heezerweg Street view, retrieved from (GoogleStreetview 2018a; GemeenteEindhoven 2018c) .........................................................61

Figure 26 Cross Section of Heezerweg Street Design, retrieved from (GemeenteEindhoven 2017d) .............................................................................................61

Figure 27 Final Design Korianderstraat, retrieved from (GemeenteEindhoven 2017c) ...........................................62

Figure 28 Current Situation (left) and Design Visualisation (right) of Korianderstraat, retrieved from (GoogleStreetview 2018b; GemeenteEindhoven 2018d) .........................................................62

Figure 29 Loading Bay Design (top) and Junction Design (bottom), Korianderstraat, retrieved from (GemeenteEindhoven 2017c, 2017a) ..................................................................................63

Figure 30 Final Design (left) and Parking Arrangement (right) of Mimosaplein, retrieved from (GemeenteEindhoven 2018h, 2017e) ........................................................................................63

Figure 31 Current Situation (left) and Design Visualisation (right) of Mimosaplein, retrieved from (GemeenteEindhoven 2018i; GoogleStreetview 2015a) .................................................................64

Figure 32 Current Situation (left) and Preliminary Design (right) of Houtplein, Haarlem, retrieved from (ORKA 2018; GoogleMaps 2019c) ..........................................................................................65

Figure 33 Public Participation Process Diagram, Houtplein .................................................................66

Figure 34 Overall Project Map, Houtplein, retrieved from (GemeenteHaarlem 2018a) .....................67

Figure 35 Distributions of Comments and Respondents by Type of User, Houtplein .....................68

Figure 36 Respondent Location Map by Postal Code, Houtplein ..........................................................69

Figure 37 Distribution of Comments by Theme, Houtplein .................................................................70

Figure 38 The green telephone boxes, captured by (GoogleStreetview 2016) ..............................................71

Figure 39 The green telephone boxes, captured by (GoogleStreetview 2016) ..............................................71

Figure 40 Distribution of Customer Requirements by Theme, Houtplein ................................................72
Online Interactive Public Participation Process | Flora Bai

Figure 41 Design Variant 1, Houtplein, modified from (GemeenteHaarlem 2018e) ......................... 74
Figure 42 Distribution of Public Comments on Design Variant 1, Houtplein ................................. 74
Figure 43 Design Variant 2, Houtplein, modified from (GemeenteHaarlem 2018f) ....................... 75
Figure 44 Distribution of Public Comments on Design Variant 2, Houtplein ................................. 76
Figure 45 Design Variant 3, Houtplein, modified from (GemeenteHaarlem 2018g) ....................... 76
Figure 46 Distribution of Public Comments on Design Variant 3, Houtplein ................................. 77
Figure 47 Preliminary Design Layout, Houtplein, retrieved from (OKRA 2018) ........................... 78
Figure 48 Car (left) and Bus (right) Traffic Plan, Preliminary Design, Houtplein, modified from (OKRA 2018) ............................................................................................................. 79
Figure 49 Bicycle Traffic Plan, Preliminary Design, Houtplein, retrieved from (OKRA 2018) ....... 80
Figure 50 Street Cross-Sections, Houtplein, retrieved from (OKRA 2018) ................................. 80
Figure 51 Houtplein North Cross-Section, (OKRA 2018) ................................................................. 81
Figure 52 Houtplein South Cross-Section, retrieved from (OKRA 2018) ................................. 81
Figure 53 Current Situation (left) and Preliminary Design (right) of Nieuwe Groenmarkt and Krocht, Haarlem, retrieved from (ORKA 2017; GoogleMaps 2019d) ..................................................... 83
Figure 54 Current Situation of Nieuwe Groenmarkt and Krocht, retrieved from (ORKA 2017) ...... 85
Figure 55 Design Variant 1, also known as ‘De Laan’, Nieuwe Groenmarkt, Modified from (ORKA 2017) .................................................................................................................. 86
Figure 56 Cross Section (top left), Emergency Access Design (top right), Landscaping Plan (bottom left) and Market Day Plan (bottom right), Variant 1, Nieuwe Groenmarkt, modified from (ORKA 2017) .................................................................................................................. 87
Figure 57 Design Variant 2, Nieuwe Groenmarkt, modified from (ORKA 2017) ............................ 88
Figure 58 Design Variant 3, Nieuwe Groenmarkt, modified from (ORKA 2017) ............................ 89
Figure 59 Linear Cross Section (top), Plan View (middle left), Visualisation (middle right), Market Day Plan (bottom left) and Street Cross Section (bottom right) of Design Variant with Underground Bicycle Parking Facility, Nieuwe Groenmarkt, modified from (ORKA 2017) .................................................................................................................. 91
Figure 60 Design Variant 4, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b) ....... 92
Figure 61 Design Variant 5, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b) ....... 92
Figure 62 Design Variant 6, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b) ....... 93
Figure 63 Design Variant 7, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b) ....... 94
Online Interactive Public Participation Process | Flora Bai

Figure 64 Prioritisation Matrices, retrieved from (Wicks 2017) .........................................................107

Figure 65 Paired Comparison Analysis, retrieved from (Ruijter 2018) ....................................................108

Figure 66 Decision Matrix, retrieved from (ASQ 2005) ........................................................................109

Figure 67 Four Phases of Quality Function Deployment ........................................................................110

Figure 68 Structure of a Typical House of Quality, background image from (Edraw 2018) ...............111

Figure 69 House of Quality and the three steps of public participation ..............................................112

Figure 70 Structure of the House of Quality Used in This Research, background image from (Edraw 2018) ..................................................................................................................113

Figure 71 The Interrelationship between the Selection Criteria .........................................................114
LIST OF TABLES

Table 1 Summary of Key Public Participation Tool Variables, reproduced from (Rowe and Frewer 2005) ................................................................. 27

Table 2 Analysis of Public Participation Methods, reproduced from (Rowe and Frewer 2005) ..... 27

Table 3 Success Factors for eParticipation Initiatives, produced with reference to (Panopoulou, Tambouris, and Tarabanis 2010). ........................................................................................................ 30

Table 4 Characteristics of the Case Study Projects ........................................................................ 39

Table 5 Performance Evaluation Criteria for Case Study Projects ............................................. 41

Table 6 Characteristics of Programme of Requirements 1, Vestdijk ............................................. 47

Table 7 Characteristics of Programme of Requirements 2, Vestdijk ............................................. 50

Table 8 Characteristics Summary of Design Variants, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b) ................................................................. 95

Table 9 Performance Evaluation Results for Case Study Projects ............................................. 98

Table 10 House of Quality Criteria Weight Distribution for Vestdijk ........................................... 115

Table 11 House of Quality Criteria Weight Distribution for Houtplein ........................................ 115

Table 12 The House of Quality Scoring Guide ............................................................................. 116

Table 13 House of Quality Evaluation Result of Accepted Customer Requirements in the Vestdijk Project ......................................................................................... 117

Table 14 Characteristics of Rejected Baseline Cases for the Vestdijk Project ............................... 137

Table 15 Characteristics of Rejected Baseline Cases for the Houtplein Project ............................ 138
1. INTRODUCTION

1.1 PROBLEM DESCRIPTION

Construction projects, especially infrastructure projects, create such a far and wide local impact that it is essential to carry out public participation processes. However, it is precisely these innate characteristics that make insightful public participation processes difficult.

The current public participation practices in the construction industry have many drawbacks:

Firstly, not all methods involving the public can classify as public participation. It is very common to confuse public participation with public communication or public consultation. Genuine public participation should have information flow in both directions between the project team and the general public (Rowe and Frewer 2005).

To achieve effective participation, the public should be involved in every step of the design process (Creighton 2005). In some of the traditional practices, the public was only informed after the decisions had been made. In other cases, they were consulted at the beginning of the project but not involved in any further steps.

Another common problem in participation practices is that the participants involved in most processes are not an accurate representation of the community. In some practices, the participants are pre-selected by the project team to emphasise a particular viewpoint intentionally. Sometimes, the selection is carried out passively due to the lack of publicity, restricted access and the limited capacity of stakeholder meetings.

Moreover, when the public is involved in the decision-making process, there is still the problem that they do not have adequate access to relevant documents and resources to form an informed opinion. The public’s lack of knowledge and awareness on the importance of participation has been identified as a barrier preventing effective quality participation (Dola and Mijan 2006)

Some practices currently in use in the industry have long-drawn-out participation processes that rack up expenditure and hinders project progress. The low cost-efficiency discourages clients from investing in public participation processes.

Others lack communication clarity and response efficiency. Dola and Mijan (2006) stated that the failure to attract more public members to participate was the reason quality feedback could not be gained. When the participation process does not generate accurate input for the design process, it will not come as a surprise that the resulting process does not create added value to the project.

Therefore, there is a need for a more effective and better structured public participation process that allows for genuine public involvement in the project design.
1.2 RESEARCH CONTEXT

Witteveen+Bos B.V. had been developing an online interactive public participation process to improve project performance.

The new process adopted the concept of group decision-making. Group decision-making as a strategy is based on the assumption that decisions made by a group of people with diverse expertise will be better than that made by a homogeneous group (Natee, Low, and Teo 2016). Creighton (2005) identified the public participation process integrated well into the decision-making progress as a character for effective participation.

The new process was designed for public participation. Rowe and Frewer (2005) defined three levels of public involvement: public communication, public consultation and public participation. Public participation is the only mechanism that fulfils the requirements of a group decision-making process.

The interactive public participation process has been designed to involve the public throughout the design process. The make-up of the decision-making group should be representative of the targeted audience. In an infrastructure project, the design decisions should be made jointly by the public, the client, and the project team.

The new process aimed to enlarge the public’s role in the design process. A well-developed public participation process should work in cooperation with the public and should contain mechanisms designed to give decision-making power, partially or completely, to the public (IAP2 2018).

The concept of eParticipation (electronic participation) had been introduced into the design of the new process. With the help of eParticipation, public participation procedures like public requirements collection were able to be conducted online. The development of the online platform played a central part in the development of the new process.

The theory of interactive design was also incorporated into the new process. The online platform allowed public members to comment on the designs published on the website in the form of maps, concept sketches, detailed illustrations and 3D renders. The public was able to explore, interact with, and comment on the design. Subsequent designs would take these comments into consideration.

This research was carried out in order to further advance the development of the online interactive public participation process. The research examined projects that had implemented the new process and investigated how the new process had influenced that project performance.
2. RESEARCH DESIGN

This chapter details the design of this thesis research. The purpose of the research is presented in the research objective and research questions. The logic behind the research design is explained in the research framework and methodology. The necessity of carrying out the research as well as the extent of the research are also discussed. The structure of this thesis is presented at the end of this chapter.

2.1 RESEARCH OBJECTIVE

The objective of this research was to introduce, evaluate and improve the online interactive public participation process. The online interactive public participation process was a method prototyped by Witteveen+Bos B.V.

There were three research objectives in this thesis research:

1) to introduce the online interactive public participation process and to compare it with traditional practices.
2) to apply the new process in infrastructure projects and evaluate its influence on project performances.
3) to find drawbacks in the new process and to improve the process design.

2.2 RESEARCH QUESTIONS

2.2.1 MAIN RESEARCH QUESTION

How does the ‘online interactive public participation process’ influence the intra-city street redevelopment projects?

2.2.2 SUB-QUESTIONS

1) What are the characteristics of traditional public participation processes?
2) What is the ‘online interactive public participation process’?
3) How does the ‘online interactive public participation process’ influence project performance?
4) Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not?
2.3 RESEARCH FRAMEWORK

Following the structure of the research objective, the research framework is set out in Figure 1.

The first research objective was fulfilled by answering the first two research sub-questions. To answer sub-question 1 (What are the characteristics of traditional public participation processes?), a literature study was carried out. The study examined the traditional public participation practices used in the industry and summarised the key characteristics. To answer sub-question 2 (What is the ‘online interactive public participation process’?), a chapter was dedicated to introducing the new process. The concept behind the process design and the steps of the process construction were detailed in this chapter. Characteristics of the public participation process and the online platform were also discussed.

The second research objective was fulfilled by conducting a comparative case study. The case study answered sub-question 3: How does the ‘online interactive public participation process’ influence project performance? In the case study, projects that adopted the new process were compared to projects that used traditional public participation methods. A set of project performance criteria was set up and the impacts on project performances was measured quantitatively.

The third research objective was fulfilled by answering sub-question 4: Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not? The need for a structured comments evaluation process was discovered during the case study. A quantitative evaluation process using the House of Quality was proposed. The chapter justified the choice of the method, introduced the concept of the House of Quality, explained the evaluation process set up and demonstrated the process.

In Chapter 7, recommendations on how to use the new interactive process and the House of Quality evaluation process were made to Witteveen+Bos and to the Clients (the municipalities) respectively.

Finally, in Chapter 8, previous conclusions were summarised to answer the main research question: How does the ‘online interactive public participation process’ influence the intra-city street redevelopment projects?
2.4 RESEARCH METHODOLOGY

In this section, the choices of the research strategies used in this research are justified.

To choose a research strategy, the researcher must first make three decisions about the research focus:

1) *depth* or *breadth*;
2) *qualitative* analysis or *quantitative* analysis;
3) *empirical* research or *desk* research.

The following choices were with reference to the three decisions and under the guidance of Verschuren and Doorewaard (2010).

2.4.1 RESEARCH OBJECTIVE I: INTRODUCTION

The three decisions were breadth, qualitative and desk research. The methodology of literature was chosen.

The primary research focus was on the breadth of the knowledge, rather than depth, because the researcher hoped to gain an overview of the discipline of public participation. With scrutiny on the information source, the literature study is ideal for the speedy gathering of reliable knowledge. Due to the nature of academic documents, the majority of data used at this stage will be of a qualitative nature.

In Chapter 2, a literature study was carried out on the current public participation practices in the construction industry.

In Chapter 3, the online interactive public participation was introduced. Discussions about the new process were made with reference to the knowledge gained during the literature study.
2.4.2 RESEARCH OBJECTIVE II: EVALUATION

The three decisions for the second stage were depth, qualitative and quantitative, and empirical research. The research strategy of a comparative case study was chosen, where projects with the new public participation process were compared with similar projects with traditional practices. A set of evaluation criteria was used in the case study to quantify the project performances for the ease of comparison.

Compared to surveys and experiments, case studies enable in-depth analysis of existing material. The case study is a suitable methodology when the researcher wishes to gain a profound and full insight into a process (Verschuren and Doorewaard 2010).

The limited sample size was an essential reason behind the choice of a case study. In this research, only four projects were studied. The small sample size allowed the researcher to make intensive observations into the studied cases without being overwhelmed.

The second reason for making this methodology choice was that case studies focused on depth rather than breadth. This research only studied the online interactive public participation process. The case study was not set up to find out how wide the new process’s range of influence was, but to find out exactly in what ways the new process changed the project performance, which required an in-depth study. Intensive data generation methods like face-to-face interviews were used to gather in-depth information. After interviewing experts with first-hand knowledge of the projects, the researcher was able to understand the project proceedings better and therefore was able to generate specific and detailed remarks after the in-depth case study.

Another characteristic of the case study is that the samples were strategically selected rather than randomly chosen. The risk of having an atypical sample was reduced by manual selection, therefore, the quality of the empirical data was guaranteed. In this research, to have better control over variables, the cases were specifically chosen to be similar in size, nature and location. The researcher only wished to study the influence of different public participation processes on project performance. Hence the method of public participation should be the only difference between the baseline case and the test case.

A set of evaluation criteria was used to translate qualitative project performance information into quantitative project performance scores. The magnitude of the new process's influence on project performance could then be measured quantitatively. The evaluation criteria were set up before the case study commenced, and the evaluation was carried out using information extracted from project documents and interview transcripts. The purpose of the evaluation was not to quantify the projects’ performance, but to measure the influence of the new public participation process.
2.4.3 RESEARCH OBJECTIVE III: IMPROVEMENT

The three decisions were depth, quantitative, and both desk and empirical research. A quantitative evaluation process was developed using the House of Quality concept.

During the case study, it was discovered that the platform was receiving too many public comments. A structured system to process the incoming comments and to evaluate the quality of the suggestions was needed.

To resolve this issue, an evaluation process was proposed. Three decision-making methods were considered to be the theoretical basis of the evaluation process. The prioritisation matrix was rejected due to limited capacity. Similarly, paired comparison analysis was turned down due to the large amount of additional workload involved. The decision matrix was chosen to be the theoretical basis of the evaluation process design.

The House of Quality method, an improved decision matrix was used in the design of the evaluation process for the online interactive public participation process. The evaluation process functions by converting qualitative information (public comments) into quantitative data (evaluation scores).

The evaluation process was developed using desk research. Empirical data from the studied cases were also used when an evaluation demonstration was carried out.
2.5 RESEARCH SCOPE

This research studies the online interactive public participation process developed by Witteveen+Bos and investigates its influence on the small-scale intra-city infrastructure projects. Due to the time constraint of the research as well as the expertise of the graduation company, the projects were only studied from project initialisation until design finalisation.

2.6 RESEARCH RELEVANCE

This research contributes to the body of knowledge of public participation in the construction industry.

Firstly, this research provides a comprehensive assessment of the public participation practices currently in use, which should provide insight to the practitioners in the industry and the researchers interested in this field.

Secondly, the research introduces a new public participation practice. What had been a private practice of an individual company is now openly displayed to academia. There is hope that it can inspire suggestions, induce discussions or attract criticisms.

Thirdly, a completely new evaluation process will be created in the process of this research. Albeit immature and flawed, it is the researcher’s genuine original contribution to the betterment of the process.

2.7 THESIS STRUCTURE

Chapter 1 gives an introduction to the research and explains the research context.

Chapter 2 details the design of the thesis research, including the research objective, research questions, research framework, research methodology, research scope and research relevance.

Chapter 3 contains a literature study about the characteristics of traditional public participation practices and summarises process design evaluation standards. The first research sub-question is answered in this chapter. Then, Chapter 4 introduces the online interactive public participation process and discusses its characteristics. The second research sub-question is answered in this chapter.

Chapter 5 carries out a comparative case study with projects that implemented the new process and those with the traditional practices. The processes’ influence on project performance is evaluated quantitatively. Thereby the third research sub-question is answered in this chapter.

Chapter 6 proposes an information processing and evaluation process to improve the new process with. The structure is demonstrated using case study data. The fourth research sub-question is answered in this chapter. Chapter 7 gave recommendations to the design company and the clients about how to use the new process and the new evaluation process.

Chapter 8 draws conclusions on this research and answers the main research question. In the end, Chapter 9 records the research reflections and gives an account of further study directions.
3. LITERATURE STUDY

A literature study about public participation is described in this chapter. Then the characteristics and classification of traditional public participation methods are discussed. Whilst other theories used to construct the new process and practices similar to the new process are studied.

3.1 PUBLIC PARTICIPATION

In this section, the disciplines of stakeholder engagement and public participation are introduced. Then the design procedures of public participation processes are described.

3.1.1 INTRODUCTION OF STAKEHOLDER ENGAGEMENT

A stakeholder is defined as ‘any group or individual who can affect or is affected by the achievement of the organisation’s objectives’ (Freeman 1984). Stakeholder engagement requires the organisation to actively identify, engage and negotiate with the interested parties to achieve an amicable project outcome. The purpose of a stakeholder engagement process is to determine the project requirements and the expectations of all parties involved (PMBOK-Guide 2013). By this definition, public participation should qualify as a kind of stakeholder engagement.

The public as a stakeholder is often categorised as ‘acquaintance’ or ‘trip ware’ according to the interest-power-attitude mapping by Murray-Webster and Simon (2006), for the reason that they are viewed as insignificant, possess low power, and remain passive in the engagement process. However, for construction projects, especially infrastructure projects, the public is the intended user of the structure. They are the ones the project benefits or irritates. So it stands to reason their opinion should be an issue of great importance.

It is for this reason that there has been an increasing emphasis on public involvement in the construction industry. Public involvement is a process that focuses on the inclusion and empowerment of the public.

3.1.2 INTRODUCTION OF PUBLIC PARTICIPATION

Public participation falls under the stakeholder engagement discipline. A public participation process can be considered as a special stakeholder engagement process where the target stakeholder is the public.

The United States Environmental Protection Agency defines public participation as any process that directly engages the public in decision-making and gives full consideration to public input in making that decision (EPA 2018a). This practice is built upon the belief that those who are affected by a decision have a right to be involved in the decision-making process (IAP2 2018).

The term ‘public participation’ is sometimes used interchangeably with ‘public engagement’ or ‘public involvement’. A distinction is made by Rowe and Frewer (2005) that three types of public involvement can be classified according to the direction of information flow, namely public communication, public consultation and public participation. In public communication, the public is merely the receiver of information. In public consultation, the public’s opinion is collected, but not
responded to. Only in public participation is there a formal dialogue where information is exchanged, and both parties engage in meaningful discussions. In the context of this research, public participation always refers to the process with information flow in both directions.

### 3.1.3 DESIGN PROCEDURE OF PUBLIC PARTICIPATION PROCESSES

The critical steps in the design of a public participation process are 1) conducting situation assessment, 2) determining the level of participation and 3) selecting the appropriate tool.

Often, a Situation Assessment is carried out around the initiation of the project. Situation assessments can be carried out internally or externally. The aim of the internal assessment is to discover the opportunities of public input and to outline any constraints that may affect public participation. The purpose of the external assessment is to identify the key stakeholders and the power they wield (EPA 2018c).

One agency that defined the levels of public participation was the International Association of Public Participation (IAP2). Five levels are distinguished: inform, consult, involve, collaborate, empower. IAP2 coined this demarcation as the Spectrum of Public Participation.

As shown in Figure 5, the public’s impact on the decision increases from informing to empowering. Each level has its definition of public participation goal and promises to the public. No level is inherently better or worse than another and there are just different methods designed for different jobs.

<table>
<thead>
<tr>
<th>INFORM</th>
<th>CONSULT</th>
<th>INVOLVE</th>
<th>COLLABORATE</th>
<th>EMPower</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PUBLIC PARTICIPATION GOAL</strong></td>
<td>To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.</td>
<td>To obtain public feedback on analysis, alternatives and/or decisions.</td>
<td>To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.</td>
<td>To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.</td>
</tr>
<tr>
<td><strong>PROMISE TO THE PUBLIC</strong></td>
<td>We will keep you informed.</td>
<td>We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.</td>
<td>We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.</td>
<td>We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.</td>
</tr>
</tbody>
</table>

*Figure 5 The Spectrum of Public Participation, retrieved from (IAP2 2018)*
At the Inform level, the public passively receives the information. The decision maker does not require public input. In Consult level, the public is asked about their opinions at fixed points in the project and the project team merely considers the public input as they make the decision. The Involve level invites the public into the process and creates ongoing opportunities for information exchange. At the Collaborate level, the public is invited into the decision-making process, but not the ultimate decision. Finally, at the Empower level, the public has the final say (EPA 2018b).

In construction, practices from the consult to collaborate levels are most common. The new public participation process proposed in this research belongs to the collaborate level.

As for selecting the appropriate tool, many techniques and methods have been developed for various participation objectives. It is vital to select the appropriate one.

There are methods to inform the public like printed documents, websites, information repositories, information kiosks, et cetera. There are methods to collect input like interviews, focus groups, public hearings, and world cafes. Lastly, there are also methods to encourage consensus: workshops, advisory boards, and citizen juries (EPA 2018d).

An alternative option is to utilise computer-assisted processes. With proper design and maintenance, it can perform all three functions mentioned above.
3.2 TRADITIONAL PUBLIC PARTICIPATION METHODS

Various traditional public participation practices are introduced and categorised in this section.

3.2.1 INTRODUCTION TO THE PUBLIC PARTICIPATION METHODS

There are uncountable public participation methods developed across the world, and it would require a comprehensive evaluation standard to make sense of them all.

By 2005, over 100 public involvement mechanisms have been identified (Rowe and Frewer 2005), and the list will never be complete. This makes it difficult to study this discipline. Firstly, the naming system lacks unity: the same term could be used in describing different practices, especially in different countries. Then there is a lack of functional equivalence: some of these methods are complete processes whilst others are just specific techniques.

Rowe and Frewer are notable in the field of public participation methods for their systematic evaluation works. In 2000, they analysed eight most formalised public involvement methods. The evaluation criteria were twofold: 1) the acceptance criteria, which evaluates the potential public acceptance of a procedure; and 2) the process criteria, which evaluates the effective construction and implementation of a procedure (Rowe and Frewer 2000).

Except for Referenda and public hearings, which are not suitable for construction projects, the eight popular public participation methods of the time are introduced here:

Public opinions survey performed well in the acceptance aspect but poorly in the process aspect. The public is highly likely to accept this method, but it might be difficult to set up because it is normally performed on a large population sample. It is, however, a cost-effective method to collect public opinion in the very early stage of a project.

Negotiated rulemaking operates with small stakeholder committees, which explains its high process criteria score. Participants who get involved in the process wields considerable power. But it might be considered by the general public as a privileged process due to the limited access.

Consensus conference also works with small groups, but with public representatives rather than stakeholders. This method scored high on both sets of criteria. When structured transparently and unbiasedly, it could be a time and cost-efficient public participation method.

With a similar mechanism to the consensus conference, the citizens’ jury also performed well in the evaluation. The difference is that the proceedings of the citizen’s jury are not open to the public. The sacrifice in transparency could, potentially, improve the decision-making process.

Citizen advisory committee is a method used to emphasise on specific viewpoints. Small groups of representatives are selected to represent the views of certain organizations. It is a prolonged process and generally reserved for significant issues. In a time-sensitive business like the construction industry, this is not a beneficial method.

Focus groups, as another group method, is cost-efficient and highly independent. Due to their limited access to project resources, it is not as efficient as a decision-making tool. But since it can
be implemented early in the project planning stage, it is potentially a great opinion-collecting method.

### 3.2.2 CLASSIFICATION OF THE PUBLIC PARTICIPATION METHODS

The research difficulty increased as more public participation methods were developed. There was a need for a clear structure to manage all the methods. Rowe and Frewer (2005) attempted to classify current public involvement methods. To this end, they established six key mechanism variables, as shown in Table 1. Twenty-five types of public participation mechanisms were analysed according to the six key mechanism variables. Eight of which could be classified as public participation methods. The analysis is included below in Table 2.

<table>
<thead>
<tr>
<th>Name of Variable</th>
<th>Levels of Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant selection method</td>
<td>Controlled / Uncontrolled</td>
</tr>
<tr>
<td>Facilitation of information elicitation</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Response mode</td>
<td>Open / Closed</td>
</tr>
<tr>
<td>Information Input</td>
<td>Set information / Flexible information</td>
</tr>
<tr>
<td>Medium of information transfer</td>
<td>Face to face / Not face to face</td>
</tr>
<tr>
<td>Facilitation of aggregation</td>
<td>Structured combination / Unstructured combination</td>
</tr>
</tbody>
</table>

Table 1 Summary of Key Public Participation Tool Variables, reproduced from (Rowe and Frewer 2005)

<table>
<thead>
<tr>
<th>Name of method</th>
<th>Selection method</th>
<th>Elicitation facilitation</th>
<th>Response mode</th>
<th>Information input</th>
<th>Information transfer</th>
<th>Aggregation facilitation</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action-planning workshop</td>
<td>Controlled</td>
<td>Yes</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Unstructured</td>
<td>1</td>
</tr>
<tr>
<td>Citizen’s jury</td>
<td>Controlled</td>
<td>Yes</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Unstructured</td>
<td>1</td>
</tr>
<tr>
<td>Consensus conference</td>
<td>Controlled</td>
<td>Yes</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Unstructured</td>
<td>1</td>
</tr>
<tr>
<td>Negotiated rule-making</td>
<td>Controlled</td>
<td>No</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Unstructured</td>
<td>2</td>
</tr>
<tr>
<td>Task force</td>
<td>Controlled</td>
<td>No</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Unstructured</td>
<td>2</td>
</tr>
<tr>
<td>Deliberative opinion poll</td>
<td>Controlled</td>
<td>Yes</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Structured</td>
<td>3</td>
</tr>
<tr>
<td>Planning cell</td>
<td>Controlled</td>
<td>Yes</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Structured</td>
<td>3</td>
</tr>
<tr>
<td>Town meeting</td>
<td>Uncontrolled</td>
<td>No</td>
<td>Open</td>
<td>Flexible</td>
<td>Face-to-face</td>
<td>Structured</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2 Analysis of Public Participation Methods, reproduced from (Rowe and Frewer 2005)
The eight analysed methods are grouped into four types according to the variables.

It is clear that all four types have open response mode and flexible information input. This is easy to explain. All four types classify as public participation methods, and by definition, they have communication channels in both directions.

Type 1 methods are characterised by a controlled selection of participants, facilitated face-to-face discussions, open response mode, flexible information input, and unstructured aggregation of information. Examples of type 1 methods include action-planning workshop, citizens’ jury and consensus conference.

Type 2 is quite similar to type 1 with the exception of the facilitation of the information elicitation. In simple terms, type 2 processes are less structured and more spontaneous. Type 1 focuses on response collection, whilst type 2 is more common in problem-solving. Examples of type 2 methods include negotiated role making and task force.

Type 3 is also similar to type 1 except for the additionally structured aggregation. While the goal of type 1 is merely to collect response, type 3 goes further and settles on a decision or a collective opinion. Examples of type 3 methods include deliberative opinion poll and planning cell.

Type 4 differs from the other three because the selection of its participants is not controlled. In a way, it is similar to type 2 in that there is no facilitation of elicitation. In another way, it is similar to type 3 because there is structured information aggregation. So in type 4, the participation is spontaneous, but they must settle on an end opinion. An example of a type 4 method is the town meeting.

It can also be noticed that all four types require face-to-face communication. The need for the public representatives’ physical presence limits the information transfer speed, delays information processing and drags out the design process. Electronic participation can be used to resolve these issues.

In this section, answers had been made to research sub-question 1: What are the characteristics of traditional public participation processes?

The traditional public participation processes were characterised by a controlled selection of participants, facilitated or elicited face-to-face discussions, open response mode, flexible information input, and structured or unstructured aggregation of information.

The face to face mode of information transfer is what has been limiting the development of public participation methods. Electronic participation is a promising development direction.
Besides public participation, other theories were also used to develop the online interactive public participation process. Systems engineering theories were used for the management of project information, and electronic participation theories were used to build the online platform.

### 3.3.1 SYSTEMS ENGINEERING

NASA defined Systems Engineering as a methodical, multi-disciplinary approach for the complete lifecycle of a system (NASA 2017). With this methodical approach, systems engineering seeks a safe and balanced design in the face of opposing interests and multiple, conflicting constraints (NASA 2017). Most commonly, these interests and constraints originate from stakeholders involved in the project.

Andrew P. Sage put forward a Purposeful Definition for Systems Engineering:

> The purpose of systems engineering is information and knowledge organization that will assist client ... to maintain overall integrity and integration as related to performance and reliability (Sage 1992).

In short, systems engineering is a methodical approach to manage project information for the purpose of client satisfaction and successful project execution.

Systems Engineering makes a distinction between technical and management processes. The technical process defines and specifies the product, while the management process supports it with planning, review and issue resolution (Oliver, Kelliher, and Keegan 1997).

This approach brings a uniform process structure with a strong emphasis on traceability of requirements (Pels, Beek, and Otter 2013). The uniformness enables horizontal comparison between case study projects, while the traceability allows all requirements and related design decisions to be tracked throughout the project lifecycle.

### 3.3.2 RELATICS

One project information management tool widely used in the construction industry now is Relatics. Relatics is a web-based platform designed for information management in complex and large-scale projects (Relatics 2018a). It assembles all project-related documents, decisions and meeting minutes in a clearly-defined structure. Through project information centralisation, this platform encourages close collaboration among team members across all disciplines.

Relatics is a useful systems engineering tool because it is flexible and completely user-defined. Users have the freedom to set up the project space according to their systems structure, which makes the tool adaptable to any project type or company structure. Because of the comprehensiveness of information available in Relatics, designs and decisions are easily traceable; it also allows more efficient high-quality deliverables generation (Relatics 2018b).

In the online interactive public participation process, Relatics was used for automated information storage and management.
3.3.3 E-PARTICIPATION

Electronic Participation (eParticipation) refers to the public participation processes that utilise Information and Communication Technologies (ICT) tools (Panopoulou, Tambouris, and Tarabanis 2010). Most of the research in this field focuses on politics, for example on social media (Johannessen 2010; Effing, Hillegersberg, and Huibers 2013; Ferro et al. 2013). Recently, there have also been studies that venture into the field of the built environment, like GIS (Loukis et al. 2010) and urban planning (Klament and Münster 2017). This research looks into the application of eParticipation in the design phase of small-scale inner-city infrastructure projects.

At the first international conference for eParticipation, Macintosh, Coleman, and Schneeberger (2009) put forward six challenges in eParticipation development: breadth of the research field, research design, technology design, institutional resistance, equity, and theory. These should be kept in mind when conducting eParticipation research.

Advances have been made in the evaluation of eParticipation. Panopoulou, Tambouris, and Tarabanis (2010) identified seven success factors for eParticipation processes, as described in Table 3. Omar, Weerakkody, and Sivarajah (2017) had further refined the evaluation standard for multi-channelled digitally enabled participation into KPIs (key performance indicators). These two standards were both referred to when the characteristics of the interactive public participation process are discussed later.

<table>
<thead>
<tr>
<th>Success factors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment by the government</td>
<td>The government should be committed in the process, particularly in: drive to set up and support the initiative; support of the participatory process; feedback and integration of results.</td>
</tr>
<tr>
<td>Usability</td>
<td>The process platforms should be easy and intuitive for all kinds of users.</td>
</tr>
<tr>
<td>Combining online with offline channels</td>
<td>There should be at least one online or offline channel in addition to the main channel.</td>
</tr>
<tr>
<td>A thorough communication and promotion plan</td>
<td>There should be a detailed, professional and intensive communications strategy. There should be one resource dedicated to promotion.</td>
</tr>
<tr>
<td>Security and privacy</td>
<td>There should be absolute security defence mechanisms in place for the platform. There should be reasonable user privacy protection depending on the process objective.</td>
</tr>
<tr>
<td>Organisational issues</td>
<td>Management, process and moderation related organizational issues should be resolved in time.</td>
</tr>
<tr>
<td>Topics complexity and quality of participation</td>
<td>Topic complexity refers to the level of knowledge and expertise required of the participants. The quality of participation refers to the number of constructive responses.</td>
</tr>
</tbody>
</table>

Table 3 Success Factors for eParticipation Initiatives, produced with reference to (Panopoulou, Tambouris, and Tarabanis 2010).
3.4 PRACTICES SIMILAR TO THE NEW PROCESS

Aside from the new process, there are other similar practices that had implemented visual aids and public intervention in the design and construction processes. In this section, Virtual Design and Construction and Participatory Design are described.

3.4.1 VIRTUAL DESIGN AND CONSTRUCTION

Virtual Design and Construction (VDC) is a design concept put forward by the Centre of Integrated Facility Engineering at Stanford University. VDC is defined as the use of multi-disciplinary performance models of design-construction projects (CIFE 2018). It studies the entire project lifecycle and uses engineering innovations in design, construction and operation phases to improve the project or corporate performances.

Within VDC, methods have been developed to facilitate collaboration. For example, Integrated Concurrent Engineering (ICE) enables multiple stakeholders to work collaboratively using VDC models, model-based analyses and social agreements to achieve better decision-making (CIFE 2018).

ICE is a social method, helped by technology, to create and evaluate multi-discipline, multi-stakeholder VDC models extremely rapidly (Kunz 2013). It commonly takes the form of meeting sessions where stakeholders and design teams would come together to present, organise and develop the project.

In comparison, the ICE is a professional tool to increase the collaboration efficiency in project delivery, while the interactive public participation process in this research is a tool to collect wishes and demands from the general public. The latter requires neither professional knowledge nor the physical presence of its participants.

3.4.2 PARTICIPATORY DESIGN

Participatory design is a design approach to actively involve all stakeholders (e.g. employees, partners, customers, citizens, end users) in the design process to help ensure the result meets their needs and is usable. The field of participatory design spans a rich diversity of theories, practices and analyses and actions with the goal of working directly with users and other stakeholders in the design (Muller and Kuhn 1993). It is not a specific design method, but a design approach that puts a high value on the input of the users.

By these definitions, the interactive public participation process in this research can be classified as a participatory design process. The process focuses on improving feedback loops in project delivery with participatory technology with the aim to reduce the risk associated with the interpretation of customer demands and to encourage better civic decision-making.
4. THE ONLINE INTERACTIVE PUBLIC PARTICIPATION PROCESS

This chapter introduces the online interactive public participation process and discusses its characteristics. The second research sub-question is answered in this chapter.

4.1 CONCEPT OF THE PROCESS

This new public participation process refers to the ‘interactive public participation process with direct public involvement’ prototyped by Witteveen+Bos B.V. The core of this process is a website that allows the general public to view, interact and comment on the design. The designers select and adopt suitable public comments into the design and then update the website, thus achieving an interactive process. The theoretical concept of this new process is illustrated in Figure 6.

![Figure 6 Theoretical Concept of the Interactive Public Participation Process](image)

Traditional public participation processes are a combination of the requirement loop and the design loop. In the requirement loop, stakeholders (the public, in this instance) state their expectations of the project. The expectations are then translated into professional technical requirements by engineers. The technical requirements should be validated against the stakeholder’s expectations before starting the design loop. In the design loop, the translated set of technical requirements will act as a guideline for the design process, as well as serve as the basis for the verification of the finalised design.

The proposed new process emphasizes the use of visualisation tools and direct interaction with the public. The new process cuts out the two loops and instead allows the public to interact with the design directly. Members of the public can explore the interactive map, comment on their interested areas, and inspect design updates as the project progresses. The designers will incorporate the public comments in the subsequent design processes and present the refined design back to the public for validation.

Visualisation tools can be used in several places in the process. The project scope is presented as an interactive map so the public can leave their comments in their concerned areas. Design alternatives are presented as illustrations or sketches that are suitable for the laymen rather than using technical drawings. When necessary, virtual reality techniques are used to help the public understand complex design solutions.
4.2 DESIGN OF THE PROCESS

4.2.1 CRITICAL STEPS

As described in Section 3.1.3, the most critical steps in designing a public participation process are:

1) conducting situation assessments,
2) determining the levels of participation,
3) selecting the appropriate tools (EPA 2018c).

The steps used in the design of the interactive process are analysed below:

When the online interactive public participation process was designed, a situation assessment was carried out before any public involvement process commenced. The situation assessment consisted of the identification of the target group, the formulation of the problem, and the compilation of the process goals.

The new process was designed to increase the public’s influence on the projects. The public was involved throughout the interactive design process, and the process would be working towards goals defined by the public, implementing their suggestions in design alternatives, and maximizing their influence in decision-making.

The new process differed from traditional practices by using new technologies. In the construction industry, the most commonly used traditional public participation mechanism is the stakeholder meeting. But not everyone in the community is available or motivated enough to attend the meetings. In most cases, the meetings are filled with middle-aged disgruntled males with something to complain about. This is not representative of the target audience. The new process chose to use an online platform to carry out public participation, and in doing so, providing equal access to all members of the public. The new process also integrated the feature of interactive design into the online process.
4.2.2 DESIGN PROCEDURE

When the online interactive public participation process was designed, the goal was to create a process that would generate a design both influenced and directed by the opinion of the community. The new process should be able to guide the public towards maximum satisfaction, and to where there is the biggest support for the project.

The most important thing about the online interactive process is that it is a user-centred design. Unlike most engineering practices, which focuses on safety standards and design guidelines, this process is about the users, which refers to the members of the public affected by the project. The new process was created for the users. The design started with the identification of the target group. This step was carried out together with the client. In inner-city infrastructure projects, the target group would consist of residents, cyclists, pedestrians, public transport users and motorists.

The second design step was to formulate the problem statement. For each project, it was essential to find out what was the purpose of the participation process. The process was only effective when it was clear what was required by the public. Sometimes, the public was asked to comment on their desires, which would be translated into requirements that guide the design. They were also asked to comment on design alternatives presented by the project team and state their preferences.

The next step was to make a list of requirements the platform had to be able to fulfil. The list was also created in cooperation with the client. Many detailed questions need to be answered here: e.g. What to put on the homepage? Is the project planning necessary? How should the project be described? Should there be an invitation link to the homepage? In most circumstances, an interactive map will be used. Then decisions needed to be made on which details should be illustrated on the map? Should there be additional information about a particular area or about a certain building?

After the theoretical design was finalised, the focus was turned to the technical design of the online platform. The online platform should be built in the custom style of the client. Then the website framework was built, the domain was set up and the security certificates were put in place. Functionalities were filled in once the framework was up and running. Finally, everything was linked to the Relatics environment so the collected public comments would be filed automatically and the process can provide traceability on the public participation.
4.3 CHARACTERISTICS OF THE PROCESS

This section describes the characteristics of the online public participation process regarding the public participation process and the online platform respectively.

4.3.1 PUBLIC PARTICIPATION CHARACTERISTICS

The online interactive public participation process was highly representative of the target group. Because the process was internet based, there was no time or geological constraints that would limit participation. Every member of the community has equal access to the online platform. The representativeness of the target audience was also indicated in the gathered information. The participants were asked about their postal code, email address and what type of stakeholder they identified as (resident, cyclist, pedestrian, motorist or public transportation user). The postal code data was used to analyse the location diversity of the participants. The types information was used to make sure the process was able to balance different types of stakeholders' interests. Also, the email addresses could be used to prevent any individual from spamming the system and thereby ensuring the data was genuine. Altogether, this was a highly representative process.

Participants have been found to be highly independent when expressing their opinions. However, what could have caused bias was that some of the public respondents were also working for stakeholder companies. The project team needed to distinguish whether their comments were posted by the person acting as an individual or as a professional. The project team needed to screen the latter kind out to avoid double representation of the big companies who had already expressed their views in stakeholder engagement processes.

The new process could have a very high score on early involvement. Theoretically, the public could be approached from the beginning of the project, especially since the platform could be built in a few weeks. In past projects, however, the performance in early involvement had varied. In the case of Vestedijk, Witteveen+Bos was involved in the project from the very start, and the process was implemented very early-on before any civilians even knew about the project. In Houtplein, Witteveen+Bos was only approached after two failed attempts had been made to start the project.

The new process was implemented when the community was already disgruntled about not being properly approached in the previous two attempts.

In the new process, the public had a significant influence on the design process. The range of the public's power was dependent on the client's level of commitment. If the client was highly committed, the public could decide which direction the design would take. Usually, the choice of the final design was reserved for the client, as they were in charge of the budget.

The new process was significantly more transparent than traditional practices. However, it was not realistic to make the process completely transparent. Certain issues and governmental documents needed to remain confidential. The main increase in transparency was that the public in the interactive process received feedback about how their input was used in the design process. Moreover, all the (suitable) comments and responses were published on the website for the public's view.
The new process was designed to provide all relevant project information to the public. The public had the necessary access to the project resources, and the municipality had published project documents on its website. It cannot be guaranteed that the public can access all project documents. Some documents, like the contracts between the municipality and public transport companies, were not released to the public. However, there should be enough information available for the public to form a well-based opinion.

A clear definition of participation objectives was made at the design phase of the process. The public was informed of the objectives when using the platform.

A structure to systematically implement public input into project designs was under development. Currently, the public received feedback about how their input was used in the decision-making process. In Vestdijk, data processing was not very structured. The addition of the Relatics environment in Houtplein improved the process with an automated filing system. A completely systematic approach that can be readily adopted by other projects was still being developed.

It was difficult to comment on the cost-effectiveness of the interactive process. Some project manager had reported the projects are becoming cheaper and credited the process. This could be because the public was involved so early that the project team already knew what the environment was and what the stakeholders wanted before the design was started. When the new process was used, most of the public requirements were already incorporated into the early design drafts, very few complaints were received in the later design procedures. Whereas without the new process, the design would receive public feedback at a much later stage and would have to conduct costly design modifications and reworks.

Setting up the online platform and building the virtual reality model, of course, was more expensive than only having stakeholder meetings. But the cost could theoretically be balanced out by the money saved on design reworks.
4.3.2 ONLINE PLATFORM CHARACTERISTICS

The interactive eParticipation platform was designed to be very user-friendly. The steps were logical and very few complaints were received about the functionality of the platform. People understood how to use it right away. This was because a company specialised in communication and positioning an online platform was hired to construct the platform.

As it was important to involve the public as early as possible, the online platform must be constructed quickly. In the Houtplein project, the platform had to be delivered in two and a half weeks. Of course, there were mistakes when the system first went online, but there were people dedicated to troubleshooting. Within a week, the platform became complete reliable.

The platform was very secure as the platform was operated by a professional company and there was a mature security system in place. To protect the user’s privacy, the platform was also SSL certified. Efforts were also being made to make the platform comply with the new European privacy law.

The maintenance was currently carried out by the design team. As the projects were all quite small, there was little need for professional platform maintenance.

Client commitment was a very important issue regarding the success of the platform. The commitment level varied among clients. Some clients were very invested in the platform and they did all they could to publicise the platform and granted as much power as possible to the public. Some other clients, however, only used the platform as evidence that they did go through with the public participation process. They were not very interested in what the public thought.

The publicity of the platform is linked to the level of commitment of the client. When the client is more committed, they try to create more publicity for the platforms.

Most participants were very open when using the platform. But there were also comments containing distrust. For example, there was a lot of negative voices about that bus contract in Houtplein. The public had expressed trust in the platform itself and more in the municipality. The distrust was focused on the project details rather than on the platform.

The majority of the comments were constructive. A rough estimation would be that around 80% of the comments that came in were usable to the design team (Interviewee A 2018).

4.4 CHAPTER CONCLUSIONS

This chapter answers the research sub-question 2: What is the ‘online interactive public participation process’?

The online interactive public participation process is an improved public participation method.

The process conducts public participation through an online platform, involves the public throughout the entire design phase, enables direct interactive design with the public and utilises virtual reality as a visualisation tool.
5. CASE STUDY

A comparative case study is carried out in this chapter to find out how the new process influences project performance. The selection of the cases were justified; design processes of the projects were studied in detail; and the new process’ impact on project performance were concluded.

5.1 CASE SELECTION

Two test cases with the online public participation process and two baseline cases with traditional public participation processes were analysed in the case study.

At the time of the research, three projects had already implemented the new process. Vestdijk in Eindhoven and Houtplein in Haarlem were chosen as test cases. They were chosen because they were both intra-city street redevelopment projects and were similar in size. The redevelopment of highway A58 was also considered to be a test case, with the Blankenburg connection in Rotterdam as its baseline case project. But the A58 project was eventually rejected because the project type and project scope were not comparable with the other two test cases. Another drawback of the A58 project was that its public participation was not conducted thoroughly and little feedback was collected. Therefore it was deemed not reasonable to study this project due to its poor public participation outcome.

The two baseline cases were chosen after careful selection. For each test case, a search was carried out for a comparable baseline case that only used traditional public participation methods. To ensure the comparison can reflect the true impacts of public participation processes, the baseline case should be similar to the test case in every other aspect. The case selection criteria were set up as follows:

An ideal baseline case should be:

1) located in the centre of the same city as the test case,
2) similar in project type to the test case,
3) similar in project size to the test case, and
4) similar in project duration to the test case.

The cost was not used as a criterion because many projects had kept its budget confidential.

After examining all the recent projects from the two municipalities, the following case choices were made: In Eindhoven, the test case was Vestdijk; and the baseline case was Heezerweg, Korianderstraat and Mimosaplein. In Haarlem, the test case was Houtplein; and the baseline case was Nieuwe Groenmarkt and Krocht. Eight other baseline case choices were rejected after careful consideration.

In Eindhoven, both the Vestdijk project and the Heezerweg project were redevelopment projects of a roughly one-kilometre street. Both projects started in 2016 and the construction of the projects was planned to complete in early 2020.

The Nieuwe Groenmarkt project was chosen out of three suitable options because it had the advantage of being managed by the same project managers who worked on the Houtplein project.
This arrangement had the added benefit that the project managers can compare the public participation processes’ influence on the projects from a personal perspective. Witteveen+Bos was responsible for the design in the Nieuwe Groenmarkt project, which meant that internal project documents of this project were more accessible than the other options.

The details of the case study projects are summarised in Table 4. Aside from information related to selection criteria, characteristics of the public participation processes were also included.

<table>
<thead>
<tr>
<th>Project</th>
<th>Vestdijk</th>
<th>Heezerweg, Korianderstraat and Mimosaplein</th>
<th>Houtplein</th>
<th>Nieuwe Groenmarkt and Krocht</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Eindhoven</td>
<td>Baseline Case</td>
<td>Test Case</td>
<td>Baseline Case</td>
</tr>
<tr>
<td>Project Type</td>
<td>Street Redevelopment</td>
<td>Street Redevelopment</td>
<td>Street Redevelopment</td>
<td>Street Redevelopment</td>
</tr>
<tr>
<td>Project Size</td>
<td>1200 m</td>
<td>900 m</td>
<td>300 m</td>
<td>150m</td>
</tr>
<tr>
<td>Project Design Phase Duration</td>
<td>20 months</td>
<td>24 months</td>
<td>15 months</td>
<td>18 months</td>
</tr>
<tr>
<td>Online Public Participation Method</td>
<td>Online Process with Virtual Reality</td>
<td>/</td>
<td>Interactive Online Process</td>
<td>/</td>
</tr>
<tr>
<td>Offline Public Participation Method</td>
<td>Stakeholder Meetings, Stakeholder Design Sessions</td>
<td>Stakeholder Interviews, Stakeholder Meetings</td>
<td>Stakeholder Meetings</td>
<td>Stakeholder Meetings</td>
</tr>
<tr>
<td>Level of Involvement</td>
<td>Inform, Consult, Involve, Collaborate</td>
<td>Inform, Consult</td>
<td>Inform, Consult, Involve, Collaborate</td>
<td>Inform, Consult</td>
</tr>
<tr>
<td>Participation Duration</td>
<td>8 months (online)</td>
<td>2 months</td>
<td>11 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Number of Public Submissions</td>
<td>348</td>
<td>6</td>
<td>266</td>
<td>/</td>
</tr>
</tbody>
</table>

**Table 4 Characteristics of the Case Study Projects**

Eight other projects were considered for the baseline cases before the selection was made. Details of the rejected projects and the reasons they were rejected were included in Appendix 1.
5.2 EMPIRICAL DATA COLLECTION

As discussed in Section 2.4.2, the method of the case study was chosen to carry out an empirical study.

The empirical data input used for the following case study included interviews, project websites, project documents, collected public comments and newspaper reports.

Face-to-face interviews were used because, as an intensive data generation method, it can provide in-depth and objective perceptions (Verschuren and Doorewaard 2010). Interviews were arranged with project managers to learn what public participation methods were used and how the projects were carried out. Interviews were arranged with design engineers to find out how the public participation processes were used in the design process. Interviews were also arranged with the client’s experts to obtain objective comments on the projects’ performances, especially regarding client satisfaction and public satisfaction.

Official project websites were used to obtain project information and design illustrations. Internal project documents were acquired from the design company to find out how the project designs progressed. In projects that used the online public participation process, the collected public comments were analysed. The comments analysis, together with the design process extracted from internal project documents, were used to study how the new process influenced the design process.

Empirical data contributed to the body of knowledge in various ways. Design drafts and project documents were as evidence to support the researcher’s observations in the case study. Interviews with different project parties revealed details of the project performances and added objectivity to the case study’s findings. Furthermore, insights derived during the interview inspired new development directions for the online interactive public participation process.
5.3 PROJECT PERFORMANCE CRITERIA

A set of evaluation criteria was set up to measure the public participation processes’ influence on project performance. The criteria attempted to quantify different aspects of the project performance so that a direct comparison could be made between the case study projects.

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Involvement</td>
<td>Inform</td>
<td>Consult</td>
<td>Involve</td>
<td>Collaborate</td>
<td>Empower</td>
</tr>
<tr>
<td>Design Process</td>
<td>Significantly deteriorated</td>
<td>Slightly deteriorated</td>
<td>No change</td>
<td>Slightly improved</td>
<td>Significantly improved</td>
</tr>
<tr>
<td>Design Quality</td>
<td>Significantly deteriorated</td>
<td>Slightly deteriorated</td>
<td>No change</td>
<td>Slightly improved</td>
<td>Significantly improved</td>
</tr>
<tr>
<td>Client Satisfaction</td>
<td>Very dissatisfied</td>
<td>Dissatisfied</td>
<td>Neutral</td>
<td>Satisfied</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>Public Satisfaction</td>
<td>Very dissatisfied</td>
<td>Dissatisfied</td>
<td>Neutral</td>
<td>Satisfied</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>Design Time (compared with original schedule)</td>
<td>&gt;200%</td>
<td>110% - 200%</td>
<td>90% - 110%</td>
<td>50% - 90%</td>
<td>0% - 50%</td>
</tr>
<tr>
<td>Project Cost (compared with original budget)</td>
<td>&gt;200%</td>
<td>110% - 200%</td>
<td>90% - 110%</td>
<td>50% - 90%</td>
<td>0% - 50%</td>
</tr>
</tbody>
</table>

Table 5 Performance Evaluation Criteria for Case Study Projects

In Table 5, the criteria are divided into six performance aspects. The scoring range is from 1 to 5.

The first criterion, level of involvement, describes the extent of the public’s impact on the decision. A higher score in this aspect represents a higher level of commitment to the general public and more decision making power given to the public.

Admittedly, it is difficult to quantify the design process and design quality objectively. Therefore, the two aspects here were not set up to give a definitive measurement on the design process or the design quality. They were set up to give an indicator of how the public participation has affected the project performance. Scores in the aspects of the design process and design quality were assigned by the researcher with an accompanying explanation.

The client satisfaction aspects measure the attitude of the client, which was determined from the interviews with the client’s project managers. The public satisfaction aspect measures the attitude of the client, which was determined from the interviews with the client’s project managers and the public comments. Both aspects were focused on the project outcome rather than the process.

Lastly, the design time aspect compares the actual time the design phase took compared with the original schedule. The project cost aspect compares the project budget at the end of the design phase with the original project budget.

The total score of a case study project would be interpreted as its quantified project performance.
Figure 7 Current Situation (left) and Design Plan View (right) of Vestdijk, Eindhoven, modified from (GemeenteEindhoven 2018k; GoogleMaps 2019e)
5.4.1 PROJECT INFORMATION

The first case study project was the redesign of the Vestdijk street in Eindhoven. It is a test project that implemented the online public participation process.

The city of Eindhoven has stated, in its urban development visions for the year 2030, that priority will be to create more space for the pedestrians and cyclists in the city centre (GemeenteEindhoven 2013; Postmes, Ouden, and Valkenburg 2017). Cars will be treated as ‘guests’ within the inner ring of the city (IntervieweeD 2019). As shown in Figure 8, the city intended to reduce private vehicle use in the city by limiting the speed and volume of inner-city streets. Vestdijk, labelled in red in the figure below, is on the reduction list. Another issue Eindhoven faced is the astonishing volume of through traffic, up to 60,000 vehicles pass through the city centre every day, using inner-city streets rather than the ring roads (IntervieweeD 2019). This behaviour overburdened the city’s traffic system without contributing to its economic development. To discourage people from using the Vestdijk as a shortcut through the city, a redesign was needed. Furthermore, a recent measurement revealed air pollution problems, which contradicts the municipality’s commitment to building a greener city (Postmes, Ouden, and Valkenburg 2017). The problem was especially intensive in the purple region in Figure 8. Reducing air pollution became part of the objective of the Vestdijk project.

![Figure 8 Motorist Planning Strategy of Eindhoven, with red marking Vestdijk and purple marking air pollution zone, modified from (GemeenteEindhoven 2013)](image)

The Vestdijk project was part of the city centre redevelopment scheme of Eindhoven. The goal of this project was to reduce traffic volume, improve the air quality and increase spatial quality in central Eindhoven. Traffic volume needed to be reduced without harming accessibility. At Vestdijk, this meant reducing the two vehicle lanes to one, and limiting south to north through traffic. Air
pollution would be achieved by reducing traffic, adding landscaping installations and updating the water system. More space would be assigned to public transport users, pedestrians and cyclists in an attempt to increase local spatial quality (GemeenteEindhoven 2018a).

Both online and offline participation methods were used for this project.

From August 2016 to March 2017, the public could view the concept design in Virtual Reality on the website ‘Experience the Vestdijk’ (http://bim.witteveenbos.com/VR/ehv_vestdijk.html) and leave comments about their wishes and requirements for the Vestdijk project. 348 comments were received through this website. In addition, several experience meetings were held for stakeholders and public members to experience the model using VR glasses. The project information, design and construction progress, and news updates could be found on the official project website (https://www.beleefdevestdijk.nl/).

The first direct talks with stakeholders and local residents started in October 2016 (GemeenteEindhoven 2018b). Throughout the project, monthly stakeholder meetings were held to ensure communication with the community. Later, these meetings developed into stakeholder design sessions where the public was invited to comment or even sketch on the design drafts. Other offline public participation methods used for this project included newsletter, residents’ letter and flyers.

The Vestdijk project was initiated in 2016 after Eindhoven failed the air quality assessment. Public participation for this project was carried out in October and November 2016. The final design was presented in March 2018. Construction work had started on September 3rd 2018. The work would take place in six phases, and the estimated completion would be in early 2020 (GemeenteEindhoven 2018i).
5.4.2 PUBLIC PARTICIPATION PROCESS

The Vestdijk project consisted of three phases: 1) collecting wishes and opinions, 2) design and choice-making and 3) tender and execute. The process diagram of the first two phases is illustrated in Figure 9. Each phase (shown in pink) went through five steps (shown in blue). It started with a project meeting, followed by related design works and then online and offline participation processes. All phases concluded with contract related works.

At the beginning of the project, a website with virtual reality models was used to inform the public and collect comments. The comments collected in the participation processes were processed, translated into requirements, then summarised into a programme of requirements. The two Programme of Requirements (PoR1 and PoR2) then formed a design guideline for the subsequent design processes.

The programme of requirements defined the top requirements to be met through the project. PoR1 focused on ‘top specifications’ which were established on the basis of the principles and (design) choices laid down in the official top documents, while PoR2 included detailed system requirements submitted by the municipality. The online public participation process results from the website were also consulted during the design process.

The project used a structured approach based on the principles of Systems Engineering in which the design was worked out from coarse to fine and the requirements were systematically verified and validated per phase. The approach produced a concrete and up-to-date Program of Requirements (PoR) for the following design and tender phase and provided traceability of design choices to the subsequent phases (Witteveen+Bos 2016).
5.4.3 VIRTUAL REALITY

The Vestdijk made use of a virtual reality model as part of the public participation process.

Using virtual reality technology had many advantages for this project. For instance, members of the public are typically laymen in infrastructure design. The vivid illustration of VR made it easier for the public to understand the project intent. Compared with visualisation pictures, virtual reality models offered more flexibility. The public was able to view the project from different views or focus on areas they are interested in.

A comparison of pictures taken from Google Streetview and screenshots from the virtual reality model at the junction of Vestdijk and Ten Hagestraat is shown in Figure 10. With the visualisation of iconic local buildings, the model was easy for the public to navigate and illustrated the project’s intention clearly.

The disadvantage of virtual reality includes the high time and budget investment to create the model. It was also feared that the detailed illustration could limit the viewer’s freedom of imagination. If their wish was drastically different from the model, it would be difficult to convey through this tool.

![Figure 10 Comparison of Street Views (left) and Screenshots from the Virtual Reality Model (right), retrieved from (GoogleStreetview 2015b, 2015c; GemeenteEindhoven 2018k; GoogleStreetview 2015d).](image-url)
5.4.4 VESTDIJK PHASE 1

Phase 1 focused on the collection of the public’s wishes and opinions. The first Programme of Requirements (PoR1) was produced in this phase containing initial comments collected via the website.

PoR1 defined the five main objectives to achieve through the redesign of Vestdijk: healthy city, climate resistance, improve residential quality, accessibility of the city centre and increase the centre area. The objectives were further defined into 18 functions. For each objective, the related objects were specified.

The characteristics of PoR1 are summarised in Table 6. System requirements refer to requirements defined by the client and the design team, which must be fulfilled through design. Project scope is also detailed in PoR1. In addition, the public’s wishes and opinions collected in this stage were translated into customer requirements. The assessment criteria were effects on scope, cost and sustainability, whether the comment supports project objectives, whether the comment fulfils sufficient SMART (Specific, Measurable, Achievable, Realistic, Timely) requirements, uniqueness and feasibility.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Number of Functions</th>
<th>Number of Objects</th>
<th>Number of System Requirements</th>
<th>Number of Customer Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Healthy City</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0 2 2</td>
</tr>
<tr>
<td>2. Climate Resistance</td>
<td>2</td>
<td>8</td>
<td>0</td>
<td>0 3 0</td>
</tr>
<tr>
<td>3. Improve Residential Quality</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>15 47 16</td>
</tr>
<tr>
<td>4. Accessibility of the City Centre</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>10 29 44</td>
</tr>
<tr>
<td>5. Increase the Centre Area</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1 3 4</td>
</tr>
</tbody>
</table>

Table 6 Characteristics of Programme of Requirements 1, Vestdijk

320 public responses were collected in this stage. These responses included 143 concerns (doubts about the usefulness and necessity of the project) and 176 customer wishes (substantive suggestions for the refurbishment) (Witteveen+Bos 2017a). Of the 176 customer wishes, 47% were about the objective ‘accessibility of the city centre’, and 44% were about the objective ‘improve residential quality’, as shown in Figure 11. This was understandable as these two objectives were closely related to the living quality of local residents and the ease of public transportation use for commuters.
As shown in Figure 12, 26 of the 176 customer requirements were accepted (or Honoured), 84 were postponed and 66 were rejected. The accepted customer requirements were linked to system requirements, concerning functions and objects. The postponed customer requirements were still under consideration at the time of the report, a decision of whether to accept them would be made at a later stage. The rejected customer requirements were so out of scope or unfeasible that they were no longer considered by the project.

Of the 26 accepted customer requirements in Phase 1, PoR1 reported a 15/10/1 distribution among objectives 3, 4 and 5. However, according to the objective and functions definition, the researcher’s own interpretation of the distribution was 11/11/4. That is to say, 11 of the accepted customer requirements were about improving residential quality, 11 were about the accessibility of the city centre and 4 were about the increase of the centre area. This result showed that residential quality and accessibility of the city centre seemed equally important in the public’s opinion.

In more details, of the 11 accepted customer requirements regarding the improvement of residential quality, 2 were about the preservation of iconic trees, 2 were design suggestions about the intersection, and the remaining 7 were about increasing the quality of public space via installation of benches and smart information boards and protection of building façade arts. This is an interesting point, as the comments were focused on the details only the users of the environment would know about. Now that the design team had this information, only a small tweak on the design would satisfy the public in these specific needs.
Accessibility of the city centre, in this project, referred to the redesign of traffic at Vestdijk. A ‘cut’ was proposed for the intersection of Vestdijk-Ten Hagestraat-Kanaalstraat to reduce through traffic. After the cut, car traffic would no longer be able to travel from south to north at this intersection. This concept design was presented to the public and received six accepted comments at this stage. There were comments from the residents demanding a smaller traffic volume and a lower speed limit, whereas there were also public members questioning about specific vehicle behaviours, e.g. the possibility of a U-turn. The various comments allowed the designers genuine insight into the needs of the street users. Having heard from residents and motorists, there were also two comments about the design of the bicycle path. One comment asking for wheelchair access at a specific bus stop was also accepted into the design agenda. Adding the two requests for a dynamic referral parking information system, there were, in total, 11 comments about the objective accessibility of the city centre: some reaffirming the existing system requirements and some creating new ones.

Finally, four customer requirements were asking the redesign of Vestdijk to retain the capacity of hosting events like marathons and carnival parades, which were a part of the innovative entrepreneurship encouragement objective.

Most of the 66 rejected customer requirements were excluded because the suggestions were out of scope, against local regulation or unfeasible to enforce.
5.4.5 VESTDIJK PHASE 2

Phase 2 of the Vestdijk project was the design and choice making phase. After the requirements and wishes had been collected, the design process was carried out in co-creation with stakeholders. PoR2 included the system requirements provided by the municipality of Eindhoven and additional customer requirements translated from public comments (Witteveen+Bos 2017b). Characteristics of PoR2 are summarised in Table 7.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Number of Functions</th>
<th>Number of Objects</th>
<th>Number of System Requirements</th>
<th>Number of Customer Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Healthy City</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>0, 21, 2</td>
</tr>
<tr>
<td>2) Climate Resistance</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>0, 16, 0</td>
</tr>
<tr>
<td>3) Improve Residential Quality</td>
<td>5</td>
<td>9</td>
<td>22</td>
<td>14, 83, 16</td>
</tr>
<tr>
<td>4) Accessibility of the City Centre</td>
<td>7</td>
<td>12</td>
<td>32</td>
<td>10, 126, 45</td>
</tr>
<tr>
<td>5) Increase the Centre Area</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>1, 10, 4</td>
</tr>
</tbody>
</table>

Table 7 Characteristics of Programme of Requirements 2, Vestdijk

PoR2 reported 133 system requirements. However, upon closer examination, many were repetitive or miscategorised. This error was probably made when the data was extracted from the Relatics Database. The true number of system requirements was 72.

In total, PoR2 contained 348 public wishes (or requirements). The distribution is shown in Figure 13. 52% of the wishes were about the objective ‘accessibility of the city centre’, which continued to be the number one public concern. The objective ‘improve residential quality’ came second with 32%, which showed that a significant number of public members were concerned about related issues. The remaining three objectives, like in PoR1, attracted less public attention.

![Figure 13 Distribution of Customer Requirements by Objectives, PoR2, Vestdijk](image-url)
The acceptance status of the customer requirements processed in PoR2 is illustrated in Figure 14. Of the 348 customer requirements, 25 were accepted into the design agenda, which was one less than PoR1. This particular requirement was about transforming Vestdijk into an international boulevard by making it a hotspot for internationals and adding terraces for people to rest and work at. This idea, categorised initially under Objective 3, was accepted in PoR1 because it met the project objective to increase the centre area. In PoR2, ruling on this requirement was changed to 'rejected' because the idea is ultimately not smart enough. It was correctly categorised into Objective 5 'increase the centre area'.

Sixty-seven customer requirements were rejected in PoR2, one more than the figure in PoR1. This was due to the status change of the abovementioned international boulevard idea.

Since the number of accepted and rejected customer requirements did not change from PoR1 to PoR2, we can arrive at the conclusion that all the new comments collected in Phase 2 were postponed, totalling 256. This was not a lack of an update as all the collected comments have been appropriately processed. The issues frequently raised in the postponed comments were further analysed in the design agenda.

![Figure 14 Status of Customer Requirements by Objects, PoR2, Vestdijk](image-url)
5.4.6 DESIGN PROCESS

The Vestdijk project strongly emphasised the participation and co-creation with the public in the design phase. In the previous phase, clear wishes came from the public to realise specific ambitions within the project scope. However, the design space is not endless. Budget, time and already established principles from the design preconditions. For a participation process to be successful, it is essential for the public to be clear on what theme is going to be designed in cooperation, the possible limitations and whether there is still room open for design alternatives (Witteveen+Bos 2017b).

The wishes and requirements collected in Phase 1 formed a starting point for the design. In phase 2, the issues raised in the previous phase were analysed in terms of administrative, political, regulatory and environmental impacts. The design was adjusted according to the study results.

The most notable part of the design process in this project was the monthly ‘stakeholder design sessions’. Every month, various stakeholders were invited to attend a meeting to watch the presentation of the project’s progress, discuss project issues and mark their comments directly on the design draft. Figure 15 gives an idea of the situation during stakeholder design sessions. The majority of the attendees were residents and businesses located right on Vestdijk.

The stakeholder design sessions were held monthly throughout the design process. It can be said that the final design of Vestdijk was created by the municipality and the community cooperatively (IntervieweeD 2019).

Figure 15 Example of the Stakeholder Design Sessions, retrieved from (GemeenteEindhoven 2018e)
5.4.7 Final Design

Through the combined efforts of the municipality and the local community, the design of the Vestdijk project was finalised in March 2018. Construction work had started on September 3rd 2018, and the estimated completion will be in early 2020.

In this section, the design will be explained from north to south. Figure 16 below can serve as the project map as well as project scope illustration.

![Figure 16 Phased Construction Plan of Vestdijk Project, retrieved from (GemeenteEindhoven 2018)](image-url)
The first objective of Vestdijk was to reduce through traffic volume. As shown on the left of Figure 17, Vestdijk and Hertogstraat currently have two to three car lanes running south to north, one bus lane running north to south, and two one-way cycle paths on both sides of the street. In the final design, shown on the right of Figure 17, the number of car lanes from south to north will be reduced to one, except for junctions. The bus going from north to south will be preserved. The two one-way cycle paths will be combined into a widened two-way cycle street. To achieve the objective of improving bicycle safety, the cycle street will be separated from the vehicle street with landscaping strips. In doing so, the design incorporated the public comment requesting reduced traffic volume and the public comment requesting for a widened cycle lane.
The junction Vestdijk - Ten Hagestraat – Kanaalstraat will have the most drastic redesign. As described in Section 5.4.4, a ‘cut’ will be implemented here to discourage through traffic using the Vestdijk as a shortcut through the city centre. The ‘cut’ is realised by redesigning the junction. This design is illustrated in detail in Figure 18. The top left figure illustrates the current travel possibilities for bus and car traffic. The top right figure illustrates the situation in the final design. Comparing the two, we can see that after the redesign, it would be impossible to pass this junction from south to north. Therefore this street will no longer function as a short cut through the city. With the through traffic volume reduced, the air pollution situation to the north of this junction should improve.

The new design would also provide smoother turning and better separation of traffic. One collected public comment warned about people doing illegal U-turns to avoid the cut. Learning from this comment, concrete roadblocks were added to enforce the design. It was estimated that the design would improve the safety of the junction, and provide better accessibility to the shopping mall Heuvel, located to the left of this junction.

The two bottom figures in Figure 18 are illustrations of the bicycle traffic design at the junction. One can easily conclude that the current cycle path design is chaotic. Ten Hagestraat has a two-way cycle street, Vestdijk has one one-way cycle path on each side, and Kanaalstraat has one cycle path on the side of the road in one direction and one cycle path in the middle of the street in the other direction. As a result, the junction ground is covered in confusing guiding lines and the motorists have to be extra careful with cyclists emerging from every direction. The new design combined all cycle paths into two two-way cycle streets. The bicycle traffic is simplified to the extreme and the safety of cyclists will be largely improved as the cycle street is separated from vehicular traffic.

Similarly, the Junction Vestdijk – Bleekweg – Bleekstraat integrated car traffic and bicycle traffic. The design details are illustrated in Figure 19. Firstly, two two-way cycle streets will be put in place of the many existing bicycle turning and street crossings. North-bound car traffic is reduced to one lane, in line with the project objective of reducing traffic. Furthermore, car and bicycle traffic now share the street of Bleekweg. To improve bicycle safety, car blocks will be placed on Bleekweg to stop car traffic, turning it into a bicycle-only street.
Other public suggestions incorporated into the final design include the preservation of iconic trees. Figure 20 shows the iconic tree (blue circle in the middle) to be preserved at the junction of Vestdijk and Geldropseweg. Comments about increasing the quality of public space via the installation of smart lighting systems and information boards were also accepted because they comply with the municipality’s vision of smart city development (Postmes, Ouden, and Valkenburg 2017).

5.4.8 PROJECT PERFORMANCE

The Vestdijk project was one of the earlier projects in the development of the interaction online public participation process. The project used a combination of online and offline participation methods. The online process clearly conveyed the project intent, collected the public’s opinions via the virtual reality model, provided the public up-to-date project information and answered the public’s concerns via the official project website. Strictly speaking, the level of involvement of the online participation process in this project was only level 2 ‘involve’. The public was involved in the design process but could not exercise much decision-making power during the online process.

True interactive design was realised offline in this project through the monthly stakeholder design sessions. In the sessions, members of the public and other stakeholders were able to directly participate in the design and exercise their decision-making powers as a group. As a result, the final design was partly made by the community. The level of participation of the combined public participation was at level 4 ‘collaborate’.

Because the public was so heavily involved in the design process, the design quality has improved in the way that it satisfied the genuine needs of the users. The stakeholder themselves were making sure their demands were met rather than relying on engineers to take care of their requirements behind closed doors. The success of the stakeholder design sessions inspired development in the online public participation process. The ‘commenting directly on the design draft’ feature was added to the participation websites, hence creating the interactive online public participation process.

The design process was shortened in this project (IntervieweeD 2019). One reason behind adopting the online process was that the project construction needed to be completed before the summer of 2020. Under the time pressure, the online process was used to increase the efficiency of public
informing and public requirements collecting. The resulting efficiency was indeed impressive. Within three months, the website has collected fairly comprehensive comments from the neighbourhood. This process made it possible for the design to start early.

The client, the municipality of Eindhoven, was quite satisfied with the online process. They requested a tool to speed up public participation process and their request was fulfilled. The platform completed the requirement collection quickly, reached a wider crowd and achieved better information delivery using visualisation.

Due to time constraint, it was impossible to measure the public satisfaction empirically. However, there are some indicators to comment on. The online process has increased the publicity of the project. The municipality also reported a higher number of public comments and enquiries about the project. One can deduct that because a wider audience has been reached, more complete customer requirements were collected and hence the design was likely to satisfy more needs of the public. Attendees of the offline methods have expressed high satisfaction during the design sessions, where they could add their desired features in the design themselves. However, it must be noted that, ultimately, the design is a compromising process. The goal of project designing is not to make everybody happy, which is frankly impossible, but to arrive at the best possible solution within the given constraints.

The budget of the Vestdijk project tripled from four million euro to twelve million euro. This was because the objectives of the project kept expanding. At the start, a four million budget was assigned to resolve the air pollution issue, then the traffic redesign became a part of the project. Afterwards, environmental improvements were added and the project needed to provide more greenery and to update the water and drainage system. With each additional objective, more project budget was assigned (IntervieweeD 2019). The increment of the budget was the result of politics, not directly related to the participation process.
5.5 BASELINE CASE 2: HEEZERWEG, KORIANDERSTRAAT AND MIMOSAPLEIN, EINDHOVEN

Figure 21 Current Situation (top) and Final Design (bottom) of Heezerweg, Korianderstraat and Mimosaplein, Eindhoven, retrieved from (GemeenteEindhoven 2018f; GoogleMaps 2019b)
5.5.1 PROJECT INFORMATION

The second case study project was the redesign of Heezerweg, Korianderstraat and Mimosaplein in Eindhoven. It was a baseline project that adopted the traditional public participation process.

Heezerweg is one of the main entrances into Eindhoven from the south-east. Korianderstraat is located just outside the ring road, and Mimosaplein is a street square on the Koranderstraat. As part of the city’s regeneration plan, the roads will be redeveloped to improve road safety, increase road quality, provide more space for cyclists, add parking spaces, and facilitate the loading and unloading process for local businesses.

As shown in Figure 22, the municipality of Eindhoven’s development strategy for Heezerweg was to maintain slow-motion traffic. Therefore, traffic design-wise, the objective of the redesign was to maintain the current traffic volume and improve the road quality.

As the neighbourhood developed, residents and customers of local businesses have generated an increasing need for parking spaces. To create more parking space became another part of the project objective. Under the double threat of limited parking and narrow streets, local shops found it challenging to manoeuvre loading trucks. The project would also investigate into improving the road usability for delivery trucks.

Moreover, according to the Eindhoven Development Vision 2030, more space should be created for pedestrians and cyclists (GemeenteEindhoven 2013). The redesign would update the current cycle paths.
The public participation methods used in this project included invited stakeholder interviews and open stakeholder meetings.

The Heezerweg, Korianderstraat and Mimosaplein redevelopment project was initiated in January 2016. Public participation for this project was carried out in November 2017. The preliminary design finished in January 2016. Whilst the final design was completed in July 2017 and was approved in January 2018 (Gemeente Eindhoven 2016). Construction work had started on October 15th 2018 after the Eindhoven Marathon. The work would take place in twelve phases and the estimated completion will be in December 2019 (Gemeente Eindhoven 2018g).

5.5.2 PUBLIC PARTICIPATION PROCESS

The redevelopment project started with input from the neighbourhood intelligence officers. These officers are well connected in the local community and have a great understanding of the needs of residents and local businesses. In the initialisation phase of the project, representatives of different stakeholders, for example the chairman of the resident’s association of the neighbourhood, were invited to the municipality for a requirements interview with the project manager. Pamphlets detailing the project information were also sent to residents.

The project design was built on the collected stakeholder wishes and the municipality’s project objectives. A stakeholder meeting, also known as an information market, was held on November 28th 2017 to answer public concerns. At this meeting, members of the public filled in reaction forms as a record of their comments. Figure 23 is an example of the reaction forms collected at the event. This form pointed out that the two trees currently located at the junction of Heezerweg and Thomas A Kempslaan block the visibility of drivers and create a dangerous situation for pedestrians and cyclists. The municipality responded on December 20th 2017 that this suggestion has been incorporated into the design. The trees will be removed from this junction and three parking spaces will be removed from the northern side for the purpose of visibility enhancement. Six similar forms were collected at the event and the municipality has responded to all.

Figure 23 Example of a Reaction Form Used in the Information Market, retrieved from (Linden 2017)
5.5.3 THE DESIGN

The street of Heezerweg is the major part of the redevelopment. In this project, the section from Piuslaan (north-west end) to Tivoliлаan (south-east) will be renovated. As stated in the project objective, the purpose of the redesign was to maintain the current traffic volume and increase traffic safety and street quality. As shown in Figure 25, the current street design has one driveway in each direction with street parking spaces provided on both sides of the street. On each side of the street, there is one narrow cycle path separated from the main street with road blocking and a sidewalk for pedestrian use.
Figure 26 gives a clearer illustration of the new design, the driveway design will be maintained to limit the growth of traffic volume. More street parking spaces will be provided on both sides of the street. A one-way cycle path and sidewalk will continue to be present on both sides of the street. The biggest change in the street design was the divider between car parking spaces and cycle paths. What is now barren tiled dividers will be transformed into landscaping strips. This design change greatly improves the spatial quality of the street with the addition of greenery.

![Figure 27 Final Design Korianderstraat, retrieved from (GemeenteEindhoven 2017c)](image)

The redesign of Korianderstraat focused on improving traffic safety and increase spatial quality. As shown in Figure 28, the current Korianderstraat contains one non-divided street sandwiched by two rows of street parking and two sidewalks. In the new design, the street will have a cycle path marked on both sides of the street, encouraging motorists to be more aware of cyclists and to give them more space. A lot of landscaping features were included in the design, most notably, a greenery strip will be added to the northern sidewalk, shown on the left in Figure 28.

![Figure 28 Current Situation (left) and Design Visualisation (right) of Korianderstraat, retrieved from (GoogleStreetview 2018b; GemeenteEindhoven 2018d)](image)

Local spatial quality will be improved by renewing the pavements, sidewalks and street lights.
Many shops are centralised at the east end of Korianderstraat, this created a delivery problem. As the current design did not account for the need of loading spaces, delivery lorries will have to park in the narrow street, which blocks the traffic flow, or park on the sidewalk, which inconveniences pedestrians.

The redevelopment design has included a designated loading bay, marked ‘expeditie’ in Figure 29 (top), where delivery trucks can temporarily park during the loading and unloading processes. The design also accounted for the wide turning radius of long delivery vehicles. The junction design, shown in orange in Figure 29 (bottom), would allow delivery vehicles to enter the side street and hence access the back loading docks of the shops.

Mimosaplein is located in the middle of Korianderstraat on the north side, as shown in Figure 27. Surrounded by residential neighbourhoods, the square faced increasing parking need. Figure 30 (right) shows the parking plan in the new design, with red marking the current number of parking
spaces, black marking the proposed number of parking spaces in the design and blue marking the differences. In total, 9 additional parking spots will be added to Mimosaplein.

As the only clearance in the street block, the square also serves as public space. The spatial quality of the square needs to be improved so that residents can conduct leisure activities here. A lot more greenery will be added to the square, especially on the eastern side. Figure 31 clearly illustrates the scenery difference before and after the redevelopment. Other measures taken to improve the spatial quality of Mimosaplein include installing benches, providing disabled ramp entrances and placing waste bins.

Figure 31 Current Situation (left) and Design Visualisation (right) of Mimosaplein, retrieved from (GemeenteEindhoven 2018; GoogleStreetview 2015a)

5.5.4 PROJECT PERFORMANCE

The Heezerweg, Korianderstraat and Mimosaplein redevelopment project adopted traditional public participation methods of stakeholder interviews and stakeholder markets.

The starting point of the project was built on the reports of neighbourhood intelligence officers. Based on the issues they reported, selected stakeholders were interviewed by the municipality to obtain their opinions on the project. Because the municipality was confident that they already had a pretty good understanding of what the public needs, a limited effort was put into the public participation process (IntervieweeE 2019). The level of participation in this project was level 2 ‘Consult’. The public was kept informed, and some attempts have been made to acknowledge public concerns and to provide feedback, but nothing more.

Public participation has not influenced the efficiency of the design process. Whilst it is worth noticing that the stakeholder meeting (information market) was held after the design had been finalised, proving that the municipality’s intent was to inform rather than to collaborate.

The project experienced a slight delay. The scheduled realisation period was March 2018 to May 2020 (GemeenteEindhoven 2016). In reality, the constriction did not start until October 2018 (GemeenteEindhoven 2018g). The municipality’s project leader has stated that the project is well within budget, but due to confidentiality, detailed budget reports cannot be released.

Interestingly, a local newspaper (Eindhovens Dagblad) has reported that local shopkeepers have expressed serious concerns about the one and a half year construction plan (Theeuwen 2018).
5.6 TEST CASE 3: HOUTPLEIN, HAARLEM

Figure 32 Current Situation (left) and Preliminary Design (right) of Houtplein, Haarlem, retrieved from (ORKA 2018; GoogleMaps 2019c)
5.6.1 PROJECT INFORMATION

The third case-study project was the redesign of the Houtplein in Haarlem. It was a test project that implemented the online interactive public participation process.

Situated at the entrance to the city, Houtplein is currently cluttered and overloaded with traffic. The municipality is now seeking a redesign of the square so that all users would have safe access to the city, as well as being able to enjoy the pleasant environment of the square (GemeenteHaarlem 2018b). The design objectives included adjusting traffic design, providing more space for pedestrians and cyclists, increasing the amount of greenery and improving spatial quality.

The Houtplein project started in June 2018. The online participation process started in June 2018 with the first sketches of the project. Design variants were presented in July 2018. The preliminary design was published in September 2018. It was estimated that the design phase will complete in early 2019 (GemeenteHaarlem 2018c).

5.6.2 PUBLIC PARTICIPATION PROCESS

The Houtplein project employed both online and offline public participation methods.

There was a public participation website dedicated to this project (https://houtplein-inbeeld.nl/). Learning from the experiences of the Vestdijk project, the online participation platform incorporated the function of public comments and municipality feedback on the project map. The project was a test case of the online interactive design process.

Figure 33 illustrates the information flow of the online public participation process. As the project progressed, more detailed designs were published on the website for the public to comment on. The comments were then analysed and incorporated into the next version of the design, at the same time, feedback were given on each of the comments about the related design decision.

The public participation website went online on June 13th 2018. Project map and sketches of the project intent were presented on the website to collect public requirements and wishes. From July 25th 2018, three design variants were published for comments. The preliminary design has also been released. The public was able to comment on the preliminary design from October 2nd to November 12th 2018. At the time this report was written, 266 public comments had been received.
Online Interactive Public Participation Process | Flora Bai

Figure 34 Overall Project Map, Houtplein, retrieved from (GemeenteHaarlem 2018a)

Figure 34 shows the overall map of project Houtplein displayed on the public participation website for the public to comment on. The interactive map clearly illustrates the project scope and allows members of the public to pinpoint comments to their location of interest.

It should be noted that not all comments submitted are displayed. Only comments with genuine context, after the approval, were displayed on the website.

In the initial stage of the project, the response sent to the participants were simply a ‘thank you for your suggestion’ without any further explanation. This could be frustrating to the respondents, making them feel their comments weren’t taken seriously and eventually discouraging the participation. The response messages were soon revised. In the later responses, the issue raised was acknowledged, the related design objective was recounted, and when possible, the following measures were described.

There were also multiple offline participation sessions for this project. The first information evening took place on June 13th 2018 as part of the public wishes collection. On July 12th 2018, the second information evening was held to present the three design variants. The preliminary design was presented at the third information evening on September 24th 2018. On October 17th 2018, a consultation meeting was held to answer questions about the project and also to collect comments from interested stakeholders. Members of the public could also visit the Haarlem Public Hall to inspect the preliminary design.
5.6.3 RESPONDENT ANALYSIS

Respondents to the public participation process were analysed by the type of users and by the location of residence.

266 public comments were collected during the public participation process of the Houtplein project. Since many respondents submitted multiple comments, the exact number of respondents were counted. The same respondent commenting as different types of users was counted separately because they were expressing different demands. The distributions, by the type of user, of both comments and respondents are shown in Figure 35. In total, 138 respondents participated in the process, 57 (41%) of which were local residents. Traffic users, with 38%, were the second largest user group, including 13 public transport users, 18 pedestrians, 14 cyclists and 8 motorists. The local businesses were also reasonably well represented, with 12 respondents identifying as entrepreneurs and 4 as businesses. This analysis showed active participation from a diversity of users. We can then conclude this participation process is a good representation of the public.

The respondents were also asked to leave their postal code when leaving comments. A location analysis was carried out using the postal codes. Figure 36 is a map of Houtplein (indicated by the red pin) and its neighbouring area. Each blue dot represents a postal code, and the number within the dot shows how many comments were submitted from this postal code. The postal codes located outside the map region are placed along the edges, with a grey dotted line showing their approximate direction and its distance from Houtplein marked in blue. The map also contains a red circle marking the 300 metre radius.

Of the 266 collected comments, 188 comments (70.7%) originates from within the 300 metre radius of Houtplein, 209 comments (78.65) originated within the 500 metre radius, and 221 comments (83.1%) originated within the 1 kilometre radius. Of the 45 comments submitted by respondents living more than 1 kilometre away, 10 were from a policeman in Ijmuiden (9.48 kilometre away), 1 was from a motorist in Hoorn (42.40 kilometre away) that frequently visits Houtplein, 5 were from a resident in Aerdenhout (2.29 kilometre away) who visits Houtplein regularly for shopping, and the rest of the comments are from other parts of Haarlem.
From this map we can conclude that the respondents were indeed centralised around the project site, the comments collected in the public participation was an accurate representation of the wishes of the local environment.
5.6.4 COMMENTS ANALYSIS

After verifying the collected comments were the true wishes of the local public, the 266 comments were then analysed by theme. As shown in Figure 37, themes that attracted most comments were traffic, public transport and spatial quality. These were the topics the public seems to be most concerned with.

![Figure 37 Distribution of Comments by Theme, Houtplein](image)

The following are the researcher’s interpretation of the collected comments.

The first theme, life and work, received eight public comments, all from local residents. Various issues were raised, including parking spaces, street atmosphere and recycling bins. Most of the objectives had already been included in the design and were acknowledged accordingly.

Interesting dilemmas occurred in theme 'shopping and catering'. Residents and pedestrians wished to create a car-free zone in order to create space for greenery and out-door catering, while the businesses and entrepreneurs are adamant the parking spaces must continue to exist. Businesses are demanding more bicycle and scooter parking facilities while other businesses are complaining about bicycle parking racks blocking access to their shop. This is a known side-effect of conducting through public participation processes. Both side’s wishes were recorded for the design purpose. But eventually there will only be one final design, chances are, it will not satisfy everybody’s wishes. But since all parties had expressed wishes in improving the spatial quality of Houtplein, perhaps a constructive compromise can be reached.

In theme 'traffic', there were many suggestions about the redesign of car traffic, public transport, bicycle traffic and pedestrian space were received. Valid concerns were translated into customer requirements for further analysis. The main public requests are to create a car-free zone, increase pedestrian space, improve the cycle path, separate bicycle and vehicle traffic, more car parking spaces and more bicycle parking spaces.

Many traffic design related comments were mistakenly filed under the theme 'safety' because the respondents were considering the safety of the road users. In particular, there was a pedestrian crossing in Houtplein that was not shown on the online illustration, which raised concerns about pedestrian safety, especially with a school and a bank nearby. There were also genuine safety issues which were centred around a local cannabis shop. Many residents expressed their wishes for the
loading bay in front of the cannabis shop to be preserved as a hangout spot for the customers, rather than having them wandering about the neighbourhood.

Again, public opinions diverge about the theme ‘spatial quality’. Some worried the redesign would make Houtplein lose its unique character. Some are very hopeful that the redesign will increase the user-friendliness of the Houtplein with accessibility improvements and increased pedestrian space.

In the theme ‘others’, much concern was expressed about a local artwork in the form of stacked green telephone boxes, as shown in Figure 38, located near 47 Houtplein. Some local residents believed that the artwork is a vital part of Houtplein’s identity, and was adamant that the artwork must be preserved as it is. While others suggested refurbishment or relocation to the nearby sculpture garden, requirements submitted in this theme include longer accessible parking spots, better accessibility of pavements and replacement of the sewage system.

As for ‘public transport’, firstly there were not enough space on the sidewalk or around bus shelters for public transportation users. Another main complaint was that there were not enough bicycle parking facilities so during rush hours bicycles parked on the sidewalk and blocked the already limited pedestrian space. The public was also quite unsatisfied about the current bus route layout, in particular, the bus stop on Tempeliersstraat, where the street is so narrow that buses were always stuck in the congested traffic during rush hour, and causing noise and vibration disturbance to the local residents outside rush hour.

In the theme ‘landscaping’, the public unanimously required for more greenery, particularly in de Dreef. The design team should be cautious when placing landscaping at street corners that the visibility of cyclists and pedestrians should be preserved.

In the theme ‘sound and air’, many complaints were filed, especially around Templar street, about noise generated by bus, scooter and car traffic. For buses, Connexxion has indicated that most lines will be operated by electric buses within three years. Scooters are governed by national regulations that the municipality cannot limit its use. As for the noise generated by cars, the trend of electric cars was already happening. Aside from this, the Houtplein project will attempt to resolve the noise pollution problem via traffic redesign.

The researcher noticed that many comments were misattributed to the wrong theme. This was perhaps caused by public members having a different interpretation of the themes. In future practices, it would be a good idea to provide the public with a clear definition of all themes. To maintain traceability, the categorising errors of comments were not corrected. However, the extracted customer requirements were categorised into the correct themes.
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5.6.5 CUSTOMER REQUIREMENTS ANALYSIS

The 142 customer requirements were extracted from the 266 comments, the distribution by theme is shown in Figure 40. Similar to the original comments, traffic, public space and public transport were the most important issues. While the last section represents the researcher’s understanding, these customer requirements were the interpretations of the design team and were used as guidelines for the conceptual design.

![Figure 40 Distribution of Customer Requirements by Theme, Houtplein](image)

The customer requirement for theme 'live and work' was summarised to 'pleasant living environment should be a priority', placing a higher preference on the requirements of local residents over traffic users travelling through this area.

In theme 'shopping and catering', requirements to make the square attractive for shops and restaurants were logged, including placing a terrace in the square, removing bicycles that block shop fronts, providing loading and unloading facilities and providing parking spaces.

The 29 accepted 'traffic' customer requirements can be summed up to five points: reducing the traffic flow in the narrower streets, enforcing the speed limit, limiting traffic flow direction, maintaining accessibility by car for local residents and putting in a two-lane bicycle path separated from vehicular traffic. Some repetitive and generic requirements were ignored and the suggestion of putting in a roundabout was rejected.

There were only two 'safety' customer requirements accepted into the system, that the design should aim to increase road safety and there should be clear signs and signals to indicate the safety features in the design.

In the customer requirements, the theme 'spatial quality' was renamed to 'public space' for clarity. Accepted requirements includes the improvement of the square’s aesthetics, the preservation of the existing artworks, better lighting in the streets and better sidewalk design. Demands to remove the 'telephone box' artwork were outvoted and hence rejected.
As the fate of the artwork had already been determined in the theme 'public space', there were only minor detailed requirements left for theme 'others' like sewage system maintenance.

'Public transport' was another major concern in this redesign. Following major complaints, a decision was made to move the Tempeliersstraat bus stop to the main street to alleviate the current congestion problem and to minimise disturbance to the neighbourhood.

In 'Landscaping', a consensus was reached to provide more greenery around the Houtplein in the new design.

To improve air quality and limit noise pollution, the following customer requirements were accepted: limiting traffic flow in side streets, reduce the use of heavy buses and adopting a quiet pavement design. The proposal to only allow electric vehicle access to the Houtplein was ruled unrealistic at the moment.

Finally, themes 'car parking' and 'bicycle parking' were added due to a large number of related comments. Current car parking spaces are to be maintained, street parking should remain possible with preference given to the locals, and commercial parking spaces will be open to residents after closing time. It was also accepted that more bicycle parking facilities should be added to the new design, perhaps in the form of a large indoor underground parking lot.

From public comments to customer requirements, the public's wishes were summarised in a more concisely, making it easier for the designers to understand and to realise the wishes. Due to the vast number of comments, the interpretation process posed a large workload on the team. Therefore a systemic method of processing the comments is needed.
5.6.6 DESIGN VARIANTS

After the initial collection of public wishes, three variants were designed and presented to the public for their comments.

Design Variant 1 would provide a separated bus route in Houtplein. Bicycle traffic and car traffic in both directions would be combined on the west side of the Houtplein. Wijde Geldelozepad, Tempeliersstraat and Wagenweg would be turned into one-way streets for car traffic. The buses route would run through Tempeliersstraat, Houtplein and Frederikspark and stop at the Houtplein and Tempeliersstraat.

The public was extremely unhappy about this design variant. As shown in Figure 42, most of the 48 collected comments are violently opposing this design. The main concerns were:

The bus stops were not removed from Tempeliersstraat. In this design, both directions of bus, car and bicycle traffic would run through Tempeliersstraat, aggravating the already existing congestion problem. As Tempeliersstraat is a narrow street with only one lane in each direction, placing bus stops in this street would stop the traffic flow on a regular basis. Furthermore, it was repeatedly
pointed out that the sidewalks in Tempeliersstraat were too narrow for passengers to wait for the bus safely nor are they accessible by wheelchair users.

In this design variant, at the junction of Houtplein and Tempeliersstraat, bus, car and bicycle traffic would have to cross over each other to make the turn, making it a dangerous situation for the cyclists and the pedestrians. Some members of the public also commented that the bus stop in Houtplein would be more convenient to use if the platform was placed on the east side of the road. On the west side, it was worried that the road would be too narrow to be used by both cars and cyclists in both directions. The junction of Houtplein, Wagenweg and Frederikspark was also criticised as confusing and dangerous.

From the first round of public communication, it was already clear that the bus service was not popular among the local residents. With a high priority for bus traffic, it was not surprising that the design variant was not received well by the public.

Design Variant 2 can be characterised as a car-free bus terminal. The design would remove the current bus stop from Tempeliersstraat and move all the bus stops to Houtplein. Bus routes would run through Tempeliersstraat, Houtplein and Frederikspark as usual. A private vehicle would no longer be able to travel through Houtplein. Moreover, Tempeliersstraat, Wijde Geldelozepad and Wagenweg would be turned into one-way streets for car traffic. Two-way cycle lanes would be constructed in all streets except for the Houtplein, where one single-lane cycle path would be placed on each side. The cycle lane on the east side of Houtplein would allow cyclists to travel north with minimal crossings.
The public gave some positive feedback to design variant 2, as shown in Figure 44. The local community was particularly glad to see the proposed removal of the bus stop in Tempeliersstraat, which was seen as a good start to solving the congestion problem in this street. As this street would continue to be used by bus, car and bicycle traffic, some members of the public have requested a separate bicycle lane to ensure the safety of the cyclists.

The centralised bus terminal design in Houtplein received many compliments. The public was delighted by the separation of bus and bicycle traffic. They were also happy to see the addition of a cycle lane on the east side of Houtplein, which would make bicycle traffic from the south to north much easier than variant 1. The public also pointed out that at the junction of Wagenweg and Houtplein there is a sharp turn that could be dangerous to cyclists.

The proposal of a car-free zone in Houtplein received mixed reviews. The local residents were glad that this square will no longer be attractive for through traffic and the roads can be used primarily by the local residents. But local businesses complained that this would make stock delivery (loading and unloading) extremely difficult. There was also a concern that, with the lavish addition of bicycle lanes and bus terminals, this design did not leave enough space for pedestrians.
Design Variant 3 would relocate two of the bus stops to Frederikspark. The current bus stop in Tempeliersstraat would also be removed. The bus route would remain the same through Tempeliersstraat, Houtplein and Frederikspark. Bicycle lanes in both directions would be provided in each street, but there would not be a bicycle shortcut though Houtplein on the east side. Partial accessibility would be retained for car traffic. Tempeliersstraat, Wijde Geldeloze pad and Houtplein would be designated one-way streets.

As shown in Figure 46, the public gave mixed reviews for design variant 3.

On the one hand, the local public was delighted that the bus stop would be removed from Tempeliersstraat and the traffic load in Houtplein would be lightened. The design variant 3 would also free up maximum public space. However, the majority of the public was strongly against placing a new bus stop in Frederikspark, worrying that it would destroy the historical monument as well as the environment.

As for car traffic, many members of the public were insisting that a car-free zone would be the best solution for Houtplein. Most of the complaints about car traffic were from a member of the public, violently opposing Wijde Geldeloze pad being used as a shortcut for through traffic in and out of the city.

The bicycle path design of variant 3 was the same as variant 1. Therefore, the dangerous turning at the junction of Lorentzplein, Wagenweg and Houtplein was reported again.
5.6.7 PRELIMINARY DESIGN

The preliminary design was completed on September 24th 2018 and was published on the public participation website, as shown in Figure 47. The preliminary design combined the positive features of the design variants as well as adopted prevailing public comments. The key features of the preliminary design are analysed below.

Figure 47 Preliminary Design Layout, Houtplein, retrieved from (OKRA 2018)
The most prominent feature of the preliminary design was the designation of Houtplein as an auto-free bus terminal, as shown in Figure 48. The bus routes will continue to run through Tempeliersstraat, Houtplein, Dreef and Frederikspark in both directions. The junction of Tempeliersstraat and Houtplein will be widened to allow easier turning for the buses.

The bus stop originally located on Tempeliersstraat will be removed and the new bus stops will be located in Houtplein and the west side of Dreef. The placement of the bus stops was influenced by the public’s opinion. During the public participation process, design variant 2, with a centralised bus terminal in Houtplein, was criticised for taking up too much public space, and design variant 3, with some stops in Houtplein and some in Frederikspark, was criticised for destroying the monumental and environmental value of the park. Hence the preliminary design combined the two variants, placing most bus stops in Houtplein and the rest in Dreef, conserving the public space in Houtplein without influencing Frederikspark.

Following the positive feedback for design variant 2, the auto-free zone of Houtplein is adopted in the preliminary design. Setting up an auto-free zone would discourage through traffic, limit the use of the streets to destination traffic and return peace to local residents. Houtplein now can be used as a common public space and Wijde Geldeloze pad will no longer be used as a shortcut in and out of the city. The auto-free zone would also boost Houtplein’s attraction as a shopping and dining square. This design choice is in line with the project statement that the preference would be given to the wishes of local residents over through traffic users.

Figure 48 also shows the car parking arrangements of the preliminary design. As requested by the residents, street parking spaces will be preserved. Loading and unloading spaces will also be
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provided where the shops are centralised, i.e. both ends of Tempeliersstraat and the east end of Lorentzplein. The loading and unloading spaces are circled in red in Figure 48.

The design of bicycle paths is shown in Figure 49. Bicycle traffic in both directions will be allowed on all streets. Learning from the design variant comments, a single separated bicycle lane will be added to the east of Houtplein so that northbound traffic can travel through Houtplein directly without going through the many junctions on the west side. The bicycle lane design at the junction of Lorentzplein, Houtplein and Wagenweg in design variant 1 and 3 had been criticised for being too dangerous as the junction had sharp angles and had traffic coming through in four different directions. The preliminary design solved this problem by separating it into two T-junctions of mild angles, circled in red in Figure 49. Bicycle racks will also be provided throughout the Houtplein neighbourhood. They will be moved from their current locations on sidewalks to in-between car parking spots so that they will no longer be causing problems like blocking shop entrances as reported during the participation process.

Cross-sections are also provided in the preliminary design to illustrate the layouts of individual streets.
Firstly, Tempeliersstraat will be turned into a one-way street for private vehicles. Cars will only be able to travel through this street from east to west. Separate bike paths will not be provided in this street. Bus traffic in both directions, bicycle traffic in both directions, and car traffic from east to west will share the 8m wide two-lane street, as illustrated in Figure 50 (left).

Wijde Geldelozerpad will become a one-way street for car traffic from west to east, opposite to the current situation.

Lorentzplein would accommodate car traffic in both directions and bicycle traffic in both directions. There will be no separate bicycle lanes, all traffic will share the 5m wide lane, as illustrated in Figure 50 (middle).

Wagenweg will become a one-way street for south-bound car traffic, sharing the 4.5m wide lane with bicycle traffic in both directions, as illustrated in Figure 50 (right).

For Houtplein, a separated single bicycle path will be provided on the east side. On the west side, southbound bicycle and car traffic will share the same lane. The bus terminal will have two lanes in each direction, one for stopping to drop off/pick up passengers and one for through traffic, so that the traffic flow will not be brought to a standstill every time a bus stops.

As requested by the public, greenery will be provided along Tempeliersstraat and Wagenweg and on both sides of Lorentzplein, Houtplein and Dreef.

There will also be a widened sidewalk for pedestrian use in the north-south direction cutting through Houtplein and Dreef, shown on the right of Figure 51 and Figure 52.

To sum up, the design was made based on public requirements and was adjusted per public preference. All main issues raised were provided with a solution in the preliminary design.
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5.6.8 PROJECT PERFORMANCE

The Houtplein project adopted the latest version of the online interactive public participation process. Compared to the process used in the Eindhoven project, the platform had additional online feedback feature so the public could participate in the entire design process online.

The level of involvement in the Houtplein project was at the 'collaborate' level (level 4). The public was not only involved throughout the design process and contributed to the design. They also wielded some decision making power and the design changes have been made based on the public's approvals and disapprovals.

The participation process of the Houtplein project has been efficient. In the first month after going online, the website had collected a large number of comments. Analyses showed that the respondents are representative of the targeted community. It is likely that the online public participation process has contributed to the efficiency of the design process. The design went through the constant public-supervised revision process. There was very little waste of design because all small design oversights were rectified timely.

Houtplein has proven to be a very timely budget. In the February 2018 version of the project programme, the online platform was scheduled to be released in June 2018, design variants would be finished around mid-July 2018 and the preliminary design should complete in September 2018 (Witteveen+Bos 2018a). Indeed, all three procedures were completed on time. It is estimated that the design phase will complete in early 2019 (GemeenteHaarlem 2018c).

Until the final design phase, the Houtplein project was on budget (IntervieweeF 2019).

The project manager from the municipality of Haarlem estimated approximately 90% of the public was happy with the participation process and the design outcome. There was an activist group promoting biking in the Haarlem trying to use this project as an opportunity to express their opinion that buses should be removed from the city centre of Haarlem. This issue was outside the scope of the Houtplein project. Except for this group, most members of the public were positive about the project and the design (IntervieweeF 2019).

The client, the municipality of Haarlem, was very satisfied with the online public participation process. Compared with traditional methods, it allowed public participation to be carried out from an earlier stage, created transparency in the project and allowed members of the public to understand other people's concerns.
5.7 BASELINE CASE 4: NIEUWE GROENMARKT, HAARLEM

Figure 53 Current Situation (left) and Preliminary Design (right) of Nieuwe Groenmarkt and Krocht, Haarlem, retrieved from (ORKA 2017; GoogleMaps 2019d)
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5.7.1 PROJECT INFORMATION

The fourth case-study project was the redesign of Nieuwe Groenmarkt and Krocht in Haarlem. It is a baseline project that adopted the traditional public participation process.

As part of the city regeneration plan, Nieuwe Groenmarkt and the neighbouring Krocht street, located in the old town of Haarlem, would be redesigned. The project aims to add the two streets to the car-free shopping zone, improve the spatial quality, increase the bicycle traffic safety and provide more bicycle parking facilities. After the redesign, the street should also be able to serve as the location for the weekly market and small events.

The Nieuwe Groenmarkt project started in October 2017. Traditional public participation methods were used, including participation meetings and interviews.

Three participation meetings took place on October 2nd, November 6th, and December 6th 2017. Representatives of local residents and other stakeholders were present at the meetings. In October, the needs and requirements were collected from the various stakeholders and the wishes for Nieuwe Groenmarkt have been mapped out. In November, design sketches were presented (GemeenteHaarlem 2017a). In December, design variants were presented to the public for comments. Three designs with bicycle parking facilities on ground level were displayed, and Variant 1, the De Laan variant, was the most appreciated. In addition, the attendees were asked to give their opinion on an alternative design with underground bicycle parking facilities in the form of voting. The voting result showed that the underground option received by far the most support. Hence, a further study for a solution with underground bicycle parking facility was commissioned, and three more design variants were developed (Witteveen+Bos 2018b).

The design proposal has been submitted to the municipality for decision.
5.7.2 CURRENT SITUATION

Once a nicely sheltered city square, Nieuwe Groenmarkt is now crowded with parked cars. As shown in Figure 54, there is no street furniture or greenery installations on Nieuwe Groenmarkt anymore. Located on the pedestrian network and the Haarlem old city shopping loop, these two streets have great spatial quality improvement potentials. But the design freedom is quite limited due to the long curved asymmetrical shape of Nieuwe Groenmarkt and the fact that the Catholic church Groenmarktkerk is located right in the middle of the street and cannot be disturbed.

The redesign project aims to improve the spatial quality by providing shelter and greenery. Parking spaces for vehicles and bicycles should be provided for residents and local businesses. The design should also reserve space for weekend market booths and ensuring accessibility for visiting vehicles attending church events as well as loading and unloading vehicles for the local businesses.

Figure 54 Current Situation of Nieuwe Groenmarkt and Krocht, retrieved from (ORKA 2017)
5.7.3 GROUND LEVEL DESIGN VARIANTS

On the third participation meeting on December 6th 2017, the following three design variants were presented to the public. The variants were characterised by bicycle parking facilities on ground level.

Variant 1, also known as ‘De Laan’ variant, was the main design presented by the design team.

As shown in Figure 55 and the street cross-section in Figure 56, Variant 1 was characterised by a pedestrian street running through the length of Nieuwe Groenmarkt and street furniture placed on the side. The bicycle parking racks (shown in red) had a design capacity of 268. The bottom left picture in Figure 56 illustrates the landscaping plan of the two streets, with green circles representing trees and dark green rectangles representing landscaping stripes. The space in front of the church would be left relatively empty so it can serve as a small open square. An art installation would be placed across the street from the church. The bottom right part of Figure 56 illustrates the stalls layout on market days. Space will be reserved for 37 stalls. Although this was a 20% decrease compared to the 46 stall spots before the redesign, the street’s ability to host weekly...
markets would remain. The design variant had also considered emergency situations. All street corners would be wide enough for ambulances, fire trucks and delivery trucks to pass through.

The main difference between Variant 1 and the other two variants is the placement of bicycle parking facilities. The bicycle parking racks are coloured in red in Figure 55, Figure 57 and Figure 58.
In Variant 2, there would be two areas designated for bicycle parking on Nieuwe Groenmarkt. The racks would be placed in one row along the street. Part of the bicycle parking zone would be used to place stalls on market days. It could potentially host more stalls than the other designs. Limited terrace space and greenery would be provided.
In Variant 3, bicycle parking racks would be arranged in a more compact manner thus saving more space for landscaping installations. Terraces for residents to socialise would be provided in a limited manner. This variant also provided the least number of market stall spaces.
5.7.4 UNDERGROUND DESIGN VARIANTS

On December 6\textsuperscript{th} 2017, an additional variant with underground bicycle parking facility, shown in Figure 59, was also presented to the public. This design gained such common support that a study to further develop the design was commissioned.

The report discovered that bicycle traffic in Haarlem will face a rapid increase as a result of both policy regulations and natural developments. According to the city of Haarlem’s ‘Future Vision 2040’, more public space should be offered to pedestrian and cyclists (GemeenteHaarlem 2017c). In the national document ‘Bicycle Agenda 2017-2020’, a growth of bicycle traffic is forecasted and more space for bicycles in cities was requested (Rijksoverheid 2016). The ‘Structural Vision of Public Space Haarlem 2040’ confirmed the estimated growth of bicycle traffic and stated that in the city’s development plan, priority will be given to public traffic (GemeenteHaarlem 2017b). Therefore, it is both necessary and reasonable to provide more bicycle parking facilities in the city of in the centre of Haarlem. Nieuwe Groenmarkt is located on the Zijlstraat, one of the access roads to the centre. This makes this location a good place for a bicycle parking facility.

An underground bicycle parking facility on Nieuwe Groenmarkt fitted well with the expected increase in bicycle traffic and with it the increasing demand for bicycle parking spaces. A major advantage of an underground bicycle parking space was that the spatial quality is maintained and that multifunctional land use is possible. The area would also remain easily accessible for pedestrians and other road users if there are no parked bicycles on the sidewalk.

It was estimated that currently there is a need for 366 bicycle parking places on weekdays and 655 spots at peak hours in Nieuwe Groenmarkt. In 2040, the demand was forecasted to be 800 places on weekdays and more than 1,400 places at peak times (Witteveen+Bos 2018b).

Figure 59 illustrates the underground design variant presented to the public on December 6th 2017. The design proposed a linear bicycle parking cellar with a ramped entrance on both ends along Nieuwe Groenmarkt. Limited by the width of the street, only two roles of bicycle racks can be placed in the cellar. The roof of the cellar would be covered with vegetation. With bicycle racks moved underground, ground level street space can be used to improve spatial quality. It would be possible to have more greenery, larger terraces and more market stalls on the square. As shown on the bottom left of Figure 59, 38 market stalls can be placed in the two streets without blocking the emergency vehicle path.

In the report, four variants with different designs of the underground bicycle parking facilities were developed.
Figure 59 Linear Cross Section (top), Plan View (middle left), Visualisation (middle right), Market Day Plan (bottom left) and Street Cross Section (bottom right) of Design Variant with Underground Bicycle Parking Facility, Nieuwe Groenmarkt, modified from (ORKA 2017)
The first underground design variant was the one presented to the public, as shown in Figure 60. It was characterised by having one floor of public bicycle parking spaces and two access ramps. Due to the limited width of the street, it was only realistic to place two rows of bicycle racks in the cellar. The design offered 496 parking spots. This design would satisfy the current parking need on weekdays but not during peak times. It was estimated that this design would cost EUR 3,400,000.00 to implement, excluding sales tax. The investment costs per parked bicycle would be approximately EUR 6,855.00 (Witteveen+Bos 2018b).

Variant 5, shown in Figure 61, was a modified version of Variant 4. Since Nieuwe Groenmarkt is located on the South of the city centre, it was predicted that most visiting bicycle traffic would approach from the south, park the bicycles, then continue north on foot into the city centre. Therefore, the southern entrance would be more useful than the northern one. Variant 5 removed the northern ramp, extended the cellar for 10 m, and placed 96 extra parking spaces. This design
could offer 592 parking spots at a total cost of EUR 3,460,000.00. On average, the investment cost would be approximately EUR 5,844.00 per parked bicycle. This design would satisfy the current parking need on weekdays but not during peak times (Witteveen+Bos 2018b).

Variant 6 contained two underground floors, as shown in Figure 62. The first floor was almost identical to Variant 5, with two roles of bicycle racks and one ramp entrance on the south. The first floor would offer 596 parking places. The second floor would contain an automated bicycle storage system accessible via a card scheme. The automated system could provide 300 parking spaces, more than sufficient for the estimated resident parking need of 235 places. The calculated implementation cost of this variant was EUR 5,971,321.00, averaging EUR 6,664.00 per parked bicycle. This design variant would offer 896 parking places in total, satisfying all current parking need as well as the estimated weekday parking demand in 2040 (Witteveen+Bos 2018b).
Variant 7, shown in Figure 63, was a cheaper alternative of Variant 6. This variant would construct the structure of the two floors in Variant 6 but only complete the construction of the first floor at the current stage. The automated parking system could be realised at a later time when the need arises. This variant would provide 596 parking places, which satisfies the current parking needs, and has the opportunity to add 300 places when capacity exceeds. The estimated installation cost of this variant was EUR 4,497,462.00 (Witteveen+Bos 2018b).
5.7.5 COMPARISON OF DESIGN VARIANTS

The characteristics of design variants are summarised in Table 8. Variant 1 is listed as the representative of the ground level solution. With the first three variants being similar to each other in every way but the arrangement of street furniture and the public has already clearly expressed a preference for an underground solution, Variants 2 & 3 are not included in the table below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Variant 1</th>
<th>Variant 4</th>
<th>Variant 5</th>
<th>Variant 6</th>
<th>Variant 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics Summary</td>
<td>Racks on ground level variant 'De Laan'</td>
<td>Underground, 1 floor public, 2 ramps</td>
<td>Underground, 1 floor public, 1 ramp</td>
<td>Underground, 1st floor public, 2nd floor automatic stables</td>
<td>Underground, 1st floor public, 2nd floor automatic stables</td>
</tr>
<tr>
<td>Number of places</td>
<td>268</td>
<td>496</td>
<td>592</td>
<td>896</td>
<td>596 (+300)</td>
</tr>
<tr>
<td>Spatial quality</td>
<td>Average</td>
<td>High, compared to now and Variant 1</td>
<td>High, compared to now and Variant 1</td>
<td>High, compared to now and Variant 1</td>
<td>High, compared to now and Variant 1</td>
</tr>
<tr>
<td>Estimated preparation time</td>
<td>6 months</td>
<td>18 months</td>
<td>18 months</td>
<td>18 months</td>
<td>18 months</td>
</tr>
<tr>
<td>Estimated execution time</td>
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<td>12-24 months</td>
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<td>12-24 months</td>
</tr>
<tr>
<td>Cost (total)</td>
<td>EUR 20,000</td>
<td>EUR 3,400,000</td>
<td>EUR 3,460,000</td>
<td>EUR 5,971,321</td>
<td>EUR 4,497,462</td>
</tr>
<tr>
<td>Cost (per parked bicycle)</td>
<td>EUR 75</td>
<td>EUR 6,855</td>
<td>EUR 5,844</td>
<td>EUR 6,664</td>
<td>/</td>
</tr>
</tbody>
</table>

Table 8 Characteristics Summary of Design Variants, Nieuwe Groenmarkt, modified from (Witteveen+Bos 2018b)

All design variants satisfied the design objectives of: increase spatial quality, limit through traffic, increase bicycle safety and create spaces for markets and events. The main divergence of the variants was the design of the bicycle parking facility.

On the one hand, the ground level variants offered a minimally invasive street redesign solution that is both fast and cheap. The drawback was that the bicycle parking places it provides cannot even satisfy the current need. It is likely that, after the implementation of this design, the excess bicycles will be parked randomly and thus clutter up the street again.

On the other hand, an underground bicycle parking facility at Nieuwe Groenmarkt fitted well with the expected increase in bicycle traffic and with the demand for bicycle parking spaces. The redesign of the area was the ideal time to realize such a bicycle parking solution. Compared with the ground level designs, the underground variants would take longer to design and execute and would be significantly more costly.

On the basis of censuses and prognoses, there was a need for around 366 places on weekdays and around 655 places at peak times in the current situation. It was expected that in 2040 the need will
be 805 places on weekdays and 1,441 spots at peak times (Witteveen+Bos 2018b). The size of an underground bicycle parking was limited by the width of Nieuwe Groenmarkt and the limitation in depth. The variants with one underground floor was the most desirable design for ease of use. For Nieuwe Groenmarkt situation, this meant parking for a maximum of 592 bicycle parking spaces (Variant 5). It met the current capacity requirement on weekdays and 90% of the current capacity requirement during peak moments. In order to be able to meet the growing demand in the future, it was also possible to opt for a second-floor layer. This layer would adopt an automated storage system to ensure ease of access, and the capacity of this second layer can be limited to approximately 300 bicycles if it was designated as resident use only. These two layers could be constructed together (Variant 6), or the structure of the lower layer could be built first and the detailed construction to be executed at a later stage (Variant 7).

If an underground bicycle parking facility in the city centre was chosen, it would need to be combined with a good enforcement policy. Without a ban and proper enforcement against bicycle parking on ground level, the underground parking facility would not be used because it is human nature to opt for the most convenient solution.

The municipality has not yet reached a decision on the final design.
5.7.6 PROJECT PERFORMANCE

The fourth case, the redesign of Nieuwe Groenmarkt and Krocht, employed a traditional public participation method in the form of three stakeholder meetings. In the first meeting, the public’s wishes for the project were collected. In the second meeting, design sketches were presented to the public. In the third meeting, detailed design variants were presented and the public voted on their favourites. Due to the prevailing preference, further development of the underground design was commissioned and four underground design variants were produced.

The level of involvement in the Nieuwe Groenmarkt project was limited to the ‘consult’ level (level 2), where the public was only approached at isolated stages of the project and a limited small crowd was reached. As for decision making power, the public as a whole had some influence over the direction of the project, i.e. ground-level vs. underground, but individual members of the public had neither access nor the power to influence the specifics of the project design.

Some waste of design had occurred in this project. The two Haarlem projects were similar in the way that multiple design variants were developed and how they received feedback from the public. However, in Houtplein, it was the design sketches that the public commented on, and as a result of the participation, the engineers gained a clear idea of how to improve the design. In Nieuwe Groenmarkt, the variants presented to the public were fully developed by a commissioned architecture firm and the feedback received was a go/no-go decision. The time and budget spent on the rejected designs were hence wasted. If the online public participation platform was used in this project, the public could have expressed their preference earlier and the design change from above-ground to underground would have happened earlier, thus making the design process more efficient.

Some delay had been observed in the project. The public expressed their preference in the last stakeholder meeting in December 2017, but the underground variant designs were not published until November 2018. The delay was because the underground bicycle parking cellar was not part of the municipality’s project scope and the original budget could not cover the additional five million necessary for the underground design. As a result, the project had been submitted to the local council and is now currently waiting decision on whether the underground option can be realised (IntervieweeF 2019).

With the underground design, the Nieuwe Groenmarkt project had already exceed its budget. If the municipality approves the additional budget, the underground structure can be constructed. If not, the project will have to be redeveloped on the ground-level only.

According to the municipality’s project manager, both the public and the city were quite happy with the participation process, because it sastified both parties’ objectives (IntervieweeF 2019).
5.8 PROJECT PERFORMANCE EVALUATION

In this section, a quantitative project performance evaluation was carried out using the criteria set out in Table 5. The evaluation results are shown in Table 9, the scoring is explained per project below.

<table>
<thead>
<tr>
<th>Project</th>
<th>Vestdijk</th>
<th>Heezerweg, Korianderstraat and Mimosaplein</th>
<th>Houtplein</th>
<th>Nieuwe Groenmarkt and Krocht</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Involvement</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Design Process</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Design Quality</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Client Satisfaction</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Public Satisfaction</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Design Time (compared with original schedule)</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Project Cost (compared with original budget)</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>SUM</td>
<td>27</td>
<td>21</td>
<td>27</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 9 Performance Evaluation Results for Case Study Projects

For the Vestdijk project, the level of involvement was 4 (collaborative) because design collaboration between the public and the municipality was achieved in the stakeholder design sessions. The design process was assigned a score of 4 (slightly improved) because the public participation process had made the design process smoother. The smoothness refers to the fact that the design went through constant public inspections and adjustments. The final design was the result of a series of small changes compared to in traditional methods where multiple design options were finalised and then discarded. Also, a more efficient public requirements collection phase was completed with the help of the online platform. The design quality was assigned a score of 5 (significantly improved). The public's direct involvement in the design process guaranteed that more users' needs were fulfilled in the final design. The design quality received a significant positive influence in the way that more customer objectives were identified and realised. The client stated that they were very satisfied with the participation process as well as the project outcome. No definite assessment on public satisfaction could be made on this project because no direct contact was established with any members of the public in this research. The score of 4 (satisfied) was assigned based on the client's project managers testimony that this project received higher public interest and more positive feedback than normal. The project scored 4 for project time. The design of Vestdijk took 20 months, which was 17% less than a typical schedule (24 months) for a project of this scale. The typical schedule of 24 months was taken from the Heezerweg project's original schedule because the two projects were comparable in size. The project cost, however, only scored
one because the project budget went from 4 million euros at the start of the project to 12 million euros at the end of the design phase.

For the Heezerweg project, the level of involvement was 2 (consult) because the general public was only notified after the design had been finalised. Neither the design process nor the design quality was affected by the public participation process because the public was involved during the design stage. A score of 5 (very satisfied) was assigned to the client's satisfaction aspect based on the client's project manager's statement that they were very satisfied with the project. However, the public satisfaction aspect only received a 2 (dissatisfied) because local media had reported on the concerns of the local business owners. The design of this project was completed on time and on budget. Therefore, both the design time and project cost aspects would receive a score of 3.

For the Houtplein project, the level of involvement was 4 (collaboration) as the interactive design was achieved via the online platform. The design process aspect received a score of 5 (significantly improved) similar to the Houtplein project. Designs of different maturity were evaluated by the public so that no resources were wasted in developing the details of unfavourable design variations. The public was involved throughout the design process and, with the process being online, they were able to provide feedback at the earliest opportunity. The impact on design quality was rated 4 (slightly improved). While the majority of the public was positive about the final design, choices had to be made that disgruntled some individuals. The best possible solution was chosen for this project. The client's project manager was very satisfied with the project, hence a score of 5. The public satisfaction aspect received a 4 (satisfied) because it was impossible to have a design that satisfied everybody's interests. In order to have a coherent design, some public comments were rejected. The Houtplein project was both on time and on budget, so a score of 3 was assigned for both aspects.

For the Nieuwe Groenmarkt project, the level of involvement was 2 (consult) because the public was only asked to express opinions on the finished design. The design process aspect received a score of 1 (significantly deteriorated) because the public voted for an underground bicycle parking facility rather than a ground-level one and the project had to be paused so that new design solutions could be developed. All resources invested in developing ground-level solutions were wasted as a result of this vote. The design quality was considered to be significantly improved because the municipality decided to honour the public's wish and investigate the possibility of realising the underground solution after all. The client satisfaction received a 4 (satisfied) because, funding aside, the client was quite happy about the design outcome. The public satisfaction aspect was assumed to be 3 due to the lack of insights into the public's opinion. The project received a 1 (>200% of original schedule) because the project spent an extra year developing underground design options and was then put indefinitely on hold while the municipality tried to find funding. The project cost was also rated 1 because the budget went from 20 thousand euros to about 3 to 5 million euros.

To sum up, the test projects scored much higher than the baseline projects. These results proved that the online public participation process had positive influences on project performance.
5.9 CASE STUDY DISCUSSIONS

This section describes the differences occurred when the new process was applied compared to the traditional methods. The project performance differences were studied and reflected on if the application of the new process had incurred these differences.

5.9.1 EINDHOVEN CASES

The Eindhoven cases were two road redevelopment projects comparable in size. The Vestdijk project was 1200 metres long and the redeveloped section of Heezerweg was approximately 900 metres in length. The two projects took place during the same period (2016-2020) and had similar objectives: regulate traffic flow, improve spatial quality and increase road safety.

While the Heezerweg project only used traditional participation methods, the Vestdijk project adopted a combination of the online public participation process with virtual reality illustrations and offline methods including stakeholder meetings and stakeholder design sessions. The researcher believed that the difference in the choice of public participation methods was caused by the design freedom difference in the two projects. The design freedom, in this study, was defined as the power to make design decisions freely. The design freedom was determined by the municipality's intentions with the projects and their level of commitment to public involvement.

The two Eindhoven projects had the same project scope: the demolition, design and construction of the project street. It was the dissimilarity in design freedom and how the project team carried out the design that made a difference. In the Vestdijk project, the team kept an open mind for design suggestions. The only clearly defined goal the municipality had for the project was that the number of car lanes has to be reduced from two to one. The design team utilised the project opportunity to identify all problems and improvement potentials in the environment and tried to solve as many issues as possible in the design. The online public participation process was used to conduct the information collection efficiently. In the Heezerweg project, however, the municipality already had a design trajectory in mind when starting the project. The street needed additional parking spaces and bicycle paths, and that was what the design provided. The municipality already had set its mind on a fixed design direction, and public participation was only used to communicate with main stakeholders and to present the final design to the public. Therefore, stakeholder meetings and information evenings were sufficient methods for this project. In reflection, an observation can also be made that using the new online process will lead to more flexible design directions, so the new process must only be used on projects with high design freedoms.

The levels of involvement for the Heezerweg and Vestdijk projects were Consult (level 2) and Collaborate (level 4) respectively. In Heezerweg, selected interviews were carried out to protect the interests of the main stakeholders. No direct collaboration relationship was established, nor was contact maintained throughout the design process. The Vestdijk project had a slightly more complex situation. With the online process still in its early development stage, the website only achieved the function of informing, by displaying the project intent with a virtual reality model, and consulting, by collecting public opinion via the online platform. Collaboration with the public was achieved through offline channels. It was in the stakeholder design sessions that the collaborative and interactive design process was established. The public was involved in formulating the design solution, and their recommendations were incorporated into the design to the maximum possible
Online Interactive Public Participation Process | Flora Bai

extent. Therefore, using the new process will increase the level of involvement in the public participation process.

The design processes of the two projects were drastically different. The Heezerweg project conducted the design behind closed doors. Whilst the public was only consulted on two occasions. Firstly, at the beginning of the project, stakeholder representatives were invited for interviews, and secondly, after the design was finalised, a stakeholder meeting was held to present the design to the community. The duration of all participation methods added up to 2 months in the 24-month project design phase. The Vestdijk project had a completely open design process. The online platform was used to collect as much public input as possible under the time constraint. Stakeholder design sessions were held monthly so that the public could participate in the design at regular intervals until the design finalisation. In doing so, the new process extended the public participation process to cover the entire design phase, and the participation process was open for 18 months of the 20-month project design phase.

The new process was found to have sped up the public requirements collection process. In Vestijk, as requested by the client, the public comments collection was completed in a much shorter time period than if traditional methods were used (IntervieweeD 2019). With the help of the online platform, a much wide audience was reached and public requirements collection could be carried out 24/7. If the stakeholder design sessions were to be incorporated into the online platform, it would generate little additional cost to keep participation channels open throughout the project.

It was observed that the new process could smooth out the design process because the designers were better informed about the user’s requirements and, with constant public feedback, design changes could be earlier in the design process. The new process was also found to have a positive impact on design quality because more issues were identified and resolved in the new process compared to the traditional process.

The project cost has been observed to rise when the new process was applied. The Vestdijk's budget tripled because more issues were discovered in the participation process and, as a result, the project scope expanded to resolve more issues. With each issue resolution planned, the relevant authorities granted more budget. In comparison, the Heezerweg project was within budget, but details were not released to the researcher due to confidentiality.

In both projects, the client, i.e. the municipality of Eindhoven, was satisfied with the participation processes chosen because it fulfilled the projects’ respective needs. Adopting the new process did not increase client satisfaction in the studied projects. In Vestdijk, the online process increased the publicity of the project, and the municipality had received more communications, but whether the final design would satisfy more members of the public was subject to design choices. In Heezerweg, there has been a newspaper article reporting the local shopkeepers’ concerns about the project.
5.9.2 Haarlem Cases

Both the Haarlem cases were the redevelopment of street squares. The Houtplein project was roughly 350 metres in width and 500 metres in length and covered the redevelopment of 5 streets. In comparison, the Nieuwe Groenmarkt project was smaller in size, with a total of 250 metres in length to be redeveloped on two streets. The Nieuwe Groenmarkt project started in October 2017 and the Houtplein project started in June 2018. Handled by the same design firm, Witteveen+Bos, the design phases of both projects were estimated to finish in early 2019.

Nieuwe Groenmarkt was a traditional project and used stakeholder meetings and interviews as its public participation methods. Houtplein employed the latest version of the online interactive public participation process in addition to stakeholder meetings. The choices in public participation tools could, again, be linked to the difference in design freedom in the two cases. In the Houtplein project, the client intended to completely redesign the square and its surroundings. The design was wide open, especially when the traffic directions in the neighbouring streets could be rearranged. As the municipality was very committed and wished to make Houtplein a key public participation project, efforts were made to give the public design powers. In the Nieuwe Groenmarkt project, however, the municipality only intended to update the currently outdated and broken-down bicycle parking facilities. The project was expected to have a minimum impact on the rest of the street. There was, frankly, very little design freedom in this project. The municipality was less committed in the public involvement of the Nieuwe Groenmarkt project but was willing to accept the collective public decision in design direction changing. The new process was chosen because the Houtplein project had a high degree of design freedom, and, in turn, the new process had lead to an open and innovative design process.

The level of involvement of Houtplein was Collaborate (level 4). The project relied on the local community for design suggestions and included public recommendations to the maximum extent possible. This project also proved that the complete public empowerment would be unrealistic because the interests of other stakeholders need to be safeguarded. In Nieuwe Groenmarkt, the level of involvement was Consult (level 2). The public was not involved throughout the design and the main objective for stakeholder meetings was to present design drafts and to obtain feedback. Again, when comparing the test case with the baseline case, it was found that using the new process will increase the level of involvement in the public participation process.

Both projects made changes based on public feedback of the presented designs; the difference was whether the changes were constructive to the project. In Nieuwe Groenmarkt, the public was directly presented with completed designs; public opinions were not registered until the designs were fully developed. Consequently, when the public rejected the current design options and expressed a clear preference for an underground solution, time and money spent on developing the detailed design options were wasted. In Houtplein, the public was shown the sketched design, design variants and the preliminary design at different stages of the project. So the design process was turned into a series of minor modifications. No efforts were spent on developing the details of a design option that would eventually be discarded. In comparison, the use of online interactive public participation process enabled constant public supervision, resulted in a smoother design process and reduced the waste of design resources. The new process was found to be able to reduce waste in the design process from this comparison.
Online Interactive Public Participation Process | Flora Bai

As for the influence of the online process on project time, Houtplein has been on schedule so far. Nieuwe Groenmarkt was delayed for one year due to the need to develop more underground design variants and was then put on hold waiting for funding. Adopting the new process was found to be able to avoid project delays because by conducting a thorough participation process, most risks that would cost project delay had been identified and eliminated in the early stages of the project.

Developing the online platform would incur more initial investment than using traditional methods. But with the online process in place, last-minute design changes could be minimised. According to a project manager, the cost of installing the platform can be evened out with the money saved on repairs and design changes in the end (Interviewee F 2019). The cost increase was unavoidable in Nieuwe Groenmarkt with major design direction changes like going underground. But had the online platform been used, the council would have been notified early on that they need to modify the project scope, rather than having to request for some additional budget at the last minute. Granting decision-making power to the public was found to diminish the client’s control over the design outcome and causing unexpected changes in the design direction. The comparison between the two Haarlem cases demonstrated that the range of decision-making power given to the public must match the participation method as well as the client’s level of commitment. Otherwise, last-minute design changes will happen, like in the Nieuwe Groenmarkt project, and greatly harm the project proceedings. When drastic design directions are unavoidable, using the new process can keep the client informed of the changes earlier in the design process, thereby allowing the client to retake control of the project and make suitable financial preparations.

Both the public and the client were satisfied in both projects because, to a certain degree, their objectives have been fulfilled. Implementing the new process had not affected client satisfaction in the studied projects.
This chapter answers research sub-question 3: *How does the ‘online public participation process’ influence project performance?* After a thorough case study on the new process’ influence on the project performance of intra-city street redevelopment projects, the following conclusions are made with comparison to traditional public participation processes:

1) **The online interactive public participation process increases the efficiency of the design progress and reduces the waste of design resources.**
   In the traditional project practices, design options are presented to the public after they have been fully developed. When the new process is used, the public is updated on the design progress. The design process is streamlined, and the final design is shaped by a series of small design changes based on regular public feedback. Waste of design resources is reduced because there is no longer a need to finalise the design details of multiple design choices.

2) **The online interactive public participation process has a positive impact on the design quality because it can identify and resolve more issues.**
   It cannot be concluded definitively that using the online process can improve design quality, as there is no way of knowing how the case study project performance would have been if the online platform had not been used. However, it is observed that designs made with the new process attempt to include all potential improvements in the project environment, while the traditional designs only fulfil the project objective.

3) **The online interactive public participation process does not affect client satisfaction.**
   The traditional process and the new process are public participation methods with different levels of involvement. The client chooses public participation methods based on the level of involvement they need for the project. When the method matches the need, both methods can deliver satisfying results.

4) **The online interactive public participation process increases public satisfaction.**
   More customer requirements are identified and fulfilled when the new process is used. Public satisfaction is increased because more of their needs are satisfied.

5) **The online interactive public participation process shortens the public requirements collection process.**
   The collection of public requirements can be conducted more efficiently online.

6) **The online interactive public participation process increases the project cost.**
   The increase could be caused by the budget additions due to the project scope increase. It could also be credited to the change in design directions because when the new process is used, the project team has diminished control over the design direction, and the public tends to choose expensive design options as they are not the direct financier of the project.

7) **The online interactive public participation process has a higher level of involvement in public participation.**
A higher level of involvement means that in the participation process, the public is involved more thoroughly in the project and is given more decision-making power. In both test projects, the online process achieved the ‘collaborative’ level of participation (level 4), where the public was treated as a design partner and was involved in the development of design options and the selection of the preferred solution.

8) The online interactive public participation process is only suitable for projects with a high degree of design freedom.

A project has a high degree of design freedom when design decisions can be made freely. The new process works best when the client keeps an open mind about design directions, is highly committed to giving decision making power to the public and is financially prepared for major design changes.
6. THE HOUSE OF QUALITY

During the case study, it was noticed that the online platform was attracting too many incoming public comments for the design team to handle. Hence, there was a need to create a structured information processing structure for the platform. This chapter justifies the choice of the evaluation method, introduces the House of Quality concept and explains the design of the evaluation process.

The House of Quality was not an afterthought added just to plump up the report. It was the researcher’s attempt to improve the current interactive public participation process. This chapter was placed after the case studies intentionally because the idea for this improvement came after experiencing the problem while conducting the case studies. The researcher felt it would be more logical for the readers to first understand how the online platform functioned and how it was used in the case study projects before reading about improvement suggestions.

6.1 CHOOSING THE EVALUATION METHOD

While carrying out the case study, the researcher realised that when the online public participation process was used, projects the size of Vestdijk and Houtplein were receiving hundreds of public comments within a few months. The number of comments exceeded the handling capacity of the design team, and a standardised tool was needed to process the incoming information and to locate the most valuable suggestions.

The criteria for selecting the suitable decision-making method for the evaluation process were defined as follows:

- The suitable method should be able to process large quantities of data.
- The suitable method should be able to produce a ranked outcome.
- The suitable method should generate minimum workload.

Three decision-making methods were found in literature: 1) prioritisation matrix, 2) paired comparison analysis and 3) decision matrix. These methods were examined on their suitability for the evaluation process.
6.1.1 THE PRIORITISATION MATRIX

The first decision-making method investigated was the prioritisation matrix. The prioritisation matrix uses a graph to rank the priority of all potential choices. It ranks priority based on the expected value outcome and necessary effort input.

As shown on the left of Figure 64, the prioritisation matrix is divided into four quadrants. When an option has high value to the project and costs little effort. It should definitely be carried out. When an option has low value but costs lots of effort, it should be avoided because the gain would not be worth the investment. When an option lands in the other two quadrants, careful considerations should be carried out to find out if it would be worthwhile to implement the option.

The prioritisation matrix cannot produce a ranked outcome. Though the prioritisation matrix offers a crude categorisation that could help design engineers to make a choice, the evaluation results are illustrated in the matrix. A ranked list of the processed options cannot be obtained using this method. Furthermore, construction projects are of a complex nature, it would be difficult to define what ‘value’ or ‘effort’ represents, or to measure them objectively.

The capacity of the prioritisation matrix is limited. In this method, each evaluated option is represented as a dot in the prioritisation matrix, as shown on the right of Figure 64. The matrix would become dense and illegible as the number of choice increases, making it difficult to locate or compare specific options. The prioritisation matrix failed to meet the capacity criteria that the evaluation process to be designed should have, namely the capacity to handle hundreds of comments at the same time. Therefore, the prioritisation matrix was not chosen as the basis of the evaluation process.
6.1.2 PAIRED COMPARISON ANALYSIS

The second decision-making method investigated was paired comparison analysis. The paired comparison analysis finds the best option by comparing all options against each other in pairs.

<table>
<thead>
<tr>
<th>Ideas:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Sushi workshop</td>
<td></td>
<td>B2</td>
<td>C3</td>
<td>D2</td>
</tr>
<tr>
<td>B. Paintball</td>
<td></td>
<td></td>
<td>C2</td>
<td>D2</td>
</tr>
<tr>
<td>C. Escape room</td>
<td></td>
<td></td>
<td></td>
<td>C2</td>
</tr>
<tr>
<td>D. Pub quiz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chosen as best option</th>
<th>0x</th>
<th>1x</th>
<th>3x</th>
<th>2x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total score</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 65 shows an example of the paired comparison analysis being used. There were four hypothetical options to choose from. The first step was to compare option A with option B. It was found that option B was moderately more preferable than option A. 'B2' was entered into the table marking the preferable option (option B), and the magnitude of the preference (a score from 1-3 was assigned). Then option A was compared with option C. C was found to be significantly preferable than A, therefore C3 was entered in the table. After all, options were compared with each other and the table was completed. Numbers in each column were added and the sum was the score of the respective option. In the table above, option C was ranked the most preferred option with a score of 7.

Even though the ranking of all public comments can be ranked using the paired comparison analysis, the method was not suitable to build a large scale evaluation process with. The nature of this method required all options to be compared with each other. If 100 options needed to be assessed, 5050 comparisons had to be made. Using this method cannot achieve the goal of lightening the information processing load. Furthermore, the comparisons were made subjectively, no evaluation standard was established. Using this method cannot achieve the goal of establishing a standardised evaluation process either.
6.1.3 THE DECISION MATRIX

The third decision-making method considered was the decision matrix. In the decision matrix, the options are assigned scores according to a set of criteria. The options would be ranked by the weighted sum of the scores.

![Decision Matrix: Long Wait Time](image)

**Figure 66 Decision Matrix, retrieved from (ASQ 2005)**

Figure 66 depicts an example of the decision matrix. In this example, the most important problem needed to be identified. Weighted criteria with four aspects were used. The four problems were assessed against the criteria, and scores of each aspect were entered in the table. The weighted sums of the problems were listed on the right. ‘Customers wait for the host’ was identified as the most important problem with the highest score of 28.

The decision matrix was chosen as the method to build an evaluation process with because it is clearly structured, does not generate excessive workload, can be applied to a large number of options and has standard evaluation criteria.

An improved version of the decision matrix, The House of Quality, was finally used in the proposed evaluation process. Compared with a typical decision matrix, shown in Figure 66, the House of Quality method can provide additional information on the interrelationships between the criteria aspects. This feature can be useful when conflicting stakeholder interests need to be addressed.

After the selection of the methods, the House of Quality, an improved version of the decision matrix, was chosen as the decision-making method for the evaluation process design. The House of Quality method is introduced in more details in the next section.
6.2 INTRODUCTION TO THE HOUSE OF QUALITY

The House of Quality method originated from the quality function deployment process. In this section, simple introductions are given to both the quality function deployment process and the House of Quality method.

6.2.1 QUALITY FUNCTION DEPLOYMENT

Quality function deployment (QFD) originated in Japan in the late 1960s in the field of total quality control (Akao 1997). QFD places the focus on the customers. It is a development tool that translates customer requirements into design features, engineering specifications and, finally, production details. It is not a theory but a process, a structured and disciplined process that ensures a multi-disciplinary team works towards maximizing customer satisfaction and value of products (Özgener 2003).

The popularization of QFD took place in the United States, it was used by the manufacturing industry to 1) reduce time to market, 2) decrease costs of design and manufacture, and 3) increase overall product quality (Morris and Morris 1999). Translated into equivalent construction terms, the potential benefits of QFD are 1) reduce time to project delivery, 2) decrease costs of design and construction, and 3) increase overall project quality. It stands to reason to try implementing QFD in the design process of construction projects.

Quality function deployment is a four-phase approach, as shown in Figure 67. In QFD, data is processed in matrices called ‘houses’. The first house linking customer requirements and product characteristics is called the House of Quality (Morris and Morris 1999). In public participation in the construction industry, customer requirements are translated into design choices, which is equivalent to the translation from customer requirements to product characteristics in the manufacturing industry. Therefore, the House of Quality could be a suitable method to improve the online interactive public participation process.

![Figure 67 Four Phases of Quality Function Deployment](image)
6.2.2 THE HOUSE OF QUALITY

The House of Quality is essentially a weighted decision matrix. It investigates and displays the relationships between customer requirements and engineering constraints. As shown in Figure 68, the House of Quality is shaped like a house and consists of many rooms.

When using a House of Quality, these rooms are filled in sequence:

1) WHATS: Firstly, a list of customer requirements is entered into the WHATs room on the left side. These requirements are translated from collected public opinions.

2) HOWs: Then a list of engineering constraints that affects project performance is made. These engineering constraints serve as the criteria for the evaluation process and should be approved by all major project stakeholders. The criteria will be stored in the HOWs room at the top.

3) HOWs vs HOWs: On top of the HOWs room, the triangle-shaped roof contains the correlation matrix of the engineering constraints. It displays the interrelationship between any two engineering constraints. Symbols are used to describe the nature of the relationships.

4) WHATs vs HOWs: This is the main matrix of the House of Quality. In this room, the relationship between individual client requirements and engineering constraints are described. Each relationship is measured by the direction of the influence and the magnitude of the influence. The relationship is quantified by assigning a score from -5 to 5.

5) WHYs: On the right side, the WHYs room contains necessary explanations of the customer requirements. This room could also be used to display the comparison between alternatives, or prioritisation of the requirements.

6) HOW MUCHes: At the bottom, the HOW MUCHes room is placed in the basement of the house. It displays how much each of the product characteristics contributes to the design process. It could also contain the prioritisation of engineering alternatives (Natee, Low, and Teo 2016; Morris and Morris 1999).

Figure 68 Structure of a Typical House of Quality, background image from (Edraw 2018).
6.3 ROLE OF THE HOUSE OF QUALITY IN THE NEW PROCESS

The House of Quality was the method chosen to improve the online public participation process. With the addition of the House of Quality evaluation process, the gap where an assessment tool was missing in the new process was filled.

The first row in Figure 69 depicts the three-step model for public participation proposed by Renn et al. (1993). This conceptual model was tailored for multi-actor, multi-value and multi-interest situations, which is fitting when studying infrastructure projects. The three steps are:

1) Identification and selection of concerns and evaluative criteria;
2) Identification and measurement of impacts of the different decision options;
3) Aggregation and weighting of expected impacts of the decision options.

The interactive public participation process studied in this research has fulfilled the first criteria. Public concerns were collected via the online platform and the design team had established a set of selection criteria. However, the second step was failed because there currently was no structured assessment process in place. The third step, evaluation of options, was partially fulfilled because, on the positive side, the design options were published on the online platform and the public’s responses were collected; but on the negative side, there was no structure in place to analyse the comments or to generate a final evaluation.

The House of Quality was introduced to fill in these gaps. The purpose of using the House of Quality was to create a clearly defined information processing and evaluation process that provides objectivity, traceability and transparency. The House of Quality could improve the first step of the three-step model with the addition of consensus. The proposed evaluation process was designed to start with a set of selection criteria mutually agreed to by all project stakeholders. The researcher’s hypothesis was that, with a consensus on how the evaluation will take place, there would be more transparency and less dispute during the process. The House of Quality could fulfil the second step by establishing a standardised measurement process in the form of a decision matrix where each customer requirement (translated from public comments) was assessed against the established criteria and assigned scores in each aspect. In step three, the evaluation process could be simplified to finding the customer requirement with the highest weighted sum.
6.4 EVALUATION PROCESS USING THE HOUSE OF QUALITY

An evaluation process for the online interactive public participation was created using the House of Quality method. This structure quantifies the interrelationship between client requirements and engineering constraints. This section describes the steps of this evaluation process.

6.4.1 THE SIMPLIFIED HOUSE OF QUALITY

As shown in Figure 70, a simplified form of the House of Quality was used in this study. The evaluation criteria and its interrelationships were first filled in the HOWs room and HOWs vs HOWs room at the top. Then the public comments in the WHATs room were filled on the left. The assessed scores of each aspect were filled in the WHATs vs HOWs room, i.e. the central matrix. The weighted scores were calculated in the HOW MUCHes room. In Figure 68, the HOW MUCHes room was placed at the bottom because, in a traditional House of Quality, engineering characteristics were measured against customer requirements. However, in this study, it was the customer requirements (public comments) that were evaluated against engineering constraints, hence the results (HOW MUCHes) were placed on the right, as shown in Figure 70. The WHYs room was removed because the comments were self-explanatory. If necessary, it can be added back for comments or notes.

![Figure 70 Structure of the House of Quality Used in This Research, background image from (Edraw 2018).](image-url)
6.4.2 SET-UP OF THE HOUSE OF QUALITY CRITERIA

The first step in using the House of Quality is setting up the evaluation criteria. The evaluation criteria should consist of the aspects to be assessed and a weight distribution signifying the relative importance of the aspects. The first two rooms of the House of Quality will be filled in this step.

In an ideal situation, the criteria should be approved by all stakeholders of the project before the public participation commences. However, this research was carried out after the case study projects had started. It was not possible to test the hypothesis of implementing consensual criteria.

The evaluation criteria used in this research were, in fact, selected by the researcher based on the project objectives. The same set of criteria was used for the case study projects with different weight distribution. The interrelationships of the criteria are depicted in Figure 71, where ‘+’ represents a positive correlation and ‘-’ represents a negative correlation. For example, a public comment suggesting a design adjustment that has a greater environmental impact would likely to be more difficult to execute, increase project time, and incur more implementation cost. It would also be likely to have a negative user impact to pedestrians and residents because they are in close contact with the affected environment. The interrelationship matrix, i.e. the HOWs vs. HOWs room, together with proper impact studies, could be a useful reference for the project team when deciding design characteristics. However, the interrelationships shown in Figure 71 were determined by the researcher. They were created for the researcher’s own use and were not part of the actual case study projects.

![Interrelationship Matrix](image)

*Figure 71 The Interrelationship between the Selection Criteria*

Due to the uniqueness of construction projects, every project should have its own criteria. In this study, the case study projects were similar enough to use the same set of assessment aspects, but different weight distributions were used. The weight distributions were assigned by the researcher and interviewees who worked on the projects.
Online Interactive Public Participation Process | Flora Bai

For the Vestdijk project, the criteria weight distribution is shown in Table 10. The opinions of the researcher and the client’s project manager were considered in the criteria set up. The project manager’s weight assignment came from (IntervieweeD 2019). The average of the weight assignments was calculated and used as the criteria for the following evaluation demonstration.

Table 10 House of Quality Criteria Weight Distribution for Vestdijk

<table>
<thead>
<tr>
<th>Weight Assigned by Researcher</th>
<th>Environmental Impact</th>
<th>Cultural Impact</th>
<th>Number of Identical Suggestions</th>
<th>Execution Difficulty</th>
<th>Influence on Project Time</th>
<th>Cost of Implementation</th>
<th>User Impact (Motorist)</th>
<th>User Impact (Cyclist)</th>
<th>User Impact (Public Transport)</th>
<th>User Impact (Pedestrian)</th>
<th>User Impact (Resident)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>10%</td>
<td>5%</td>
<td>15%</td>
<td>10%</td>
<td>20%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Weight Assigned by Client’s Project Manager</td>
<td>20%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>15%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Average Weight</td>
<td>18%</td>
<td>8%</td>
<td>5%</td>
<td>10%</td>
<td>13%</td>
<td>15%</td>
<td>5%</td>
<td>8%</td>
<td>5%</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

The criteria weight distribution for the Houtplein project is shown in Table 11. The opinions of the researcher, the design team’s project manager and the traffic designer were considered in this criteria set up. The project manager’s weight assignment came from (IntervieweeB 2018), and the traffic designer’s weight assignment came from (IntervieweeC 2018). The average was calculated and used as the criteria.

Table 11 House of Quality Criteria Weight Distribution for Houtplein

<table>
<thead>
<tr>
<th>Weight Assigned by Researcher</th>
<th>Environmental Impact</th>
<th>Cultural Impact</th>
<th>Number of Identical Suggestions</th>
<th>Execution Difficulty</th>
<th>Influence on Project Time</th>
<th>Cost of Implementation</th>
<th>User Impact (Motorist)</th>
<th>User Impact (Cyclist)</th>
<th>User Impact (Public Transport)</th>
<th>User Impact (Pedestrian)</th>
<th>User Impact (Resident)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Weight Assigned by Design Team’s Project Manager</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>15%</td>
<td>15%</td>
<td>5%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Weight Assigned by Traffic Designer</td>
<td>15%</td>
<td>5%</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Average Weight</td>
<td>13%</td>
<td>7%</td>
<td>5%</td>
<td>10%</td>
<td>12%</td>
<td>13%</td>
<td>8%</td>
<td>10%</td>
<td>5%</td>
<td>7%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The two baseline projects did not use the online participation process. There were no public comments to process, and hence no need for evaluation criteria.
6.4.3 EVALUATION OF THE PUBLIC COMMENTS

With the criteria set-up completed, the next step in the House of Quality process was to evaluate the submitted public comments. In the following steps, the WHATs, WHATs vs HOWs and HOW MUCHes rooms were filled.

Firstly, all collected public comments were checked for validity. The relevant comments should be within the project scope and support the project objective. Irrelevant comments were not processed. Then, the comments that passed the validity test were entered into the WHATs room. They were each evaluated against the criteria and a score was assigned for each assessing aspect. The scoring range was -5 to 5, with -5 representing the maximum negative impact and 5 representing the maximum positive impact. A score of 0 represented a neutral impact. The positiveness and negativeness for each aspect are defined in the scoring guide in Table 12.

<table>
<thead>
<tr>
<th>Table 12 The House of Quality Scoring Guide</th>
<th>Negative (-5 to -1)</th>
<th>Positive (1 to 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Impact</td>
<td>Detrimental to the environment</td>
<td>Beneficial to the environment</td>
</tr>
<tr>
<td>Cultural Impact</td>
<td>Detrimental to local culture</td>
<td>Beneficial to local culture</td>
</tr>
<tr>
<td>Number of Identical Suggestions</td>
<td>/</td>
<td>Number of identical suggestions</td>
</tr>
<tr>
<td>Execution Difficulty</td>
<td>Difficult to execute</td>
<td>Easy to execute</td>
</tr>
<tr>
<td>Influence on Project Time</td>
<td>Extending project time</td>
<td>Shortening project time</td>
</tr>
<tr>
<td>Cost of Implementation</td>
<td>Increasing project cost</td>
<td>Decreasing project cost</td>
</tr>
<tr>
<td>User Impact (Motorist)</td>
<td>Against user’s wishes</td>
<td>In line with user’s wishes</td>
</tr>
<tr>
<td>User Impact (Cyclist)</td>
<td>Against user’s wishes</td>
<td>In line with user’s wishes</td>
</tr>
<tr>
<td>User Impact (Public Transport)</td>
<td>Against user’s wishes</td>
<td>In line with user’s wishes</td>
</tr>
<tr>
<td>User Impact (Pedestrian)</td>
<td>Against user’s wishes</td>
<td>In line with user’s wishes</td>
</tr>
<tr>
<td>User Impact (Resident)</td>
<td>Against user’s wishes</td>
<td>In line with user’s wishes</td>
</tr>
</tbody>
</table>

In the House of Quality, every public comment was evaluated against the set criteria and had a score assigned on each aspect. On the right, the preference value of the comment was calculated as the weighted sum of all aspect scores. After all comments had been evaluated, they were ranked according to the preference value, i.e. the weighted sum. Comments with the highest scores were the most preferred suggestions.

Due to the time limit, the evaluation was not carried out on all the public comments received in the test project. 24 accepted customer wishes from the Vestdijk project were evaluated using the House of Quality with the criteria in Table 10. These comments were approved by the design team and marked green in Figure 14. The scores were assigned based on the researcher’s judgement. After combining similar suggestions, the results of 16 unique public comments were calculated and ranked, shown in Table 13. The evaluation was carried out as a demonstration of the process.
A higher evaluation score meant it was highly recommended that the comment was added into the design. A high positive score meant that the project would benefit from adding these design suggestions. Out of the five top-ranked comments, four were about small design features that would benefit the public without incurring significant cost or time. Comments with low positive scores, including many traffic design suggestions, should be treated with care because they could lead to adverse environmental impacts, significant cost increase or disputes between stakeholders with conflicting interests. Comments with negative scores should be avoided.
6.5 THE HOUSE OF QUALITY DISCUSSION

The House of Quality was introduced as an information processing and evaluation process. While the public participation provided the design team with insights of the local community, the House of Quality evaluation process was set up to help the design team to focus on the main issues. The House of Quality was not a project performance measurement tool, its sole function was to evaluate and rank the public comments.

The evaluation process developed with the House of Quality method proclaimed to have the characteristics of objectivity, traceability and transparency. The traceability of the online platform was realised with the help of Relatics. With some technical adjustments, the evaluation process could easily be incorporated into the Relatics environment and, hence be open to the inspection of the entire project team. The transparency was significantly increased compared to the status quo because the selection criteria and the scoring sheet can always be released when concerns arise.

The current House of Quality has some drawbacks regarding objectivity. Admittedly, the evaluation results presented in Table 13 lack objectivity. The assessment criteria were partially created by the researcher and the scores were assigned solely based on the researcher’s personal judgement. But it needs to be clarified that the purpose of Table 13 was never to present the evaluation result of the Vestdijk comments. Together with Table 10 and Table 12, it served to demonstrate the steps of the proposed evaluation process. The research objective for this section was not to determine the most important comments for a certain project, but to present this evaluation process itself as the researcher’s contribution.

However, there are many methods that could potentially improve the objectivity of the House of Quality. One improvement suggestions is to increase the objectivity of the criteria. Before public participation begins, all project stakeholders should reach a consensus on the evaluation criteria and weight distribution. The interests of different stakeholders should be balanced out in the criteria set-up. When more objective criteria are used, the evaluation results would be more objective too. Another objectivity improvement possibility is to minimize human bias. In the evaluation process, the assessment scores are assigned by humans, which would inevitably have an impact on the results. One remedy for this could be involving more people in the process, repeating the evaluation process, and taking the average as the final result. The desirable judges would have different expertise and are representatives of different stakeholders. Due to the project time limit, these hypothetical improvements were not tested.

The evaluation was still a lengthy process because each and every public comment needed to be assessed manually. New technologies like text mining were being developed to (partially) automate this process.
6.6 THE HOUSE OF QUALITY CONCLUSIONS

This chapter answers research sub-question 4: Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not?

The online interactive public participation process can be improved by adding a clearly defined information processing and evaluation process.

During the case studies, it was noticed that the new process was attracting hundreds of public comments per project. It became difficult to find useful public suggestions, therefore an information processing structure was needed.

The House of Quality method was chosen to be the theoretical basis for the evaluation process.

A selection process was carried out to find the theoretical basis for the evaluation process. Out of three decision-making methods, the decision matrix was found to be most suitable for the design of the evaluation process. The House of Quality method, an improved version of the decision matrix, was used in the actual evaluation process design.

The evaluation process created with the House of Quality method can help the project team make design decisions.

The evaluation process was set up with the following steps:

1) Set up mutually agreed upon evaluation criteria;
2) Assign weight distributions to the aspects in the criteria;
3) Evaluate each public comment against the criteria, and assign scores for each aspect;
4) Calculate the weighted sum for all the comments;
5) Rank the comments by the final evaluation score.

After the evaluation, public comments with the high positive evaluation scores were most recommended to be added to the design because the value these comments can generate far outweigh the efforts they will cost. Comments with low positive scores should be treated with care because they can cause both positive and negative impacts, and will lead to adverse project outcome if handled improperly. Comments with negative scores should be avoided because they do more harm than good to the project.
7. RECOMMENDATIONS

Recommendations on how to use the online interactive public participation process are made to Witteveen+Bos and to the municipality respectively in this chapter.

7.1 RECOMMENDATIONS FOR WITTEVEEN+BOS

7.1.1 THE ONLINE INTERACTIVE PUBLIC PARTICIPATION PROCESS

This thesis research studied the online interactive public participation process prototyped by Witteveen+Bos and researched its impacts on the project performances of intra-city street redevelopment projects. Learning from the findings of this research, the following recommendations were made to Witteveen+Box on the use of this new process:

The choice of public participation methods must match the intended level of participation in the project. If the purpose of public participation in a project is only to inform the public of the project or consult the public on their requirements, the new process must not be used. In the case studies, the online interactive public participation process was proven to have the ‘collaborate’ level of involvement. Therefore, the new process must only be used when the client wants the project to be highly influenced by the public. Otherwise, either the client would lose control of the project because the public seizes the decision-making power, or the public would lose confidence in the project because their wishes were not implemented in the design. The new process should only be suggested when the client is prepared to make a commitment to the public.

The online interactive public participation process is only suitable for projects with a high degree of design freedom. Because the new process gives a lot of decision-making power to the public, the project team cannot control the design direction completely. Therefore, the new process works best when the client does not already have a clear idea of how the project would be but has an open mind to all possible solutions.

The new process is suitable when design quality is the highest priority of the project. Compared with traditional public participation methods, the new process can increase the efficiency and thoroughness of the initial public requirements collection. With more issues uncovered, the potential to increase the quality of life for the local community also becomes higher. More efforts must be made to address the discovered issues in order to realise a positive impact on design quality. The design team should strive to implement all beneficial public comments into the project design. The concentrated focus on design quality can also lead to increases in project time and cost. The client must be informed of these side effects before the project commences.

The new process has been proven to be able to streamline the design process. The increase in design process efficiency is achieved by not developing more than one design variant. Implementing the new process will change the working process of the design teams. Witteveen+Bos should make preparations to accommodate these changes and educate the staff in order to make the transition a smooth process.
7.1.2 THE HOUSE OF QUALITY EVALUATION PROCESS

The evaluation process, described in Section 6.4, was proposed by the researcher to improve the online interactive public participation process. The evaluation process was designed to be used by the design team to standardise the process of the incoming public comments and to establish a preference ranking among the comments. The following recommendations were made for Witteveen+Bos regarding the use of the evaluation process:

The House of Quality evaluation process requires a set of weighted criteria to be set up before the project commences. The criteria can be produced by the design team alone or together with the client and other stakeholders. The more parties involved in the criteria making, the more objective the evaluation results would be. Publishing the evaluation criteria to the public could also improve the transparency of the new process and increase the public’s trust in the project.

The design team should appoint designated staff to be responsible for the evaluation process. Even with a structured process, the consistency of the evaluation results largely depends on the consistency of the score assessment, which involves a lot of personal judgement. If the designated staff conducts the entire evaluation process, however, the consistency of the evaluation outcome can be improved. Personal bias can be reduced by asking people with different expertise or representing different interest groups to repeat the evaluation process and then average the results.

The evaluation results can help the project team with design decision-making. Public comments with high positive evaluation scores should be incorporated into the project design because the additional project value they can bring, far outweighs the effort required to implement them. Public comments with low positive scores should be treated with care. These comments would bring both positive and negative influences to the project design and the project team should be vigilant and eliminate comments that would cause significant damage to the environment, project budget or a particular stakeholder’s interest. Public comments with negative evaluation results should be avoided because implementing these comments would decrease the overall project value.
7.2 RECOMMENDATIONS FOR CLIENTS

Based on the findings obtained in this research, the following recommendations were made for the clients (the municipalities) regarding the use of the online interactive public participation model:

The choice of public participation methods must match the intended level of participation in the project. The online interactive public participation process has been found to have a level of involvement of 'collaboration'. If the client wishes to commit to a less thorough public participation, the new process must not be used. Using public participation methods with high levels of involvement in low-level projects will do more harm than good because more underlying issues would be uncovered during the participation process than the project design can address.

The client must be prepared for the uncertainties in the project outcome if it wishes to use the new process. The main uncertainties lie in design direction, project cost and project durations. In the new process, the public wields some decision-making power and can exert a certain influence on the directions of the design. The client does not have complete control over the design and must be prepared for an increase in project budget or a delay in the project schedule. Clients who cannot commit to the uncertainties must not use the new process.

When using the new process, the client should make an effort to publicise the online platform. With the proper publication of the platform, a wider community can be reached and the public participation can be more thorough. The client should also appoint staff to be responsible for the new process. The designated staff will review replies to the public, take part in the evaluation criteria set up and participation in the evaluation process.

The online interactive public participation process can also be used flexibly according to the client’s wishes. For smaller projects, online public participation can be combined with offline design methods, like the stakeholder design sessions used in the Vestdijk project. Online communication, though efficient, has its own drawbacks. The online platform limits the length of the comments and does not support in-depth discussions. When dealing with a small community, face-to-face communications can be more effective.
8. CONCLUSIONS

This chapter describes the conclusions reached in this research. In Section 8.1 the main research question is answered with a summary of all the findings from this research. The detailed conclusions are listed in Section 8.2, where all the research sub-questions are answered in the order of the three research objectives: ‘to introduce, evaluate and improve the new process’.

8.1 THE GENERAL CONCLUSION

The main research question for this thesis was How does the ‘online interactive public participation process’ influence the intra-city street redevelopment projects?

After carrying out the thesis research, the main research was answered with the following statement:

As a public participation tool with a high level of public involvement, the ‘online interactive public participation process’, when used in intra-city street redevelopment projects, will improve the efficiency in the design process, increase public satisfaction, shorten project time and raise the project cost.

In reflection, the 'online interactive public participation process' has been proven to improve the project performance in many aspects. The process can be used to establish collaborative design with the public, but must only be used when the client is willing to commit to a high level of public involvement. When using the new process, the client must be emotionally prepared to recede control of the project direction and be financially prepared for unpredictable design outcomes.
8.2 DETAILED CONCLUSIONS

8.2.1 CONCLUSIONS ON PROCESS INTRODUCTION

The first two research sub-questions were *What are the characteristics of traditional public participation processes?* and *What is the ‘online interactive public participation process’?*

After thorough analyses, it was concluded that:

1) **The traditional public participation processes were characterised by a controlled selection of participants, facilitated or elicited face-to-face discussions, open response mode, flexible information input, and structured or unstructured aggregation of information.**  
   The face to face mode of information transfer is what has been limiting the development of public participation methods. EParticipation is a promising development direction.

2) **The online interactive public participation process is an improved public participation method.**  
The new process was created using public participation design principles. It successfully combined collaborated interactive design with public participation. The new process conducts public participation through an online platform, involves the public throughout the entire design phase, enables direct interactive design with the public and utilises virtual reality as a visualisation tool.

3) **Compared with traditional methods, the online interactive public participation process can increase the level of participation in the project.**  
   A higher level of participation means that the public is involved more thoroughly in the project and is given more decision-making power. Both Vestdijk and Houtplein had successfully incorporated public participation in the design phases. In both projects, the online process achieved the ‘collaborative’ level of participation (level 4), where the public was treated as a design partner and was involved in the development of design options and the selection of the preferred solution.
8.2.2 CONCLUSIONS ON PROCESS EVALUATION

The third research sub-question asked *How does the ‘online interactive public participation process’ influence project performance?* Compared to traditional public participation methods, the online interactive public participation process had been found to influence the project performance of intra-city street redevelopment projects in the following ways:

1) **The online interactive public participation process increases the efficiency of the design progress and reduced the waste of design resources.**
   In the traditional project practices, design options are presented to the public after they have been fully developed. When the new process is used, the public is kept updated on the design progress. The design process is streamlined, and the final design is shaped by a series of small design changes based on regular public feedback. Waste of design resources is reduced because there is no longer a need to finalise the design details of multiple design choices.

2) **The online interactive public participation process has a positive impact on the design quality because it can identify and resolve more issues.**
   It cannot be concluded definitively that using the online process can improve design quality, as there is no way of knowing how the case study project performance would have been if the online platform had not been used. However, the new process can have a positive impact on design quality because more public requirement can be identified in the early stages and the design engineers are better informed of the design requirements from the start. It was also observed that designs made with the new process attempt to realise all improvements potentials in the project environment, while the traditional designs only fulfil the original project objective.

3) **The online interactive public participation process does not affect client satisfaction.**
   The traditional process and the new process are public participation methods with different levels of involvement. The client chooses public participation methods based on the level of involvement they need for the project. When the method matches the need, both methods can deliver satisfying results.

4) **The online interactive public participation process increases public satisfaction.**
   Public satisfaction is increased because more of their needs are acknowledged in the public requirements collection phase in the new process. The increase in public satisfaction could also be credited to the increased decision-making power given to the public.

5) **The online interactive public participation process shortens the public requirements collection phase.** The collection of public requirements can be conducted more efficiently online.

6) **The online interactive public participation process increases the project cost.**
   The increase could be caused by the budget additions due to the project scope increase. It could also be credited to the change in design directions because when the new process is used, the project team has diminished control over the design direction, and the public tends to choose expensive design options as they are not the direct financier of the project.
7) The online interactive public participation process is only suitable for projects with a high degree of design freedom.
A project has a high degree of design freedom when design decisions can be made freely. The new process works best when the client keeps an open mind about design directions, is highly committed to giving decision making power to the public and is financially prepared for major design changes.

8.2.3 CONCLUSIONS ON PROCESS IMPROVEMENT

The fourth research sub-question was Can the ‘online interactive public participation process’ be improved? If yes, how? If no, why not?

It was concluded from this research that:

1) The online interactive public participation process can be improved by adding a clearly defined information processing and evaluation process.
During the case studies, it was noticed that the new process was attracting hundreds of public comments per project. It became difficult to find useful public suggestions, therefore an information processing structure was needed.

2) The House of Quality method was chosen to be the theoretical basis for the evaluation process.
A selection process was carried out to find the theoretical basis for the evaluation process. Out of three decision-making methods, the decision matrix was found to be most suitable for the design of the evaluation process. The House of Quality method, an improved version of the decision matrix, was used in the actual evaluation process design.

3) The evaluation process created with the House of Quality method can help the project team make design decisions.
The evaluation process starts with setting up evaluation criteria and assigning weight distribution on criteria aspects. All public comments are assessed against the criteria. The preference scores are calculated as the weighted sum of all aspect scores. After the evaluation, public comments with the high positive evaluation scores were most recommended to be added to the design because their value outweighs their efforts. Comments with low positive scores should be treated with care because they could lead to adverse project impacts. Comments with negative scores should be avoided.
9. REFLECTIONS AND FURTHER STUDIES

This chapter documents research reflections and gives an account of further study directions.

9.1 REFLECTIONS

Due to the time limit, there were hypotheses that were not tested, research steps that were not carried out and case study analyses that were not completed in this research. This section describes the researcher’s reflections and learnings from this research.

9.1.1 UNFINISHED PROJECTS

The case study was, in fact, not completed. At the time this research was completed, design phases of the Houtplein project and the Groenmarkt project were still ongoing. The analyses on the influence of public participation processes in this report were conducted on the preliminary designs. It is possible that the final design would contradict the current findings. However, due to research time limitation, the definitive analysis of final designs could not be included in this research.

9.1.2 UNOBTAINABLE INFORMATION

The researcher failed to obtain some project information. For example, the budget reports could not be released due to confidentiality issues, and the attempt to locate the minutes of some stakeholder meetings has failed. If the researcher were able to access this information, the conclusions made in the report would be better founded.

9.1.3 UNTESTED HOUSE OF QUALITY IMPROVEMENTS

Many hypotheses related to the House of Quality were not tested because there was not enough time. Firstly, the evaluation criteria in the House of Quality was designed to be approved by all project stakeholders. The consensus on the evaluation criteria set up should have been reached before public participation commenced. Then the evaluation would be more objective because the criteria would have been designed for the balance of different parties’ interests. If the consensus could be reached, it could also serve as a dispute resolution guideline in case of conflicts. This consensus on evaluation criteria was not implemented in this research because all case study projects had already started when this research began.

Another idea the researcher had to improve objectivity in the House of Quality evaluation was to invite representatives of the client, the design team and main stakeholders to assign the scores. The human bias should be reduced if the stakeholders’ contradicting interests were equally represented in the evaluation process. This idea was not tested, and the researcher was the one who filled in the demonstration House of Quality in this research.

The researcher had also planned to translate the House of Quality into a questionnaire and to distribute it to the members of the public who participated in the online interactive public participation process. This was part of an attempt to validate the House of Quality design. This plan was not carried out because no permission was granted by the municipality.
Lastly, the researcher tried to carry out the House of Quality evaluation on the two test projects. The intention was to compare the highest ranked comments with the actual design outcome in order to evaluate the design of the process. However, the Vestijk project and the Houtplein project received more than 600 comments together, and the researcher was not able to complete this evaluation within the project time limit.

9.2 LEARNINGS

The most important thing the researcher learned from this study is that academic researches should be meticulously planned with clearly defined research objectives and carefully chosen research methodologies. The research should be carried out rigorously according to the plan throughout the entire duration of the research. Only after this, the findings or the lack of findings can be reported in truth after the completion of the study.

This thesis research underwent some changes as the researcher’s understanding of the subject deepened and to make the best use of the available resources. If the researcher had the opportunity to research subject again, the following changes will be made:

9.2.1 BETTER RESEARCH PLANNING

The research would be planned in a more rational manner from the beginning. Instead of shaping the research to make use of available information resources, the logic of the research should be established first, and then the data inputs to be obtained would be determined. The feasibility to use other research methodologies other than the case study should be investigated. For example, a questionnaire survey of the public users of the new process may be able to reveal hitherto undiscovered insights. The research’s scheduling could also be improved so that all the unfinished research components discussed in the previous section can be completed.

9.2.2 MORE THOROUGH LITERATURE RESEARCH

Literature research was conducted in this research to find a clear knowledge gap for the thesis research to address. The literature research also provided the researcher with the theoretical knowledge to study the discipline of public participation in depth. If the research was to be carried out all over again, more thorough and meticulous literature research would be carried out to support the new process's addition to the body of knowledge of the public participation discipline.

9.2.3 MORE LOGICAL LINK BETWEEN DIFFERENT PARTS OF THE RESEARCH

The current logical structure of the different parts of the thesis research could be improved. In this research, the new process was studied indirectly by evaluating its influence on project performances. If the research was to be repeated, the researcher would attempt to find a more direct way of evaluating the process.

Also, a link between the case study and the improvement of the new process could be improved. If a drawback of the new process could be identified from the result of the case studies, the link between evaluation and improvement would be more logical.
9.3 FURTHER STUDIES

The research had opened up some opportunities for further investigation.

9.3.1 INCORPORATE THE HOUSE OF QUALITY METHOD INTO THE ONLINE PLATFORM

The proposed House of Quality evaluation process could be incorporated into the online public participation process using Relatics. A case study could be carried out to measure the performances of the projects that implemented this updated online platform.

9.3.2 OPTIMISE THE HOUSE OF QUALITY CRITERIA

The criteria and weight distribution used in the House of Quality evaluation process demonstrated in Section 6.4 was designed for the Vestdijk project only. The criteria should be tailored for each individual project. A study could be carried out to find out how the criteria should be edited and amended depending on the project type and other constraints. It would also be worthwhile to launch a comparative study to optimise the criteria set up.

9.3.3 RESEARCH THE IMPACT OF THE NEW PROCESS ON OTHER PROJECT TYPES

This research was focused on the new process’s influence on intra-city street redevelopment projects. Where its influence on other types of projects would be similar remains to be examined.

9.3.4 INVESTIGATE THE NEW PROCESS WITH ANOTHER METHODOLOGY

The findings in this research were made based on the outcome of the case study. Other research methodologies may generate different learnings about the new process and should be carried out to improve the body of knowledge of public participation.

9.3.5 TRANSFORM THE PROCESS INTO A STAKEHOLDER MANAGEMENT TOOL

The online platform can potentially be developed into a stakeholder engagement tool. Both the efficient communication channel as well as traceability of design changes are suitable for stakeholder management. Case studies could be carried out in this development direction.

9.3.6 BALANCE BETWEEN NUMBER OF COMMENTS AND PRODUCT EFFICIENCY

The further development of the new process is worth investigating. There now exist a tension between the number of public comments and project efficiency. An empirical study could be conducted to find out the optimum scale of public participation.

9.3.7 USE TEXT MINING IN THE NEW PROCESS

The proposed House of Quality method could be used to evaluate the comments. But the processing of the public comments still needed to be done manually. Studies could be carried out to see if the use of text mining can help automate future comment processing procedures.
9.3.8 QUANTIFY THE TERM OF DESIGN FREEDOM

One learning from this research was that the new process is only suitable for projects with a high level of design freedom. It has been established that design freedom is linked to the client’s intention with the project and their level of commitment to the public. It would be interesting to see if the design freedom concept could be quantified in further studies.

9.3.9 CREATE A PUBLIC PARTICIPATION METHODS SELECTION GUIDELINE

It was also learnt in this research that the level of involvement of the public participation method should match the client’s level of commitment. Further research can be conducted to try to establish a guideline that can inform the client which participation method they should choose.
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APPENDIX 1 REJECTED BASELINE CASES

Besides the Heezerweg project, four other projects were considered in the selection of the baseline case for the Vestdijk project. Details of these cases are shown in Table 14.

<table>
<thead>
<tr>
<th>Project</th>
<th>Vestdijk</th>
<th>Brugstraat</th>
<th>De Stoutheuvel</th>
<th>Kleinenberg</th>
<th>Boeiende Binnenstad</th>
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<tbody>
<tr>
<td>City</td>
<td>Eindhoven</td>
<td>Tilburg</td>
<td>Eindhoven</td>
<td>Eindhoven</td>
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<td>950 m</td>
<td>350 m</td>
<td>900m</td>
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<tr>
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<td>/</td>
<td>42 months</td>
<td>/</td>
<td>40 to 60 months</td>
</tr>
<tr>
<td>Public Participation Method</td>
<td>Online Public Participation + Offline Stakeholder Design Sessions</td>
<td>/</td>
<td>Stakeholder Meeting, Presentation Evening</td>
<td>Stakeholder Design Sessions</td>
<td>City Challenge</td>
</tr>
</tbody>
</table>

Table 14 Characteristics of Rejected Baseline Cases for the Vestdijk Project

For the Vestdijk project, the first baseline choice considered was the Brugstraat in Tilburg. The project was immediately rejected because it was not at all comparable to Vestdijk. No efforts were made to find out the project duration or the public participation method.

The Stoutheuvel street was roughly the same size as Vestdijk, and the project duration was roughly the same. Traditional public participation methods like stakeholder meetings and presentation evenings were used in the Stoutheuvel project. However, unlike the redevelopment of Vestdijk, where the focus was on the reconfiguration of the traffic, the redevelopment of de Stoutheuvel was limited to planting more trees and replacing the sewage system (GemeenteEindhoven 2019b). Furthermore, the project was located outside the city centre. Therefore it was rejected.

The Kleinenberg was a shopping street in the centre of Eindhoven. The street was planned to be completely redesigned. This project was rejected because it was too small compared with the Vestdijk project and it did not employ traditional public participation methods. The Kleinenberg project had also been put on hold while the municipality reconsiders the project approach (GemeenteEindhoven 2019c).

The Boeiende Binnenstad project (the Fascinating Downtown project) was also part of the city centre redevelopment of Eindhoven. The Boeiende Binnenstad project focused on the redevelopment of the city centre shopping street parallel to the Vestdijk. The project would have made a perfect comparison with the Vestdijk project except that it was not a traditional project. The municipality held a city challenge design competition for its residents (GemeenteEindhoven 2019a). The Boeiende Binnenstad project was rejected because it did not employ traditional public participation processes.
Besides the Nieuwe Groenmarkt project, four other projects were considered in the selection of the baseline case for the Houtplein project. Details of these cases are shown in Table 15.

<table>
<thead>
<tr>
<th>Project</th>
<th>Houtplein</th>
<th>Floraplein</th>
<th>Julianstraat</th>
<th>Kinderhuisvest / Kenaupark</th>
<th>Delftlaan-Zuid en P.C. Boutensstraat</th>
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<tbody>
<tr>
<td>City</td>
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<td>Haarlem</td>
<td>Haarlem</td>
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<td>20 months</td>
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<td>Online Interactive Public Participation Process</td>
<td>Stakeholder Meeting, Consultation Evening</td>
<td>/</td>
<td>Stakeholder Meeting</td>
<td>Stakeholder Meeting, Information Evening</td>
</tr>
</tbody>
</table>

Table 15 Characteristics of Rejected Baseline Cases for the Houtplein Project

Floraplein was located right next to Houtplein. The Floraplein project replaced the sewage system and redeveloped the 300m long street. Both the project size and the project type of Floraplein were ideal, and the project only employed traditional public participation methods. However, the Floraplein project was halted halfway through construction because local residents complained about the pavement design (GemeenteHaarlem 2019b). The scope of this thesis research was limited to the project’s design process. Issues arisen during the construction process were out of scope for this research. Therefore, the Floraplein project was rejected.

The Julianstraat project combines travel reconfiguration with street redevelopment, which was similar to the Houtplein project. The location and the size of Julianstraat were also suitable to be the baseline project. However, this project had a long and complicated history. After the preliminary design was made in 2010, the project endured a decade of discussions, planning and policy changes before being approved for implementation (GemeenteHaarlem 2019c). The Julianstraat project was rejected because it had too much political influence and could not reflect the true impacts of public participation processes in the comparison.

Kinderhuisvest and Kenaupark were located close to Haarlem train station. The project combined traffic reconfiguration with street redevelopment and sewage system update (GemeenteHaarlem 2019d). It employed traditional public participation methods and had similar project size and project duration to the Houtplein project. The Kinderhuisvest and Kenaupark project fulfilled the requirements to become a baseline project.

The Delftlaan South and P.C. Boutensstraat project was also a street-redevelopment-and-traffic-reconfiguration project. The project employed traditional public participation methods of stakeholder meetings and information evenings (GemeenteHaarlem 2019a). The project fulfilled the location, type, size and duration criteria to be a baseline project for Houtplein.
There were three suitable baseline case options in Haarlem: 1) Kinderhuisvest and Kenaupark, 2) Delftlaan South and P.C. Boutensstraat, and 3) Nieuwe Groenmarkt and Krocht. All three projects were comparable with the Houtplein project. The researcher chose the Nieuwe Groenmarkt project because it was conducted by Witteveen+Bos, therefore internal project documents were more accessible. Nieuwe Groenmarkt also had an advantage that its project managers (both in Witteveen+Bos and the Municipality of Haarlem) had previously worked on the Houtplein project. The two project managers could comment on personal experiences working with different public participation processes. Therefore, the Nieuwe Groenmarkt project was chosen as the baseline case for the Houtplein project, and the other two options were rejected.
APPENDIX 2 INTERVIEW TEMPLATES

INTERVIEW TEMPLATE – PROCESS DESIGNER

INTRODUCTION

Hello. Thank you for taking the time with me today. My name is Flora Bai and I am writing a thesis about the new public participation process initiated here in Witteveen+Bos. This interview is about the Vestdijk project in Eindhoven and the Houtplein project in Haarlem. If it’s okay with you, I’ll be recording our conversation so I’ll have an accurate and complete record. If you have any concerns about the confidentiality of this conversation, please let me know.

QUESTIONS

A. PERCEPTION ON PUBLIC PARTICIPATION
   1. What is your function in the project?
   2. What do you think is the purpose of public participation?

B. PREVIOUS PRACTICES
   1. What public participation practices have you used before this process?
   2. What is the most noticeable difference between the new and old practices?

C. DESIGN OF THE PROCESS
   1. Could you talk me through the design methodology of this process?
   2. How are the incoming comments processed?
   3. How are data collected used by the design team?
   4. How long were the platforms online?

D. DETAILS OF THE PROCESS DESIGN
   1. Would you comment on the representativeness of the process?
   2. Would you comment on the independence of the process?
   3. How early was the public involved?
   4. How much influence does the public have on the end result?
   5. Would you comment on the transparency of the process?
   6. How much access does the public have to project resources?
   7. Are the task definitions clear?
   8. Is there a structure build for the decision-making process?
   9. How would you rate the cost-effectiveness of the process?

E. DETAILS OF THE PLATFORM DESIGN
   1. Would you comment on the usability of the platform?
   2. Would you comment on the reliability of the platform?
   3. Would you comment on the security of the platform?
   4. How is the process maintained?
   5. How committed was the client?
6. How much publicity did the platforms get?
7. How open and trusting would you say the public is when using the platform?
8. Would you comment on the quality of participation?

F. PROJECT IMPROVEMENT
1. In which aspect do you think the project could be improved?
INTERVIEW TEMPLATE – CLIENT’S EXPERT

INTRODUCTION

Hello. Thank you for taking the time with me today. My name is Flora Bai and I am graduating my master’s at Witteveen+Bos. This interview is about the public participation project used in X project. If it’s okay with you, I’ll be recording our conversation so I’ll have an accurate and complete record. If you have any concerns about the confidentiality of this conversation, please let me know.

QUESTIONS

A. PERCEPTION ON PUBLIC PARTICIPATION
   1. What is your function in the project?
   2. What do you think is the purpose of public participation?
   3. Can you talk me through your understanding of the new process?

B. EXPERIENCE WITH THE NEW PROCESS
   1. In which manner do you interact with the new process?
   2. How have your experience been with the new process?

C. PREVIOUS PRACTICES
   1. What public participation practices have you used before this process?
   2. What is the most noticeable difference between the new and old practices?

D. EVALUATION OF THE PROCESS - ORGANIZATIONAL
   1. How committed was the municipality?
   2. How was the process promoted?
   3. How satisfied is the municipality with this process?
   4. In your opinion, how satisfied is the public with the project outcome?

E. PROJECT IMPROVEMENT
   1. In which aspect do you think the project could be improved?
INTERVIEW TEMPLATE – STAKEHOLDER MANAGER

INTRODUCTION

Hello. Thank you for taking the time with me today. My name is Flora Bai and I am writing a thesis about the new public participation process initiated here in Witteveen+Bos. This interview is about the X project. If it’s okay with you, I’ll be recording our conversation so I’ll have an accurate and complete record. If you have any concerns about the confidentiality of this conversation, please let me know.

QUESTIONS

A. PERCEPTION ON PUBLIC PARTICIPATION
   1. What is your function in the project?
   2. What do you think is the purpose of public participation?
   3. Can you talk me through your understanding of the new process?

B. EXPERIENCE WITH THE NEW PROCESS
   1. In which manner do you interact with the new process?
   2. How have your experience been with the new process?

C. PREVIOUS PRACTICES
   1. What public participation practices have you used before this process?
   2. What is the most noticeable difference between the new and old practices?

D. DESIGN OF THE PROCESS
   1. Could you walk me through the handling process of the incoming comment?
   2. How efficient would you rate the current process procedure?
   3. Which aspect do you view as most important when processing the comments?
      - Scope, budget, schedule, design requirements, innovation, environmental
   4. How do you balance technical requirements and client desire?
   5. How are the comments incorporated into the design?

E. PROJECT IMPROVEMENT
   1. In which aspect do you think the project could be improved?
Interviewee position: Project Leader
Organisation: Witteveen+Bos
Project: Houtplein + Vestdijk
Date: August 23th, 2018

A. PERCEPTION ON PUBLIC PARTICIPATION

1. What was your function in the project?

My function would be the project leader, with the focus on user-centred design. I coordinate the whole projects regarding the online platform. But I’m not in charge of actually managing the stakeholders. We would have a stakeholder manager as part of the team I coordinate.

So in the case of the Vestdijk, I would be in charge of developing the entire platform, including the content, and including the look and feel. Same for the Houtplein. All the functionalities have been thought out by me and my team. But we are definitely not in charge of handling the content that comes in or the input from stakeholders.

2. What would you say is the purpose of public participation?

The purpose is reaching a broader audience than we do via the regular stakeholder meetings.

Let’s say the younger families who just had a few kids of two, three years old. They just put their kids to bed at 8:30 pm and they are not going to come to a stakeholder meeting at 9 o’clock. Those people are not represented in regular stakeholder meetings, among other groups. We want to target a broader audience so that we also gather a lot of input from a broader audience; so we can get some perspective of how the average profile looks.

If you go to a regular stakeholder meeting, you’ll probably see mostly 50+ men who have something to complain. That’s the regular audience on a stakeholder meeting. Also that’s the reason why other people don’t really want to come, because usually it’s not a very nice atmosphere.

So, that (to reach a broader audience) is the main goal. With reaching a broader audience, we create a greater support for the project itself, and we are more in control of our design process.

B. PREVIOUS PRACTICES

1. What public participation practices have you used before this process?

Mostly stakeholder meetings. I would say in 90% of the cases, it would be stakeholder meetings. So we would go to a certain building in the municipality, and, together with the municipality, we would invite residents. They (the municipality) were pretty active in approaching them, so
Online Interactive Public Participation Process | Flora Bai

we would have flyers, emails and tweets to reach them (the public) to come to the stakeholder meeting. But very few thing were done online. Maybe municipality itself on Twitter or Facebook, where they want to ask the public about how they think of something. But that is only a minor part of the stakeholder management.

They sometime send out letters or questionnaires and ask people to fill them in. But as I said, I think 90% of the public participation before this online approach has been done by stakeholder meetings.

2. When they (the municipality) do use twitter, was is more for informing the public of what is going on? Or were they asking for the public’s opinion?

Mostly informing.

The thing is, as you know, Twitter and Facebook are also amazing tools for filing concerns and even complaints. So people use them (Twitter and Facebook) to complain to the municipality, to complain to Rijkswaterstaat, for example. What you see in those channels is people spamming the municipality with the information they didn’t ask for. The municipality is not requesting any specific information, but they get the complaints anyway. It is a part of participation to answer their concerns, but it is not very constructive (to do so).

3. What was the most noticeable difference between the new and old practices?

The amount of people we reach is the biggest difference.

Also, the rate of user satisfaction. People are much happier when they are involved more. And that’s what we achieve with these platforms. People are happier when they feel they’ve been heard.

And they see what happens with their input, that’s really important. So what we try to prevent, for example in Houtplein-in-beeld, is that we had our stakeholder manager in the team. And he was in charge of answering all the questions and concerns of the civilians that came in. What he did at the very first few requests was that he answered ‘Thanks for your suggestion.’ That’s it. And that’s not feedback. If you do that, you will only frustrate them (the public) more. (The public would think:) “You asked me for my concerns. You asked me for my questions. And you do this with it. You say ‘thank you for your suggestion’ without any explanation.” I saw this after 20 suggestions and I gave our stakeholder manager a call telling him that this is not the way to go because the power of our product is that we are in constant contact with our stakeholders. And we need to take them seriously. If we don’t, the frustration rate would just go up. Because we reach a broader audience, and they will all know about it. If they all hear ‘thanks for your suggestion’ and nothing else, the frustration will be way bigger than only the stakeholder meeting.

C. DESIGN OF THE PROCESS

1. Could you talk me through the design methodology of this process?
The most important thing is that it’s a user-centred design. At engineering consultancies you usually see that there is a focus on technical aspects, safety measures, and design guidelines. What we do is to focus on the end user. And what that means is that you will have to filter information to what’s most important, and to make it (the important information) accessible to the public. You don’t want technical drawings, you don’t want any calculations in there. It needs to be ready-to-go and easy-to-understand for the public.

What we start with is that we describe our target group. Usually it’s about the residents, but it can also be, for example if we want to talk about the redesign of a building, about people working or living in a building. We first formulate the target group: Who are we doing this for?

Then we formulate the problem, the project we are talking about. We need to have it clear that what needs to be described and what needs to be presented on this platform.

Then we make a list of requirements of what the platform has to be able to do. We formulate that list together with the client. We always have a homepage. That’s for sure. The question is what do we put on the homepage. Do we need the planning on there? Do we need the description of the project itself? Are we inviting people onto that homepage? What are we doing there? That’s part of the requirement we are looking for. Usually we have a map that people can respond on. Not necessarily, but it’s most of the time the way to go. If we use a map, what do we want to know? Is there something that we especially want to know about a certain area, or about a certain building? Or do we want to know about, for example, connecting roads to this area. So you can specify the requirements of your platform. That’s what we always do: Target – problem – list of requirements.

Then we start designing the platform itself. We need the style of the client itself, that they use in their websites. We need to use their style. We are not using our own style, we copy their style, so I need to be in close contact with their communications officer. So the platform would have the proper look of a website from this client. That’s the first thing we do. Then we programme the functionalities, we take care of the framework, we’ll have a domain and a cyber security certificate. And we make sure everything is connected to the Relatics environment. That’s what happens in the background. When the framework stands, we’ll be able to decorate it, fill it in. That’s actually how the design process goes.

If we use 3D visualisations, it’s something we do on a parallel line. So we have the platform itself. And when the client asks for the 3D visualisations of these few buildings or a certain road crossing, I’ll ask someone on the team to make those visualisations so we can implement them on the platform.

2. Were the 3D visualisations used when the design is more finalised? Was the information collected through the platform used to formulate the design?

Not always.

In the case of Vestdijk, there wasn’t a design at all. We needed to visualise it because otherwise people wouldn’t understand. We had a choice of visualising in a top view where people could maybe imagine what it would look like. But what we decided together with the client is that we were going to make a sketch model for what we have in mind right now. And there were only
a few things we had in mind: we were going from two lanes to one lane; we needed to cut the
major crossing into Vestdijk and to add a two-way bicycle lane on one side of the road. Those
were the aspects we could implement. We made a sketch model from that, and that’s what
was shown on the platform.

The danger it comes with that is it can look pretty definitive. When people look at it, they might
think: “Okay. Apparently, you have already figured it out. What do you need my help for?” To
prevent that, we made sure we left important questions in the visualisations. In the
visualisation, it would say “This is a sketch design. Let us know how you think. We need your
input.” Another tool to motivate them even more is that the opening page of the website has
a video of a municipality counsellor inviting people to think with us and to provide input. That
was very powerful.

When we use 3D visualisations, we try to gather as much input as we can. Maybe there are
already designs made somewhere, maybe there’s been a stakeholder management history
somewhere around about this project that we can base it on.

Sometimes we use the 3D visualisation in the end. Okay, now that we’ve got all your input, this
is what the result is.

3. How were the incoming comments processed?

For Vestdijk, people would leave their suggestions. Someone would copy the suggestions from
the platform into an excel, then try to process them manually in Relatics. It was a very slow and
inefficient process, not to mention not traceable.

In Houtplein, we made a big step that everything on the platform comes in the Relatics
automatically. The stakeholder manager would see the comments, and type a concept answer.
That concept answer is sent to an expert of the council. The expert will agree or disagree with
the concept answer and types his own answer. After that, the final answer will be published to
the crowd. What’s also important to know is that when somebody puts in a suggestion, it’s not
visible right away. We want to prevent people from using bad words on the platform, we want
to be in control. They can only see the comments after we agreed on a final answer.

4. How were the data collected used by the design team?

We label all the suggestions by theme and type of respondent. Firstly you can see which theme
is the most important. There are big differences. In Houtplein, it’s mainly about public and
traffic.

We are working on text mining so you will be able to search by key words. Right now the
number of responses are manageable.

Some of the comments will simply not happen. If it’s not happening, we’ll give feedback to the
stakeholder :’thank you for your suggestion, but we will not keep this in our design process
because of ...’. The accepted comments will be formulated into requirements. That’s when the
design process kicks in. Road designers, when he’s designing a road, he has to look at the
requirements.
The judgement of whether a suggestion is accepted is made by the project controller and the project leader.

D. EVALUATION OF THE PROCESS DESIGN

1. Would you comment on the representativeness of the process?

We know a few things about the participants. We know what kind of stakeholder they are, whether they are road user, cyclist, pedestrian or public transport user. That’s what we asked them. We ask them their zip code so we know where this comment is coming from. I guess that’s the most descriptive information we get. With that information, we kind of know how the target group is represented. We don’t know their age or gender. But we do know’ this is what the cyclists think’ and ‘this is what the public transport users think’, and so on.

I think it’s pretty representative. And I guess if we ask more of them, it will work the other way round. It will work against us. So if we would ask them for their age, for example, I think fewer people would be willing to respond.

Another thing is that we ask them for their email address. And the good thing about that is that we can see how many different people filled in the suggestions. At the first day, we had like 25 responses, but 15 of them were from the same person. Then it’s good if you know the email address.

2. Would you comment on the independence of the process?

I think the residents and the stakeholders feel very free to say what they want. They are pretty independent.

What could be dangerous is that some of the respondents are also working for some companies. For example, we had some reactions from a guy working for one of the bus companies. In Houtplein, there’s a major bus route. You have to figure out is that really the input we are looking for? Cause we already know how the bus company thinks about this. So do we treat this guy as a concerned resident, or do we treat him as a professional who just wants to voice his opinion? When we look at the independence, we need to be careful that the public is not overshadowed by big companies.

What you notice with these kinds of new techniques is that even the client itself has to convince their own organisations to implement these kind of systems. What we have, for example at Houtplein, we said we are ready to go. We can hand this platform to you within two and half weeks. The client was like, okay, great, we want this. But then the communication department was like wait a minute, we are developing a similar platform like this, and my manager is expecting this to be done in 6 months. And the client is like, yeah okay, but I need this in two and half weeks. There are internal struggles to get budget for this. So that’s what you see with these kinds of techniques is that the independence of the organisations themselves is not very high. They are dependent on the complete managing board and how they think.

3. How early was the public involved?
In Vestdijk, W+B was involved from the very beginning. No member of the public knew about the project plans. W+B was in talks with the municipality before any residents of Eindhoven even heard about the project. And that’s the way we like it because you can then be in perfect control of the design process.

In the case of Houtplein, we were also involved pretty early. The only thing was that two different attempts had been made previously to start this project. Both times, the project was stranded because the community was unhappy about how they were involved. That was another motivation for the city of Haarlem to create such a platform. Because they were getting complaints: “If you don’t want our input, this (the project) is not going to happen.”

4. Would you comment on the transparency of the process?

It’s way more transparent than it used to be. I wouldn’t say 100% because there are things we can’t inform the civilians. In terms of transparency, it’s very important that first we give them the opportunity to respond. But then we need to show them what’s been done with their input. I think that’s the major part of process transparency. Like I’ve mentioned in the answer of the third question, we need to explain. For example, somebody is worried about parking spaces. Then we will answer them: “Thank you for your suggestion. The design of our parking spaces along the Houtplein is a very important part of the whole design process. We will use your comment in our design process.” And then at the end of the process, we need to inform them what happened. Because then you give full transparency of what happened with their input.

I think that’s the only way we reach our goals. In Dutch we call this draagblak gestuurd ontwerp, which means support-oriented design. You want to make a design that is influenced and directed by the opinion of the community. We are only the advisors. We want to know what the community thinks. We want to guide them in a way towards maximum satisfaction, and where there is biggest support for the project.

5. How much access does the public have to project resources?

There are all the documents they could reach on the website of the municipality itself. Normally there is always some sort of digital library they can use. If not, they can ask the employee of the municipality. Of course, some things are classified. In the case of Houtplein, there is an existing contract with public transport companies. That contract lasts for 10 years. What we said to the public from the very beginning is that we know that everybody is concerned about the bus route, but we cannot change anything about it because the contract is still valid for another 8 years. Some people ask if they can look at that contract. The answer is no. They are classified.

There is enough information available to get a well-based opinion from.

6. Are the task definitions clear?

Yes. The public should contribute to the design.

7. Is there a structure build for the decision-making process?

The public gets feedback about how their input is used in the decision-making process.
Online Interactive Public Participation Process | Flora Bai

The term ‘structure’ gets my attention. That’s what we are really trying to develop right now at Houtplein. In Vestdijk, it wasn’t very structured. The only thing we had was a theme, type of respondent and the zip code. That’s the same thing as we have right now. The biggest difference between Houtplein and Vestdijk is the introduction of the Relatics environment. Now we have full control of the requirements coming from the stakeholders. And what we are trying to figure out now is how can we structure that in a way that really influences our design. That we can copy paste to the following projects. Now, it’s a bit custom-made, and we need to structure a process into decision-making. That’s what we are working on right now. It’s not very structured yet, but we are getting there.

8. How would you rate the cost-effectiveness of the process?

That’s a difficult question. The only thing that I can base this on is that the project manager of the Vestdijk in Eindhoven told us this project was way cheaper than we expected. He credits this partly on the online platform. Cause we involve them so early that we already know what the environment was, what the stakeholders were thinking, before we even designed anything. And by that way, our first sketch design that came on later was already influenced by the crowd. So you’ve already covered say 80% of the complaints in that first design. Whereas when you didn’t use the platform, you would just start from your expert judgement, and from your knowledge. Then you present it (the design) to the crowd and hopefully they like it. That was really helpful. We already collected a lot of the complaints before we even started designing.

Since we get them (the public) informed during the process, a lot of time was saved with managing those complaints. People were less eager to complain about the process because they were involved way better. I would say in case of the Vestdijk, it (the project design phase) is way cheaper in the end. But the investment in the beginning was higher. Building the platform and building the virtual reality model of course is more expensive than only having stakeholder meetings. You have to invest a little in the beginning in order to be more effective in the end.

The case of Houtplein will be done in a few weeks. We’ll see what the municipality thinks about that.

9. How long were the platforms online?

Houtplein will be kept in the air for 6 months. Because after that the stakeholder participation period is over. The input gathering period is over and we shut the doors. After that, we only inform them (the public). Because if you keep gathering input along with your further design steps, you will lose the effectiveness of the platform. For example, in the beginning, 200 people were involved, and by the next step, a lot of them were already satisfied with what happened, so you’ll only get comments from 30 people; and by the next step, 5 people. That’s not representative of your target crowd anymore. That’s why we close the platform after 6 months.

Vestdijk was online for 7 to 8 month.

10. In the case of Houtplein, how many design steps will be published to the public?
With the input for Houtplein, we are going to make three designs. Then we will ask the public for their opinions specific on the design instead of keeping asking for input about the environment.

E. EVALUATION OF THE PLATFORM DESIGN

1. Would you comment on the usability of the platform?

Very user friendly. The steps were logical and we get very few complaints about the functionality of the platform. People understand how to use it right away and that’s good. This is because we hired a company that specialised in this. They are focused on communication and positioning an online platform effectively. I think the usability is pretty high.

2. Would you comment on the reliability of the platform?

The thing is, in the case of Houtplein, we had to deliver in two and half weeks. Of course mistakes are made in the process. You need to be very quick to respond to those mistakes. We were online, we tested it, we found a few mistakes, and fixed them. There are people dedicated for that in the beginning. I would say, in the very beginning, the reliability was acceptable but not very high. But after a week, it’s complete reliable. Because we hired a professional company, we don’t need to worry about servers or cyber security.

The only thing that could happen in the far future, not very likely though, is that hundreds of people would be visiting the platform at the same time. Then maybe we won’t have enough capacity. But then we would be very successful and we would upgrade our server.

3. Would you comment on the security of the platform?

We have an SSL certificate. So the information we gather is encrypted prior to transmission. We are also working to comply with the new European privacy law.

4. How is the process maintained?

The maintenance is carried out by the design team.

5. How committed was the client?

That’s a very important issue regarding the success of the platform.

Both Vestdijk and Houtplein are perfect examples of good commitment from the clients. For some other clients, commitment is way less. They are not really keen on gather as much input as they can. It is possible that they just want to show that by having the platform, they’ve performed their public participatory duty. If someone complains later, they can say: we had this platform, where was your input?

Commitment is very important. For example the city of Haarlem was tweeting about the platform, they were handing out flyers, posting on their Facebook group. They were really dedicated on reaching the crowd. That helps a lot.
Normally, projects within a city is more successful than national scale projects. The commitment of the stakeholders themselves also matters. Somebody who uses Houtplein every day would more likely to respond than somebody using highway every day. They are more connected in the environment. They live in a city, it’s their city. Very unlikely someone will claim a highway as their own.

6. How much publicity did the platforms get?

When the client’s more committed, they try to create more publicity for the platforms.

7. How open and trusting would you say the public is when using the platform?

They are very open. But you can read distrust in the comments. For example the bus route in Houtplein, there was a lot of distrust about that contract. There is trust in the platform itself and more trust in the municipality. The distrust is more on the project itself than on the platform.

8. Would you comment on the quality of participation?

The majority of comments are constructive. Of course, there are people who just say ‘I hate this’ and don’t give any suggestions. A rough estimation would be that around 80% of the comments that come in are usable to us.

F. PROJECT IMPROVEMENT

1. In which aspect do you think the project could be improved?

We are working on text mining. So you can search for keywords in Relatics.
APPENDIX 4 INTERVIEW TRANSCRIPT B

Interviewee position: Assistant Project Manager
Organisation: Witteveen+Bos
Project: Houtplein + Nieuwe Groenmarkt
Date: October 12th, 2018

A. NIEUWE GROENMARKT PROJECT INFORMATION

1. Can you talk me through the Nieuwe Groenmarkt project?

Maybe it’s good to start with the process of the Groenmarkt and then we can go through the questions because then you would have an insight into what the project is like. Here we have a booklet which describes all of the stages in the process. First of all there is the start notion, and that means that the municipality has a question and they want to reduce the cars in the city centre. There is a problem of car emissions from the use of cars. That’s why they make the street car-free. They want to do that by making some modifications to some places in the city, like Groenmarkt and Houtplein. Here you can see the current situation. This is the Groenmarkt. The cars are everywhere. By renovating the situation, we try to update it to a nice looking square. So it would look like a square and not like just a car park. First, we analysed what was the city in the past. So there is something about that. We analysed different types of squares in Haarlem. This was the starting point, and we did some research about the history (of the street). Then we made the schemes what the structure of the city is, how is the city used. You can see the places with facilities, like the market spots. So once a week there is a market and here is the location where you have the booth in the farmers’ market.

There are certain things that we analysed. So in the new situation, there was still a need for these marketplaces. So there needed to be enough space, which we had to take into account during the design. So we used a couple of themes. This is the economy. Then we had accessibility. These were all the requirements of the municipality so in terms of accessibility it was important to have enough space for bikes and one of the problems with that is that when you have a lot of bikes you need space to put them. Like bike parking is really hard in this area. So one of our recommendations was to build an underground bike place. You can see them later in the slides. We checked a lot of things. I won’t go too deep into it.

Then we made four different designs. Here you can see it. This is the first one which was just putting some trees and make it look nicer but still a lot of concrete and stone. Here you can see the in-depth design. But to make this we used participation. So in this project we didn’t do e-participation, but we only did normal participation. So maybe you can compare the two.

Here you can see the impression of the first design, and we had I think three of four meetings with the local people. It was kind of a presentation and Q&A style.
2. With normal participation, do you mean stakeholder meetings and resident letters?

Yes, that is the same. We sent the local people a letter and then there are scheduled meetings with the neighborhood. So I think first we thought the people that we were doing this project. In the third one, we showed some different designs. And then they had the possibility to respond to the designs. By doing so, they felt they had been heard. The last step was the recommendation to the municipality for which one they should choose. But I'll first describe the other designs because, in the end, we had two different designs which we recommended. Which is not usual but that was because the need for a bike parking and we recommended one design which was a solution to put them on the normal road. The other solution was to put them underground. So we also included the cheap design, because a car park underground is more expensive. So that's why we decided to have three design with normal budget. The budget that the municipality had was also not enough to make such underground parking. You can check these things later. I'll show you the last one. So here you can see bikes how they route and where the bikes spots are. So you see like different types of materials. Then the fourth one is the underground parking. Here you can see what it is like. It needs to be under the landscape. It looks really nice but it is really expensive. That's why the municipality is still deciding on a design they want. So we are waiting for the results.

3. The final decision hasn’t been made yet?

No, they haven’t decided. So here you can see the two entrances, it looks really nice but it is not that big and that’s the main problem with this one. It’s quite expensive for the number of bikes you can put underground. Here you see the church, and then you have the bikes underneath. It’s a cool design. So we are still waiting on the result from the municipality as they need to get a refund because they don’t have that kind of money to put in the project right away. That’s why we are waiting. But I think you want to know more about the process of the presentation.

B. THE PUBLIC PARTICIPATION PROCESS

1. I am more interested in how the public was engaged throughout this project. You mentioned there were a few stakeholder meetings. Is there a record when it happened?

Yes, I think so. We make notes so we have them. I will write it down and check it for you.

2. Is it right that you said all four design options were presented to the public and they had a chance to comment on them?

Yes, there was a voting. That was the last meeting with the public.

We had personal feedback channels with the public stakeholders so they were not at the same meeting as the public one. You had two types of meetings. One on one with the maintenance people of the municipality and with the fire department and all the other stakeholders which are public stakeholders. We had two sets of interviews, these were scheduled. Scheduled meetings with maintenance and there were no presentations just one on one Q&A kind of
things. So more like recommendations and what they really want. Not wishes but they have to be in the project, like requirements. So we have to do these things. We have to apply them in the design. With the public, it is different because some things people say we as a design team don't want in. And sometimes things can't be put in the project. They want public facilities, like toilets and stuff. They want them in public space. Then I ask do we really need them, that kind of stuff. Basically, we had the two types and then with the Houtplein project we still had two types, but we did this thing also. So what I think is that as a recommendation you can also use this platform to put in the wishes and requirements of the authorities. So I think that would be interesting. When there are changes made at the public parties then what happens a lot is when someone changes to a different spot in the organisation then the next person has different requirements, but when you put that really clearly on thing such as Relatics then you have the history of the changes.

Then the new person can see the previous has used these requirements and that would be really good for the project. Because then you don't have all these changes. For instance, I want a statue, but sometimes the maintenance people say they want a statue here on the location because I really like it. Then it is put in the list of requirements, and then the next person says I want another one. Then it is really good to have it on paper, so they know this is what we asked before.

3. In Nieuwe Groenmarkt, how were the wishes of the public translated to the designers?

This voting was done to get an idea of what the people liked, and we made our own opinion of which one was the best, and that was our requirement. However, it was good to give the municipality an idea of what the public wanted and that's why we chose to do that.

So in Nieuwe Groenmarkt, the team did look at what the public thought. But it was still the team's recommendation of which one to recommend to the municipality.

4. How representative are the attendees of the meetings?

That is always a problem with this kind of meetings because the people have to make time to get there and it is always like 7, so a lot of people who work can't come. That is why this kind of e-participation would be a more realistic view.

C. HOUTPLEIN PROJECT INFORMATION

1. Can you talk about the Houtplein project?

I am sure you have seen this. But still, I can explain the process. In this project, because we also wanted to create a bus station and also reduce the amount of cars in this area, we decided to first solve the issues around the traffic and then develop the spatial planning. The design of the square. So we first did some modelling on routing, so we came up with three different possibilities of routing in the areas. And that is for the busses, the bikes and the cars. That is the result of these three different options. I'm sure you know this already. There were three options, and we showed them to the public, but these were not the design which we wanted.
The preliminary design was a mix up of two and three. Because we chose to do this to get a feeling of what the public wanted, so we made three different things and said you could react on the designs. That gave us the possibility to make a design which suited the most wishes of the public. So it was quite a different approach than with the Groenmarkt. Based on the traffic designs we came up with the spatial designs with the trees and the park.

2. You mentioned a different approach. Am I correct to understand that the design in Groenmarkt have less openness as the designs are more final when they were presented to the public, and for Houtplein there was still room for change?

Yes. This is less developed indeed. Because we are still searching for the optimizations in the design. Still, we didn't finish the design yet. And we are still discussing things with the client. It was like a different approach in the way to contact the stakeholders but also Groenmarkt we had an integrated design approach, and here we did the traffic analysis first. Then we started to put in the trees and the more scenic things, like the landscape and the spatial designs and stuff. That is quite different because this project is way more difficult in terms of traffic and how to organise it. The complexity of this one is higher as it has a different scale. So we came up with the three designs and then I will show you the final. I'm not sure if you have seen this one already. This one is the design as it is now, so we made some changes to the one we presented earlier because we not only did the e-participation but also the public meetings. So we actually did both as it was a pilot and I think in the next steps you can improve it by reducing the amount of public interactions.

3. I heard that there has been talks between the municipality and the bus company about moving the bus routes out of Houtplein entirely. Is that true?

Yes, but that one is still under discussion and out of the scope of our project team. It’s a discussion on a higher level with the municipality and the bus company. We are just executing the plan.

4. I was wondering who translated all the comments in relatics to customer requirements.

That is what our "omgevingsmanager" (environmental/area manager) the person that has contact with all the stakeholders and is also in the project team but witteveen+bos outsourced him. He is really involved with Haarlem and the people there. So that makes him a really good candidate for our project. I will find out what the translation is. Stakeholder manager is fine.

5. How was the translation process carried out?

He did all the stuff with the Relatics thing and I just analysed them and put them into 25 actions with the Groenmarkt, with Houtplein as well.

We have this Relatics list, and I just made a short list of what are the most important things, and I gave them to the designer of ocra which is the architect, and he did the landscaping design. so I divided the list into more traffic-related.

D. HOUSE OF QUALITY CRITERIA
Online Interactive Public Participation Process | Flora Bai

1. Could you comment on this criteria I have drawn up?

I think the whole the traffic situation for the decision making and then also the routing for bikes because we want to support biking instead of cars, as in creating bike lanes and parking for them. I think that was the main objective to create enough space for bikes. I think more important was the bus, we have this bus, and that requires a certain time schedule of the bus. They are fixed, so the buses need to be able to drive in. There was a signed contract that the bus company has the right to run for the next 10 years. That was the main problem. So creating enough spaces for buses was the highest priority and then you had the bike lanes which was a high priority of the municipality. The bus thing was the highest priority of the region, Amsterdam-Haarlem. They are two differences, and then people say they want enough space to park their cars which were a hot item, for the local people. Because everyone still has a car and the municipality doesn't want to use cars, which is quite a problem if everyone still has one.

2. Would you agree with the statement that the residents should be put on a higher priority?

I don't know. I think it is kind of the same scale. Because we didn't list their wishes higher or something, it is all the same weight. But the bus concession is the highest rated. Environmental impact was also important as you have regulation from the law if you increase the pollution or the noise with two decibels then you have to do certain research. And it takes more time, so they didn't want that. There was a certain need for keeping the changes minimal. Also, there needed to be enough space for pedestrians. Also, the province which has an office in front of the Houtplein. They had a lot of requirements, and they are paying a subsidy for the project.

3. Is the province one of the main stakeholders?

Yes, they are both a main stakeholder and a local business. They have two votes. They have certain wishes about how they want to have the footpath in front of their office or certain things like that. But they also have in another spot in that office they decide about these concessions. So they are two kinds of stakeholders in one. We did approach the same, but then we still keep in mind that they have more power.

4. Can we return to the criteria?

Cost is also important as there is a certain budget set by the municipality and they don't want to go above it. But it is not entirely cost driven. If we can motivate that we need more money then we can ask for more. However, then the people need to find more money, and it will take more time.
Interviewee position: Traffic Designer

Organisation: Witteveen+Bos

Project: Houtplein

Date: December 19th, 2018

A. USE OF ONLINE PLATFORM IN HOUTPLEIN

1. What was your function in the project?

I was the traffic design engineer. I took over the Houtplein project from a colleague who left W+B.

2. When did you take over the project?

In August or September.

3. How did you use the online platform in the design process? Did you use any of the data from it?

Not in particular. Of course the comments from the people on the subject. I have seen them, and I have the official remarks and need to write the reaction on them. I don't know what the origin of those remarks is, is it the moments of the people at the events or do it via the Houtplein inbeeld. Not sure what the origin of the remarks is.

4. Do you mean the origin of the public remarks or our response to the people?

We got the response from the people. They could do it in different ways. So the community evenings with the drawings. Of course there they made the remarks and they could you use Houtplein Inbeeld for their remarks, but not sure what way they used. So I can't see the origin of the remarks, so I don't know.

5. You don’t know why they have decided to submit the remarks?

People make remarks, the people who live there they could use the website but also the community gatherings. Of course some like to use the internet while others like to be at the events because they want to see and talk to people. That is different, and that is the way it is now, you have both ways and can profit from them both.

6. Were the comments from the public used in the design in some way?

Yes, people were complaining not about the details of the design, but more about the principles and routing. There were some complaints.
B. HOUTPLEIN DESIGN PROCESS

1. How did we change from design variants to the final concept design?

We had three concepts shown to the public. Not that we have to use one of these, but they were selected because of the different elements of it. So all different elements were spread across the different variants. So we can test every aspect. What we did is we took all the comments and made a new variant. Then we built one, and it was close to one of the three but with some differences.

2. In the current design process, is the square of Houtplein still going to be car-free?

It is car-free, so there is no interaction besides the intersections. There is no interaction between the car and busses. But the cars are allowed to drive here in one direction together with the bikes. It is a car-bike lane. Because how to get there is quite difficult, we expect that there will be less traffic because only people that need to be there will go.

3. (Gesturing on the map) Would it be difficult to get there?

Yes, that was a bit too much but in the actual situation right now, there is a route like this, and that is through traffic.

Which one was the through traffic?

This one. That traffic is away now. However, we still have the same route to get here.

There is no way for the car to come this way anymore?

No, not anymore. So they have to go back to this route either like this or like this. We expect only people who have to be there to take the route. Then you get fewer cars.

Only destination traffic.

Yes, only destination traffic.

Other than the bus station here, I remember in the concept design that additional bus stations would be put here?

No, they would be here. Here also the bus is stopping. They have no special bus pockets. They just stop on the street. That is why it can stay green mostly.

4. Is this almost the final design?

Depends, the province office, they are a stakeholder but then a three times stakeholder. Because they have the office here, so they are stakeholder like others but also the stakeholder because of the money. They need to subsidise it, and they are a stakeholder because they have a certain vision on the public transport. That is a little bit mixed, especially the last two ones. Because they have to give the money and they have a different vision about the public transport than the municipal has.
This is designed with bikes and they get priorities and busses have to wait for them. But the province says, no we want a design where the bikes have to wait for them. That is a big discussion where the other people are not so happy with. But I assume they prefer their choice of the municipality to give the bikes the right of way.

Especially the bikers’ association, they really want to have bikes right of way. They are very strong in Haarlem. You have the bikes that do just want they want. But you also have the groups who wish to promote biking. They have political power. They are very strong about everything about biking, sometimes it is too much and other times good. In this case, in general, they like this design, they have some complaints about the details, but this is what they want. This is also what the municipality wants, but if the province doesn’t want to give the money, then the project stops. That is quite something for a discussion. They have the blocking power. That is not related to the Houtplein in beeld, that is on a different level.

5. How many of the public comment would you say were helpful in the design?

I don’t know the difference between the meetings and which from the other ways. But I can just give an example in general. Most of the time, they are useful because they are much the same so you can easily put them in groups. Such as shops, they want the customers, and they see certain problems. You have the people who live there, they have their own cars and say get rid of all those buses. So there are different groups of remarks. Remarks about the buses are not a problem because there is in another decision that the busses have to stay. That’s just the start of the issue and is not a problem, just a discussion, and we can explain to them that the municipality already decided the buses have to stay there. That is a starting point for this design. But how you can get to the shops with your car, as the shop owners want people with their cars to be able to get there. That is a problem. Because of their complaints, we decided to change the design and not so much the design but the routing. Because the design if you look at it from a distance it looks almost the same, but it is the routing that has changed.

6. Has the routing been designed on the basis of everyone’s wishes?

Yes.

C. HOUTPLEIN PUBLIC PARTICIPATION PROCESS

1. How has your experience with the platform been?

It is good to know what is the reaction of the three versions, which were shown in Houtplein in beeld. Because I have a feeling that there was a more positive reaction than in general. Most of the time you only get the negative reactions. I dont like this, so you have to do it differently. There were quite a number of reactions, we like the plan just not this little detail. But in general we like the plan. I don't know whether it is just Houtplein in beeld or in general, I think that is positive.

2. Would you say the public’s responses were more positive than the traditional way in the meeting rooms?
It could be. I don't have exact proof of it. I think it could be because of the way Houtplein in beeld was presented very low key. You have people who live in Houtplein or the neighbouring streets, but not people who live a little bit further away.

I think it would be interesting because most of the time in a process like this we have a lot of people just from the small circle. The project is not just for the people who live there, but it is public space for everyone, so also of the people living around. So it is interesting to see the difference between working with Houtplein in beeld and with the internet like this. It will give more information about the opinion of the people living around it because the road users are normally not questioned. There was a nice thing, which was a simple one, not sure where it was but they had a sign and it said if you like this new road blink with your headlights. And they had a sensor in it to sense it, that way they could very easily communicate with the people passing. Very low key. That was a nice way to get people involved who normally don't get involved. It is always looking around if you organise a meeting in a restaurant very close to it, so people can easily come. But it is very difficult to reach other people and I think this is a good way to reach more people. So I wonder how effective it really is. But probably you can say something about it.

3. Regarding the design process, how much influence do you think the public comments had on the design?

I think substantial, because of the complaints and also, in general, comparing to other cities. If there are serious problems, they will be taken seriously. But sometimes you need to make a strategic choice. For example, take the cars or give the buses the right of way or not and relate it to choices. On a higher level I think there is not too much, that's what the politicians want, and they have tested it before already. Because they don't want to take back their ideas. So I think in general they try and talk a little bit here and there, find out how it will be and if they think it will be good, they make their choice. So on the strategic level, certain decisions are made, and it will not change because of the public, it is only just a go or no go.

4. The outline of the project and the main decisions were already made?

The main decision in design, the most crucial decisions were already made. It's take it or leave it. If you want Houtplein redesigned, then we have to do it this way. If you don't like this way then its simple then we don't redesign it. If you don't like the current situation, then you are in bad luck. You have to do it, and I think that's the politician's way of handling things like that. They are not going to make principle changes in the design.

5. Do you think the in beeld website has had any influence on the design quality?

The problem is when you look at the design, the landscaper has a problem because he wants to put his efforts in this area because it is the widest area. But the way the design is now there is a lot of space for the bus, so they can only do something in the margin. So in that way there is not much influence. It is just a little bit more green. There was the discussion about the trees on which side of the road and how big they can be because they take the light away and the leaves are falling and such little things.
In the landscaping there is not better quality, but I’m not sure about the quality of design as it is a route replanning. The main thing is changing the route organisation of this area. To define the quality of a design, that is difficult. It is just puzzling on centimetres, that’s really a problem on this location. The buses do play an important role in this as they take so much space. It is the starting point, and we have to deal with this amount of buses. What we did do is look a little bit to the future, so if there will be once in a time, less buses is also a good design. Then you can reuse the space for the buses and the design can work also. But as long as there are buses, a perfect design is very difficult. We have bikers here and there. We have buses and cars that have to get here. There is not so much space for design freedom, for example, the landscape architect.

D. HOUSE OF QUALITY CRITERIA

1. Would you comment on this evaluation criteria in the context of the Houtplein project?

In this case, I would say the pedestrian should have more weight. And maybe a little bit against the bikers, in general, I would say pedestrians, bikers, residence. Give them all 10% and the motorist 0% and the public transport users I would say start it with 0%, and it is not a final choice, but if that is the way to look at remarks or what to do then it would be interesting to see what would be happening then.

I think when so close to the old city with the user impact of the pedestrian and most residences are pedestrians even if they walk to the car. The pedestrian impact should be more especially in locations like this. It should be more emphasised. I think at this point it should be the most important. The other problem, environmental, cultural impact are very abstract. Suggested visibility, cost of implementation related to the other percentages these hardly can make a difference.
APPENDIX 6 INTERVIEW TRANSCRIPT D

Interviewee position: Project Manager

Organisation: The Municipality of Eindhoven

Project: Vestdijk

Date: January 17th, 2018

A. VESTDIJK PROJECT BACKGROUND

1. What was the story behind the project?

Where I will start with you is the history of the Vestdijk as a project. What was the main reason to do this? It was mainly two things. First, it was in the document the vision of the council of Eindhoven traffic in 2030. It’s a document called Eindhoven on route. Unfortunately, it is only in Dutch and is very thick, and you can find it here. In the document it is decided in November 2030 that Eindhoven has to pay more attention to pedestrian and cyclist and the car is a guest. It’s a completely different vision than we had 20 years ago. When you approach Eindhoven from north, south, east, west it has all big lanes for much traffic to the centre. There are lots of shops a lot of bars etc. That was in the early 70s, we rebuild and rebuild and it is similar to Amsterdam. A lot of bombs were dropped in the centrum. There are two big companies, DAF and Philips. They started 150 years ago here. It’s nice to visit. They also had the history and the history of how Eindhoven is growing. It used to be a tiny village it had lots of small neighbourhoods but still are separate from Eindhoven. Due to the influence of Philips more people wanted to work in Eindhoven. About 20 thousand a year, that was a lot of people back in that time. Now it’s different, it’s gone and the main HQ is in Amsterdam. What I want to try and tell you is that it makes the changes and vision of the car will be the guest in our centre. About 30 years ago the car was the most important vehicle to use to get here. We had lots of parking places, and people come from different directions. Their first question was where can I park my car. We decided to change our thoughts and it’s a difficult one, a lot of politics. Do people like it. We don’t know, how do you find out. So we make an analysis from our stakeholders projecting on the Vestdijk. We found that back in 2016 when we started with Vestdijk — facing our decision from our council in 2030 to invite the cars as much as we can. Forbidding them is impossible. Its further away, perhaps 2040, but we don’t know that. The car will always be the guest in our city even if it is an electric car. But an electric car needs a space to park. Every parking place in a circle environment you can choose a ride. You can choose asphalt for the parking place but you can also choose more green, restaurant. Which is better for the environment. In 2016 there was a program from the national government, we had some meters for air pollution. One is the traffic idea and will bring back the motor traffic for the pedestrians and cyclist you increase it, especially the in centre of Eindhoven. It is not one-night thing or fortnight but costs a couple of years.

When we were positive about the two ideas of changing the whole centre, where Vestdijk is the first step. You have Eindhoven here and in Eindhoven itself and the ring around Eindhoven.
Online Interactive Public Participation Process | Flora Bai

We have an outer ring and an inner ring, that one is here, and this is Vestdijk. We call it peanut because it looks like it. This Vestdijk on one particular part near the central station there was huge air pollution about 40% higher than the level of the EU commission told to keep to. What actually was a traffic project became another project. Which solution do we have for the air pollution? Concerning that you can say we make some analysis, we stop the traffic and no cars will enter from the south. It’s a ring and you can also enter with your car from the south to the north. That was the biggest problem from the air pollution. About 60000 cars per day just on one tiny road every day. But they didn’t visit Eindhoven, just passing through. Sometimes with some festivals it was 200000. A lot of cars have to go to the north and didn’t take this one, it was about 5mins longer which is not much longer. But they thought it wasn’t their priority to get to the ring and actually it is not true. Just taking care of your green priority there and not in the centre. So a lot of cars go like this and go to the Vestdijk and to the north. That was the main reason for the air, and the Dutch government gave us some money to start with it, about 4 million euros. And they said, go ahead and solve the problem. Otherwise, the whole centre is blocked. You can do anything about, nothing is allowed. To hold festivals, to build apartments for living because of the air pollution. If you solve it you can go further with your ideas.

The Vestdijk about 2 years ago had a cycle path from north to south in one direction and at another part from south to north which is separate directions. Now you have just one. From two to one and one lane for the bus. These were the first ideas two years ago before we started our management wanted to know the scenario and our ideas. How will it fall with the civilians and our stakeholders? Will they agree or not. We will investigate, but we have to be sure and need to be sure everyone will participate and agree with what we are doing. That is the first step in 2016 that W+B is involved with the VR thing. It was amazing also for them. So we invited the stakeholders and made an analysis of the stakeholders, who has a company, a bar or shop on the Vestdijk itself and also where the civilians lived. Two thousand civilians were living there and needed to be involved in the project as well because they are living there on the Vestdijk. But we would also get the big hotels around the corner and go back further north is the NH hotel and it is near the movies and the other side is the bank, and another side is another hotel at the end of the Vestdijk, the AH and then you have the central station. On the left side, you have the little block from glass and the Bijenkorf. That’s the beginning from our Vestdijk and we already started with it now. First go back, we wanted to collect the ideas from our stakeholders, what’s important for them. We had a lot of meetings with them with the VR glasses. Then W+B put the traffic situation like they want it to be in the future. Just one lane across and one lane for the bus and we put the bike path from south to north to the other one and make it bigger. Normally the bike path is about 2 meters for one direction, and now it is in both directions and about 4 meters. So we have a lot of space for us. So we invited the people and the stakeholders with civilians from restaurants and shopping malls. What’s important for you for the Vestdijk in the future. For example, you are sitting in the hotel, you got more space because the pavement will disappear. There is extra space to fill in and how would you like to see that filled in. With green, benches, trees. What can you imagine a terras with a restaurant. So you can sit outside to meet or work. Everything is possible. We had several meetings where people collected ideas for us, and we pointed out that W+B has done that for us. I have a restaurant here, and it is important that people can easily find my restaurant. But also that people can sit on the terras as well. However, for others its important that it has to be more
green than it is now. Now there are some trees but actually nothing. More green also for the climate as the Dutch government agreed at the climate conference and actually also the Eindhoven council finds it very important that we do something with our climate, it is a product that we have to take care of in this project as well. Also, what do you feel about green, about water, about car parking, about bike parking? And where did you want just a place over here or there? Or you don't care. It was completely mixed up with ideas and wishes and a lot of them we can fulfil them. It would really take place.

2. What do you think of the online public participation platform?

It is very useful for us, but also for anyone that wants to be involved in the project. We can fill in every comment, idea, wish, suggestion, you name it on that platform. But the most important for Vestdijk is the schedule. It has to be finished next year summer. By using this platform, you get in a short time a lot of wishes and ideas, and you can frame them from each subject from water to green, restaurant, everything that the stakeholders find important for them. It will be organised and realised in the project Vestdijk. The platform we use that for giving them feedback very quickly. We can see hundreds of stakeholders just in a time frame from three months you did everything. It goes that fast, and we have got some ideas, but the civilians and stakeholders also have ideas and perhaps better ideas than we have. So we talked to them online, I see you put it on our platform, and then the question comes for a kind of subject. We get an immediate answer, and we can take it with us, or it is too expensive or its technically realisable. So the platform was very useful for us.

3. As a client how satisfied are you with this platform and the overall delivery of the project?

In the beginning, it was new for us. We are used to working where we invite them to a big hall and make the drawings on the wall, and everyone was shouting and then it takes about 3-4 hours and next week again and again. It will be horrible when we do that for this project. That will be just chaos. So with the help of W+B to organise this and how we can do that better in a shorter time and in that short time we don't have all the answers but all the people will be involved and really involved. Also when they have suggestions, they can easily give them. It has to be easy for everyone to join us on the platform if it is too difficult it is not good.

4. Would you comment on how satisfied the public is with this project?

With this project you get people who are amazed at what you can create, but also ones who are more concerned, like the hotels or the management of the shopping malls. First two car lanes now just one, there will be fewer cars, and I fear less people. So you get always a balance from people who are against and who like it very much. Most of them I think is about 85%-90%.

5. That is about the design of the project?

Yes and also how we do it. And how the people are involved and every month from 2 years ago, when the first designs were ready. We involved in several meetings it was just like this, big table with all stakeholders. Well, go ahead. We want a bench and more parking and bike parking. With our specials from water to green to biking and pavement for light. Together we make this first drawing, but it became to what it is now. It is not only our idea. It's an idea from us but also the stakeholders together.
6. Which stakeholders were involved in this kind of meetings to sit down with you and draw on the map with you?

We have a kind of separation, the first one is the stakeholders first degree. These are the main stakeholders, who live or have their shop or work just on Vestdijk. These were the main people, like civilians, people who live there and work there.

7. These people were invited?

Every time, from the beginning till now. Still, we have every month a meeting where the stakeholders come. So what's up now? How is it going? There was a problem over here and there. A lot of cars and traffic and mess, they can spell it out. What is the reason? Why? Just interactive communication, where some things really go on for the hotel or the shops. They find those easily, just mail us or take the phone and we have a project team. That consists of three project managers, one with the content another with technique or the content of the project itself, the financials or legal issues, and one of them, which is my function, is the environment. Because it talk alot with the stakeholder, we know what's the problem and how do we solve it.

8. Has the budget and schedule changed compared with the start of the project?

It has doubled in the budget. We started with 4 million from the government, what do you want to do with that budget. Make the whole Vestdijk, climate, family, for traffic etc. just 4 million. I have to do that. The design company figured it out for us, and they said I guess it will be at least 8 million to 12 million. Now it is almost 12 million.

9. Was the design phase on schedule?

Yes, that was on schedule, just in time thanks to the platform used. It was very useful, but now we have some problems in the field.

B. HOUSE OF QUALITY CRITERIA

1. Could you comment on this evaluation criteria in the context of Vestdijk?

Environmental would be the biggest. It was one of the main reason why we reconstructed it. The local stakeholders were very important. Cultural impact was not that big, because the mainframe was on the environmental and climate and less car traffic. Priority for pedestrians and bikes were also important. Public transport users are already there and will continue to be there.
APPENDIX 7 INTERVIEW TRANSCRIPT E

Interviewee position: Project Manager
Organisation: The Municipality of Eindhoven
Project: Heezerweg, Korianderstraat and Mimosaplein
Date: January 17th, 2018

1. Why was the project done?
   It was bad, the technical state of this particular road was bad.

2. What public participation methods were used, was it done in with public meetings in a hall?
   Yes, also but before we started. I have some colleagues whose job it is to have contact and to be the intelligence officer between the neighbourhood and the municipality. So they already know what the concerns of the people are and the contacts. I use these colleagues to invite stakeholders. To come to my office to present the first plans and ideas. Secondly, there is a pamphlet in a later stage for the whole of the neighbourhood and delivered door by door, which gives information. A third what we do is with the main stakeholders. For instance an organisation with retailers or shopkeepers, they have usually some sort of, and I invite the board/president/chairman to my office. That is the third way that we do it. And the fourth form is when we are almost there and have a very definite plan we had an information market where we present the plans and are happy to answer any questions or concerns that they may have. That is usually a few months before we start. That is how it usually works. When the plans are definite then also on the website of the municipality it is shown. I think it is difficult for people to read this kind of designs. So we have a few artist impression which helps them to see what we will do. We give people the opportunity to ask, what it is all about.

3. Was this project on time?
   Yes.

4. And in budget?
   Yes, also in budget. It is more or less an internal procurement. We have more or less program managers whose task it is to set targets for infrastructure or housing or whatever. And they are also the one who gives it as a contract to me and have to do this within a certain time, for a budget and with that sort of quality.

5. What was covered in the design?
   For instance in Holland the bike is very important, so you see the red lines and we have made it safe. So there is some green space between the roads that the bikes can take and the grey part the cars use. That makes it, but it also requires some space and is a choice that we make.
You also have to look what's underneath, and underground infrastructure is also very important. Is it still up-to-date? Telecommunication is also part of the project.
Interviewee position: Project Manager

Organisation: The Municipality of Haarlem

Project: Houtplein + Nieuwe Groenmarkt

Date: January 22nd, 2018

1. What is your function in the project?

I am the project leader for both the Houtplein and Nieuwe Groenmarkt projects.

2. In terms of the project objective what was the municipality's priority?

For the environment or the people who live in Haarlem, we want to make a plan which matches the objectives of the people who live in the neighbourhood. So we wanted them to participate as early as possible. So for the steps we make in the process, they understand why we do it, and we want to know their objectives, so we can see if it matches with our objectives. So as early as possible we wanted to participate with the stakeholders, to at the end get a result that matched with the objectives of them. Normally we participate much later on, so we already have a sketch and thought what would be best in this situation. There can be a lot of disturbances because they think they are not being heard and that their objectives are not in the sketch which is presented.

3. Aside from providing bike parking places were there any other reason why the Nieuwe Groenmarkt project was done?

They wanted a new road, and we wanted to more bike racks. Also, the shop owners in the neighbourhood wanted more bike racks. So this was an opportunity to match those objectives.

4. For the Houtplein project, what was the main objective?

There was a need for road maintenance. It was necessary to maintain the road. That was an opportunity to redesign the square. We wanted to make some choices and make a good design for the future. So that more buses could go through Amsterdam and Haarlem and that doesn't match the current capacity of Houtplein. It was a different objective, and we wanted to realise it in a new design.

5. In Houtplein, the centre square was made into a car-free area. Was that the municipality's wish or was that from the public?

That was both. It was a wish from the municipality and also the people who live in this area, they didn't want cars there. So the objective matched.

6. What public participation methods were used in the two projects aside from the online platform?
Online Interactive Public Participation Process | Flora Bai

There was no online platform at the Groenmarkt, but we chose to organise design workshops so people can speak with us about their wishes. In the sessions, with all the input we made a few designs, what was possible. Then we spoke about the possible designs and few preferences. Which design they liked and with that input we made one good design sketch. So we can have a much wider public participation where everyone in the municipality can say what they like and don't like about the design. Three sessions and one public participation, a formal public participation where everyone in Haarlem can say what they like about the plan. Not every municipality does that, but in Haarlem we do.

7. Is the Inspraak you mentioned an event open to the whole municipality? And how does it take place?

Yes. During 6 weeks they can write letters or send an email. What they like and don't like. We call that an opinion and then we have to decide if we can add it to the design or not. There is one session during that period where everyone from Haarlem can come and look at the design and ask questions.

8. So the inspraak hasn’t been held for the Nieuwe Groenmarkt project yet because no final design has been made?

No, because during that process there was an idea to build an underground cellar. That is not part of our scope of the project. In our scope there was only a redesign of the surface and not an expensive cellar. So we are going back to the municipality board, the local council. To ask for more money to realise this plan and if we get the money, then we can restart with the new scope, if not then we have to concentrate our efforts to redesign the surface. That is why there is no decision yet. Right now in the Nieuwe Groenmarkt we don’t have a decision to go further. We haven’t decided which design to use for the public participation.

9. Has the inspraak been held for the Houtplein project?

Yes. There were 90 reactions, and we have to decide what to do with them. As of now, they are finalising the plan to go to the local council to decide if this plan is going to be realised. That process starts end of January.

10. What influence do you think does the online platform have on the design process?

I think it is positive. We always have a lot of discussions afterwards. Usually, people get to see the plans during the public participation. Then they have good suggestions, or there is a lot of resistance because people like to be taken along the steps. It is all about creating support during the process for the final design. That works better than when you show them a design which is finalized and they don’t have the idea, and there is a lot of discussion on how the plans are made and what decisions are made along the process. If you take them in that process, you create more support than when showing them a finalised design when there is little influence from the public to change the design.

11. Is the Houtplein still in budget now that it is in the final design stage?

Yes.
Online Interactive Public Participation Process | Flora Bai

12. Was more investment made because the online system was used compared to the traditional methods?

Yes, it costs more, but if you have a lot of discussions afterwards, it also costs money to repair or other changes that need to be made later on in the project. I think it is even in the end.

13. How was the public satisfaction with the participation project and the outcome?

The groenmarkt was good. Also from the clients perspective, there is a great support for the bike cellar or good service plan. For both plans there is support. Houtplein I think 90% is positive, there is one group of participants called "buskruii", they have a bigger problem with the municipality about the buses going through the whole city. Also in the centre, the buses which go through the Houtplein also go through the centre and other parts of, and they have a bigger problem than the buses through the city. They catch this opportunity to get their message heard. So they are trying to get their problem integrated into this project, and that is the 10% that is not positive. We cannot arrange their objectives into the plan because there already is an agreement signed with the bus company. We cannot get the buses off of Houtplein, that is not our scope. That is a much bigger problem that concerns all Haarlem. If you see the results of the public participation, I think 30% is positive, and 30% are problems that we will solve in the new design and 30% of the complaints are about the buses. So we can solve everything except the buses.

14. How satisfied was the municipality with these two projects?

We have presented the plans to them, they are positive but have some details that they want worked out and we can solve those in the new design. But the participants know how to get their problems on the agenda of the local council, so we get some resistance about the buses from the local council because the participants feed them with the problems. So there is some resistance but mainly about the buses and not about the plans.

15. Are you satisfied with how the online platform has worked out so far?

Yes. It is transparent to everyone, so normally it is quite anonymous, and people don't see what another person's wishes or complaints are. On the online platform, it is transparent to everyone and can react and know what the neighbours or others think about it. It is better for everyone.