STAKEHOLDERS' PREFERENCES FOR PARTICIPATION PROCESSES

Discrete choice experiments to examine neighboring stakeholders' preferences for participation processes in construction projects

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Author	J.J. (Jurjen) Wabeke – 0963247
Graduation committee	Prof. B. (Bauke) de Vries (TU/e)
	Dr. Q. (Qi) Han (TU/e)
	L. (Li) Dai (TU/e)
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Summary

In the past years, stakeholder participation in construction projects has become an increasingly important scientific and political concept. Although stakeholder participation is widely accepted to increase the quality of the decisions, the quality of the decision depends on the quality of the process that leads to it. Therefore, several studies have evaluated the quality of participation processes to identify features of best practices. Research on the stakeholder participation processes tends to focus on evaluating specific participation cases and existing literature, but the perspective of the stakeholders and quantitative methods are not sufficiently examined. Consequently, the objective of this study is to better understand stakeholders' preferences regarding attributes of participation processes using quantitative methods. Therefore, the following research question is formulated: "*What stakeholder participation process attributes are preferred by neighboring stakeholders in the Netherlands for participating in real-estate development projects?".*

A literature review provides a state-of-the-art overview of the benefits of stakeholder participation and element of best practices of participation. The most important benefit of stakeholder participation is that it improves the quality of decisions. By involving stakeholders in the decision-making, different interests and opinions are integrated into decisions, conflicts can be resolved, trust in decisions and institutions is generated, and stakeholders are informed and educated. The following attributes should be taken into account for participation processes: 1) The participation technique, 2) Timing of the first involvement, 3) Information provision, 4) The objective of the involvement, 5) The identification of relevant stakeholders, 6) The adoption of ICT's, and 7) Administrative.

The first four attributes are included in the experimental design and transformed into attributes and attribute levels. A combination of these attribute levels represents a hypothetical participation process alternative. Two alternatives are combined into a choice set, to which respondents in an online questionnaire indicated whether and in what alternative they would

most likely participate. The online survey also consisted of questions regarding experience, familiarity, and motivation for participation, and demographic information.

Quantitative methods are used to gain in-depth insight into the perceptions, motivations, and experiences of stakeholders regarding participation. To test if the familiarity and motivation for participation differ for demographics groups, Kruskal–Wallis and Mann–Whitney non-parametric tests are performed in SPSS. Discrete choice experiments are executed in NLOGIT to evaluate stakeholders' preferences for the participation process alternatives. First, a multinomial logit model compares the preferences for the attributes and attribute levels for the complete sample. Thereafter, a latent class model examines if classes with similar choice behavior exist.

A sample of 123 useful respondents is collected. Interestingly, the results suggest that males are more motivated to participate than females, this indicates that differences in motivation for stakeholder participation exist for different groups. The latent class model denotes that three groups with distinct preferences for participation processes exist. However, preferences for the timing of the first involvement and for receiving information are the same; stakeholders prefer to be involved for the first time in the design phase and they prefer to receive information from websites. For the objective of the involvement, stakeholders favor impacting the decisions, but the most preferred attribute level differs. In contrast, for the participation technique differences in preferences are identified. The attributes objective of the involvement and the moment of the first involvement are the most important for the majority of the sample.

Discrete choice experiments provide a powerful tool for gain insight into the preferences of potential stakeholders. The results of the analyses provide governments and project managers a practical guide and aid for executing participation processes. Therefore, it is recommended that further research should expand the experimental design to examine other attributes of participation processes.

Samenvatting

Stakeholder participatie in bouwprojecten is de afgelopen jaren zowel in de wetenschap als in de politiek belangrijker geworden. Over het algemeen wordt de kwaliteit van beslissingen verbeterd als gevolg van stakeholder participatie, maar de verbetering hangt af van de kwaliteit van het participatie proces. Daarom hebben verschillende onderzoeken participatie processen geëvalueerd om kenmerken van succesvolle processen te identificeren. Echter, focussen deze onderzoeken zich voornamelijk op gevalsstudies of bestaande literatuur. Hierdoor is het perspectief van stakeholders vanuit kwantitatieve methodes nog niet genoeg verkend. Het doel van deze studie is daarom om de voorkeuren van stakeholders voor participatie processen beter te begrijpen. Daarom is de volgende onderzoeksvraag geformuleerd: *"Voor welke attributen van stakeholder participatie processen hebben omwonende stakeholders in Nederland de voorkeur om te participeren in vastgoedontwikkelingsprojecten?".*

Om de voordelen en de kenmerken van succesvolle participatie processen in kaart te brengen is een literatuur studie is gedaan. Het belangrijkste voordeel van stakeholder participatie is dat het de kwaliteit van beslissingen verbetert. Bovendien, kunnen door stakeholder participatie processen verschillende meningen en belangen geïntegreerd worden in beslissingen, conflicten kunnen worden opgelost, vertrouwen groeit in de beslissingen en de organisatie, en stakeholders kunnen er van leren. De volgende kenmerken moeten in acht worden genomen voor participatie processen: 1) De participatie techniek, 2) Het moment van eerste betrokkenheid, 3) De informatievoorziening, 4) Het doel van participatie 5) Het identificeren van relevante stakeholders, 6) Het gebruik van ICT, en 7) Administratieve taken.

De eerste vier attributen zijn opgenomen in de proefopzet en zijn getransformeerd naar attributen en attribuut niveaus. Een combinatie van deze attribuut niveaus stelt een hypothetisch participatie proces alternatief voor. Twee alternatieven vormen samen een keuze taak. In een online vragenlijst gaven respondenten per keuze taak aan of en in welk alternatief

zij zouden participeren. In deze vragenlijst kregen respondenten ook vragen over hun demografische kenmerken, ervaring, bekendheid, en motivatie voor participatie.

Kwantitatieve methoden zijn gebruikt om inzicht te krijgen in de beleving, motivaties, en ervaring van stakeholders met betrekking tot participatie. Om te testen of de bekendheid en motivatie voor participatie verschilt per demografische groep zijn de Kruskal–Wallis en Mann–Whitney non-parametic tests uitgevoerd in SPSS. Discrete choice experiments zijn uitgevoerd in NLOGIT om de voorkeuren van stakeholders voor de participatie proces alternatieven te analyseren. Eerst vergelijkt een multinomial logit model de voorkeuren van de gehele steekproef voor de attributen en attribuut niveaus. Vervolgens, onderzoekt een latent class model of klassen met soortgelijke voorkeuren bestaan.

Een steekproef van 123 bruikbare respondenten is verzameld. De resultaten suggereren dat er verschillen zijn in motivatie om te participeren voor verschillende groepen, mannen zijn bijvoorbeeld gemotiveerder om te participeren dan vrouwen. De resultaten van het latent class model wijzen erop dat er drie groepen zijn met verschillende voorkeuren voor participatie processen. De voorkeuren voor het moment van eerste betrokkenheid en informatievoorziening tonen gelijkenissen. Stakeholders geven voorkeur aan om voor het eerst betrokken te worden in de ontwerpfase en dat zij informatie over het project ontvangen via websites. Stakeholders verlangen om invloed te hebben op de beslissingen, maar het meest favoriete attribuut niveau voor het doel van de participatie verschilt per klas. Voor de participatie techniek zijn daarentegen verschillende voorkeuren gevonden. De attributen het doel van participatie en het moment van eerste betrokkenheid zijn het belangrijkst voor het grootste deel van de steekproef.

Discrete choice experiments zijn handige methodes om inzicht te krijgen in de voorkeuren van potentiele stakeholders met betrekking tot participatie processen. De resultaten van de analyses bieden overheden en projectmanagers een praktische leidraad bij het uitvoeren van participatie processen. Daarom wordt er aanbevolen dat vervolgonderzoek gedaan wordt naar andere attributen van participatie processen met deze methodiek.

Abstract

Stakeholder participation can increase the quality of decisions, but the quality of a decision is determined by the quality of the process. Although several researchers identified features of best participation practices, the perspective of the stakeholders and quantitative methods are unsatisfactory explored. Consequently, this study aims to increase the understanding of stakeholders' preferences regarding features of participation processes in real-estate development projects using discrete choice models.

A literature review produced a state-of-the-art overview of the advantages and features of best participation practices. The core advantage of stakeholder participation is that it enhances the quality of the decisions. A selection of the features is transformed into attributes and attribute levels. These attribute levels represent hypothetical participation process alternatives and are combined into choice sets with two alternatives. Respondents indicated in an online questionnaire in what alternative they most likely participate. The experience, familiarity, and motivation for participation, and demographic information of respondents are also collected.

Descriptive analyses, multinomial logit - and latent class models on a sample of 123 respondents established insights into stakeholders' preferences for participation processes. Strikingly, males are more motivated to participate compared to females. Stakeholders' preferences for attributes of participation processes show similarities and differences. Stakeholders prefer to be involved for the first time in the design phase and they prefer to receive information from websites. For the objective of the involvement, stakeholders favor impacting the decisions. In contrast, for the participation technique differences in preferences appear. For the majority of the sample, the attributes objective of the involvement and the moment of the first involvement are the most important.

Keywords:

Stakeholder participation, participation process, discrete choice experiments

List of Abbreviations

ICT	Information and communications technologies
K-W	Kruskal–Wallis
LC	Latent class
MNL	Multinomial logit
M-W	Mann–Whitney

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1 Introduction

1.1 Problem definition

Currently, stakeholder participation in construction projects is increasingly investigated and becomes legally more important in the Netherlands. Stakeholder participation is the process where affected communities are involved in governmental and corporate decision-making (Creighton, 2005). The core value of this is that stakeholders have an opportunity to influence decisions that affect them (International Association for Public Participation, 1990; Uittenbroek, Mees, Hegger, & Driessen, 2019). The fundamental purpose of stakeholder participation is to enhance the quality of the decisions (Luyet, Schlaepfer, Parlange, & Buttler, 2012).

Participation is an important aspect to increase the success of construction projects (Erkul, Yitmen, & Celik, 2020; Leung, Yu, & Liang, 2013). For that reason, the new Dutch environmental code states that stakeholders should be involved in the decision-making process of projects that affect their habitat at an early stage to bring interests, opinions, and creativity to the table promptly (Stb. 2018, 290, p. 134). Moreover, the new code states that project initiators need to indicate whether they involved neighboring residents in the development of plans, how they involved the residents, and what the outcome of this involvement was (Informatiepunt Leefomgeving, n.d.).

Although stakeholder participation is widely accepted to increase the quality of the decision, the quality of the decision depends on the quality of the process that leads to it (Reed, 2008). Therefore, different studies attempted to identify features of successful participation processes (e.g Brody, Godschalk, & Burby, 2003; Storvang & Clarke, 2014; Vente De, Reed, Stringer, Valente, & Newig, 2016). These studies established that among other things the following features should be carefully considered in participation processes: the selection of participants that are involved, the moment participants become involved for the first time, and the information provided to participants (Brody et al., 2003; Storvang & Clarke, 2014; Vente De et al., 2016).

However, research on the stakeholder participation processes tends to focus on evaluating specific participation cases and existing literature, but there has been done little work exploring the perspective of the stakeholders using quantitative methods. To gain a fuller understanding of how to involve stakeholders, in-depth quantitative research is required (Uittenbroek et al., 2019; Yang & Pandey, 2011). Focusing on stakeholders' perspectives can help develop more robust theories regarding the quality of participation processes (Maguire, Potts, & Fletcher, 2011). While, satisfactory consideration of stakeholders and understanding their preferences for the design of participation processes, result in more effective processes and satisfied participants (Erkul et al., 2020; Fung, 2015). Consequently, this study aims to increase understanding of stakeholders' preferences regarding features of participation processes. Quantitative methods will be used to gain in-depth insight into the perceptions, motivations, and experiences of potential stakeholders.

To investigate stakeholders' preferences regarding features of participation processes, this research focuses on the specific context of neighboring stakeholder(s) of real-estate development projects in the Netherlands. Real-estate developments are selected while stakeholder participation is a crucial factor in these projects (Martinez & Olander, 2015). Additionally, it is expected that this sector requires more insights into participation processes (Ng, Li, & Wong, 2012; Storvang & Clarke, 2014). For the geographical context, the Netherlands is selected while this country faces a shortage of houses, and the government wants to increase the involvement of stakeholders in development projects. The Netherlands faced a shortage of 331.000 houses in 2020 and aims to develop 845.000 houses before 2030 (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2020). Stakeholder participation becomes legally more important in the Netherlands (Stb. 2018, 290, p. 134).

1.2 Research questions

Stakeholder participation provides many advantages for the development of construction projects. This study aims to increase the available knowledge regarding the preferences of neighboring residents for participation processes in real-estate development projects. The higher purpose of this is to enhance participation processes by providing project managers with more information or directions to design participation processes. Therefore, the following research question is formulated:

- What stakeholder participation process attributes are preferred by neighboring stakeholders in the Netherlands for participating in real-estate development projects?

To answers this research question, the following sub-questions are constructed:

1. What are the advantages of participation processes?;
2. What attributes should be considered for successful participation processes?;
3. Are there differences in willingness to participate and familiarity with the concept of participation for different demographic groups?;
4. What attributes are important in participation processes of real-estate development projects and to what degree?; and
5. Are there differences in preferences regarding the participation process in real-estate development projects for different groups?.

1.3 Research design

The research design describes the procedures and the components of the study; it includes the plan for the collection, measurement, and analysis of data. For this research, the design is visualized in Figure 1.1. The research is divided into three stages: literature review, data collection, and finalizing and concluding.

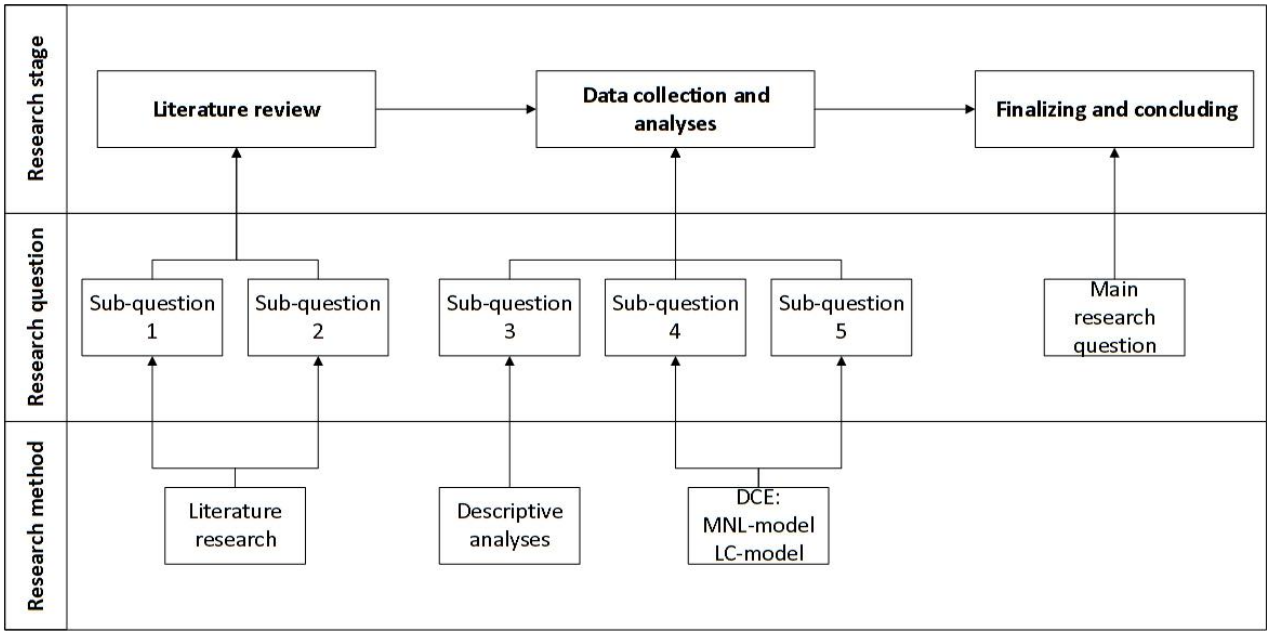

Figure 1.1: Graphical representation of research design

After the literature review, the first and second sub-question are answered. The goal of these sub-questions is to gather knowledge about the concept of stakeholder participation. The first sub-question aims to understand the potential of involving stakeholders in construction projects. First, by reviewing general scientific studies about stakeholder participation and then only focusing on articles specifically for the construction sector. The second sub-question aims to increase understanding of the design of participation processes. Moreover, to identify what factors or attributes should be considered for a participation process and to identify corresponding attribute levels. This sub-question also reviews articles that are general and specific for the construction sector.

Subsequently, the data analyses and collection phase starts with developing an experimental design. For the creation of the experimental design, hypothetical participation process alternatives are created. The alternatives are based on selected attributes and attribute levels derived from the literature review. These alternatives are included in an online questionnaire and participants indicate in what alternative they are most likely to participate. This survey is distributed during the data collection phase. The survey also includes general questions regarding experience and motivation for participation and demographic information about the respondents are collected. Thereafter, data analyses are performed on the collected data. The goal of these analyses is to transform the quantitative data into useful information regarding the preferences of potential stakeholders for participation processes. Hereby, the third, fourth, and fifth subs-questions can be answered. The third question is based on the answers to the general questions and the demographic information of respondents. The question is answered by comparing the means of the different groups by executing descriptive analyses. The other two sub-questions are based on the answers about what alternative participants are most likely to participate in. The analyses performed are discrete choice analyses.

In the finalizing and concluding stage, the answers to the sub-question are used to answer the research question. After, answering the sub-questions pronunciations can be made about the preferences of neighboring stakeholders for participating in real-estate development projects.

A disadvantage regarding discrete choice experiments is that it assumes that selected attributes and attribute levels represent a participation process. It could be argued whether this is a realistic representation of a real-world participation process since not all factors can be included. The size of the experiment limits the number of attributes included in the analysis. Moreover, not every aspect of participation processes is included in the analysis as it cannot be represented in an attribute and or attribute levels. Regarding the data collection, two limitations could appear. First, the number of participants could be too low. Secondly, a selection bias could appear; one demographic group might be over-or under-represented in the sample.

1.4 The relevance of thesis

This section explains why the concept of stakeholder participation is scientifically and socially relevant.

1.4.1 Scientific relevance

Stakeholder participation is a regularly investigated topic in existing scientific literature. This research sheds new light on current knowledge about stakeholder participation by using a different research approach and evaluate the process from the perspective of stakeholders. Existing literature seems to exploit the perspective of stakeholders not enough, consequently, this research distributes a questionnaire among potential stakeholders. Moreover, this paper describes a new quantitative approach to evaluate stakeholder participation processes, while existing literature appears to mainly use literature- and case studies. Consequently, this study reviews and compares previous findings regarding stakeholder participation from a different perspective and approach.

1.4.2 Social relevance

While it is broadly established that stakeholder participation processes enhance the quality of the decisions, society will benefit from this study as the findings can increase the quality of participation processes. Moreover, as described above, a core value of the new Dutch environmental code is to involve citizens promptly in the decision-making of projects in their living environment. The findings of this study increase the understanding of how this involvement can be implemented for the construction of real-estate development projects. The Dutch government benefits from this because they can provide initiators and project managers more directions to stage participation processes. Similarly, while initiators and project managers are encouraged to increase the involvement of stakeholders in the decision-making, they will benefit from the findings as it increases the practical knowledge of participation processes. Finally, stakeholders could benefit from this, while the participation processes can be designed more according to their preferences.

1.5 Reading guide

This paper is organized into five sections.

The first section gives a brief overview of the research problem, design, and relevance.

The second section reviews relevant scientific literature regarding stakeholder participation. It starts with explaining the concept and the origin of stakeholder participation. Thereafter, the advantages of stakeholder participation are elaborated. This is followed by a review of existing literature regarding stakeholder participation in the construction sector. In the next section, existing literature on the design of participation processes is reviewed. This review is dived into two parts; the first part evaluates the research outcomes and the second part the research methods. Some conclusions regarding the existing literature are drawn in the final section.

The methodology of this research is outlined in section 3. This section begins by explaining the research cycle applied in this research. Thereafter, the steps taken for the data collection and analyses are elaborated. The theoretical background regarding the statistical analyses is discussed in the last section.

The next chapter presents and explains the results of the analyses. This chapter begins with the results from the descriptive analyses to indicate the representativeness of the sample. Subsequently, the results from the analyses on the general questions are presented. The derived discrete choice models are presented in the following sections. Some conclusions are drawn in the final section.

The fifth section presents the conclusions of this study. This section begins with answering the sub- and main research questions. Followed by discussing the scientific and social relevance of the findings. In the third section, recommendations are elaborated.

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2 Literature review

To search for relevant publications the databases of Google Scholar, Proquest, and Web of Science are used. The keywords used to search in these databases were for example: “stakeholder participation”, “citizen participation” or “public participation”, or “stakeholder involvement”. In addition, to collect relevant articles for the construction sector keywords like “construction project”, and “infrastructure project” are added. Additionally, keywords such as “design”, “process”, and “features” are included to derive articles that discuss characteristics of participation processes. To evaluate the relevance of a publication the abstract is reviewed. Subsequently, are relevant articles added to a database. Interesting articles in the references of the collected articles and the articles that cited relevant articles are also evaluated.

2.1 Introduction to stakeholder participation

2.1.1 The concept of stakeholder participation process

In the field of participation, several definitions of stakeholders, public, citizens, and community can be found. Consequently, these concepts are not used consistently, and the distinction between these concepts is more likely to generate confusion than simplification (Kessler, 2004; Luyet et al., 2012). Therefore, these concepts are assumed to be synonymously in this study in line with Kessler (2004). However, this study prefers to use the term stakeholder, because the public can be considered as one specific stakeholder (Kessler, 2004; Luyet et al., 2012). Moreover, throughout this paper, the terms participation, involvement, and engagement are used interchangeably in accordance with Kessler (2004).

Different definitions of the concept of participation are identified in the existing literature. A participation process can be defined as: “the process by which public concerns, needs, and values are incorporated into governmental and corporate decision-making” (Creighton, 2005, p. 7). Reed (2008) defines stakeholder participation as: “a process where individuals, groups and organizations choose to take an active role in making decisions that affect them”. Similarly, Luyet et al. (2012) used the following definitions: “a process through which stakeholders influence and share control over development initiatives and the decision and resources which affect them”.

This paper follows the definition of Creighton (2005) while he describes the process more specifically. In contrast to his definition, this paper interprets the public as stakeholders.

In this paper, the Oxford English Dictionary (n.d.) definition of a process is used, namely: “a series of actions or steps taken in order to achieve a particular end”. Stakeholder participation involves an organized process to ensure the involvement of stakeholders (Creighton, 2005). Throughout this paper, this organizational aspect of participation processes is the study object.

2.1.2 The origin of stakeholder participation

Stakeholder participation is not a new concept; it has been around for a long time. Already, in the renaissance citizen were invited to participate in the design process of the Duomo, a cathedral, in Florence (Creighton, 2005). In the past centenary, the concept of stakeholder participation has received increased attention from researchers and politicians and has been advanced greatly since (Hickey & Mohan, 2005; Reed, 2008). The following noticeable stages of stakeholder participation progression are identified by Reed (2008):

- 1960s: awareness-raising of the concept of participation
- 1970s: start to incorporate local perspectives in planning projects
- 1980s: the creation of participation techniques to incorporate local knowledge in decision-making
- 1990s: participation becomes more the standard method for sustainable developments
- 2000s: growing criticism regarding participation due to its limitations and failings
- 2005: post-participation evaluation of successes and failures increase the consensus on best practices

2.2 The advantages of stakeholder participation

As described above, the core value of stakeholder participation is to enable stakeholders that are affected by a decision to influence that decision (International Association for Public Participation, 1990; Uittenbroek et al., 2019). Existing literature identified a wide range of benefits for involving stakeholders in the decision-making. This section is structured by the five benefits found in the empirical research of Beierle and Cayford (2002). They analyzed a data set of 239 public involvement processes in environmental decision-making in the United States (US) from a few hundred existing scientific studies.

The most commonly discussed advantage of stakeholder participation is that it can improve the quality of the decision (Beierle & Cayford, 2002; Creighton, 2005; Luyet et al., 2012; Reed, 2008; Simonofski, Vanderose, Clarinval, & Snoeck, 2018). Beierle and Cayford (2002) reviewed 172 cases with eight quality criteria to conclude that the majority of the decisions had been improved by involving stakeholders in the decision-making process. Figure 2.1 presents their findings, where low, mid, and high represent whether the quality, respectively is decreased, remained the same, and increased (Beierle & Cayford, 2002). The quality of the decisions can be advanced from stakeholder participation in different manners. The most straightforward way relates to more information inputs available in the decision-making process. Logically, by involving stakeholders more information is available for decision-makers, which results in better-informed decisions (Beierle & Cayford, 2002; Creighton, 2005; Reed, 2008; Reed et al., 2018; Simonofski et al., 2018). Moreover, stakeholders frequently own essential information about the local circumstances and have increased awareness of issues (Beierle & Cayford, 2002; Creighton, 2005; Luyet et al., 2012). For instance, Uittenbroek et al. (2019) evaluated three participation cases in the Netherlands and stated that participation increases the quality of the decisions by harnessing local knowledge and information. Secondly, the quality of decisions can be improved by more creative problem solving and innovative ideas as a result of involving stakeholders (Beierle & Cayford, 2002; Creighton, 2005). Frequently, new alternatives are considered by decision-makers as a result of involving stakeholders and stakeholders can obligate decision-

makers to rethink assumptions that could prevent them from seeing the best solution (Creighton, 2005).

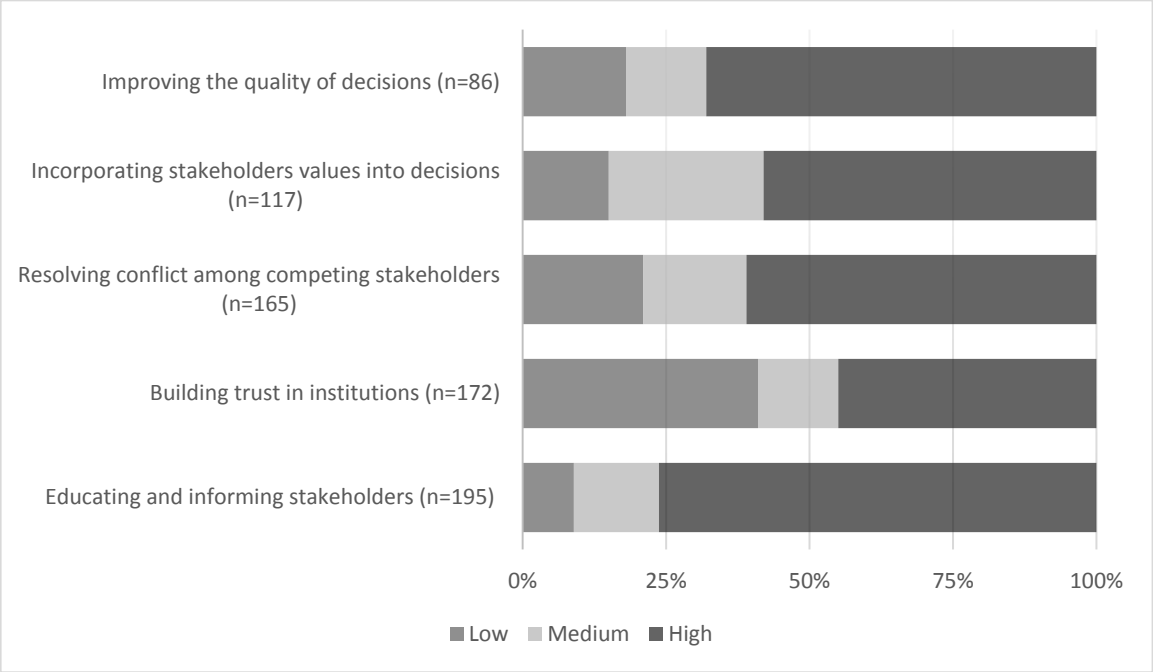


Figure 2.1: Evaluation of benefits of participation processes

Note. Adapted from "Democracy in practice: public participation in environmental decisions" (p. 23), by Beierle, T. C., and Cayford, J., 2002, Washington: Resources for the Future.

Several studies, for instance, Beierle and Cayford, (2002) and Luyet et al. (2012) appoint the integration of various interests and opinions to be a benefit of stakeholder participation. Beierle and Cayford (2002) assumed that any influence of participants on the outcomes of the participatory process reflects the values of the participants. From evaluating 195 stakeholder participation cases, they concluded that in the majority of the cases the stakeholders impacted the decisions. Figure 2.1 reports the findings where high, medium, and low represent the amount of input or changes of stakeholders on decisions. Similarly, a literature study concluded that integrating local and scientific knowledge increases the understanding of complicated and dynamic systems and processes (Reed, 2008). Moreover, project management can anticipate

better stakeholders' concerns and attitudes as a result of participation processes (Creighton, 2005).

Moreover, different studies reveal that participation enhances the stakeholders' acceptance of the decisions resulting in increased ease of implementation (Creighton, 2005; Kessler, 2004; Luyet et al., 2012). After evaluating existing literature, Kessler (2004) claimed that participation increases stakeholders' compliance to the outcome since they possess more understanding about, and are more committed and supportive to the process. Similarly, by participating in the decision-making process, stakeholders perceive ownership for the decisions, and they support it and want it to be successful (Creighton, 2005). Subsequently, the ease of implementation of the project is increased due to more support for the decisions (Creighton, 2005; Luyet et al., 2012).

Another benefit of a stakeholder participation process is that it can resolve conflicts among different interests. From evaluating 165 participation cases that involved conflicts, Beierle and Cayford (2002) found the majority of conflicts to be resolved or improved after the process. Their attention was on conflicts between stakeholders and Figure 2.1 reports their results, where high, medium, and low represent, respectively conflict are resolved, conflicts are partly resolved and conflicts are not resolved or conflicts are worsened (Beierle & Cayford, 2002). Similarly, a review of existing literature claimed that participation could eliminate conflicts between stakeholders and project management (Creighton, 2005). A more recent literature study revealed that participation processes are able to decrease and resolve conflicts by developing trust and learning among stakeholders (Reed et al., 2018). In addition, a case study in the Netherlands suggested that participation processes help to the identification and resolution of conflicts (Uittenbroek et al., 2019).

Stakeholder participation processes generate increased trust in decisions and executive organizations. Different literature reviews revealed that stakeholders' trust increases if they are provided opportunities to share their needs and concerns and if they perceive the process to be

transparent (Kessler, 2004; Luyet et al., 2012; Reed, 2008). After analyzing the change in stakeholders' trust about organizations' credibility or competence in 86 participation processes, Beierle and Cayford (2002) found that the amount of trust generated at the end of the process was either high or low. The results of their study are presented in Figure 2.1, where high, medium, and low are respectively defined as trust generated by the participation process, trust was enhanced moderately or only among a subset of participants, and trust decreased or was not improved (Beierle & Cayford, 2002). From reviewing past literature, Reed (2008) concluded that decisions emerging from participation processes are associated with enhanced public trust.

Furthermore, stakeholders can be educated and informed about project issues as a result of involvement in the decision-making process (Beierle & Cayford, 2002; Creighton, 2005; Luyet et al., 2012). As shown in Figure 2.1 the majority of stakeholders in 117 participation cases learned a lot about the decision-making issues (Beierle & Cayford, 2002). Public participation programs will also leave the public more informed of the reasoning behind decisions (Creighton, 2005). Moreover, participation processes can develop social learning because it enables deliberation among participants (Luyet et al., 2012; Uittenbroek et al., 2019).

2.3 Stakeholder participation in the construction sector

Recently, there has been increased attention on stakeholder participation in the construction sector. For instance, in the construction industry of Hong Kong, stakeholders are more frequently involved in the decision-making process (Yu & Leung, 2018). Furthermore, construction projects are projects people want to participate in; in 30 different focus group discussions, housing development and planning, specifically rural housing, was one of the most often mentioned issues for which people wanted to participate (Lowndes, Pratchett, & Stoker, 2001).

Different researchers emphasize the importance of stakeholder participation in construction projects. Due to the complex character and the wide variety of stakeholders affected by property developments, stakeholder participation is crucial to provide opportunities for communication and interaction between various stakeholders (Martinez & Olander, 2015). After reviewing 110 publications, Chan and Oppong (2017) concluded that different sets of distinct and similar interests arise from construction projects and that these can represent a threat or an opportunity to project outcome. Therefore, they recommended that the consideration of external stakeholders is crucial and critical in construction projects, especially at the design and planning phase of projects (Chan & Oppong, 2017). Moreover, several studies found that involving stakeholders in the decision-making of construction projects increases the likelihood of project success. Heravi, Coffey, and Trigunarsyah (2015) conducted a literature review and performed Kruskal–Wallis (K-W) and Mann–Whitney (M-W) non-parametric tests on a sample of 77 respondents. They concluded that the project success of construction projects can be severely affected by the external community and other external groups. Therefore, they suggested project leaders and owners to design stakeholder involvement processes from the start of the project to its completion. In addition, stakeholder participation is essential to address the needs of the local community for urban planning developments (Steiniger, Poorazizi, & Hunter, 2016). Additionally, a case study on public participation in the development of a Chinese and US railway system concluded that ineffective participation affects the success of

infrastructure megaprojects in terms of cost and schedule overruns (Wu, Jia, & Zhang, 2019). More recently, a structural equation model was used to confirm that stakeholder engagement has significant relationships with stakeholder satisfaction and project success in mega transport infrastructure projects (Erkul et al., 2020).

2.3.1 Advantages for the construction sector

Besides the increase in the likelihood of project success, infrastructure and construction projects benefit from stakeholder participation in more ways. The advantages of stakeholder participation discussed in chapter 2.2 also apply to construction and infrastructure projects, but this section discusses the results of studies specific to these types of projects.

In the literature, several studies appoint that the attitude of stakeholders regarding a construction or infrastructure project is more positive if they participated in the decision-making process. From the evaluation of a public participation process for a small infrastructure project in Thailand, it was concluded that stakeholders' attitude towards developments in their neighborhoods is more positive if they have the opportunity to receive project information and to share their concerns (Rojanamon, Chaisomphob, & Bureekul, 2012). Similarly, Yu and Leung, (2018) developed a structural equation model based on a sample of 140 data points, to demonstrate that residents and the community have a more satisfying attitude towards the construction developments if they have an opportunity during the decision-making process to share their opinions and influence project. Furthermore, a systematic literature review of 142 papers found that effective communication, involvement, and feedback procedures create trust from stakeholders during the implementation of urban environments development (Ferreira, Barreira, Loures, Antunes, & Panagopoulos, 2020).

A strength-weakness-opportunity-threat (SWOT) analysis identified the benefits of stakeholder involvement in the decision-making and execution of infrastructure and construction projects in China (Xie, Yang, Hu, & Chan, 2014). After surveying 692 respondents, they identified the four benefits of participation from stakeholders' perceptions (See Figure 2.2). The most indicated

advantage of stakeholder participation was the increase in awareness of the stakeholders about the decision-making (Xie et al., 2014). Hereafter, over 60 percent of the respondents declared that stakeholder participation processes improve the decisions in infrastructure and construction projects (Xie et al., 2014). Thirdly, the facilitation of project execution is asserted by 62.6 percent of the respondents as a benefit of stakeholder participation in infrastructure and construction projects; it is believed that the facilitation of project execution can reduce growing conflicts between the stakeholders and project managers (Xie et al., 2014). Finally, 54.3 percent of the participants believe a benefit of stakeholder participation is that it facilitates the collection of opinions (Xie et al., 2014).

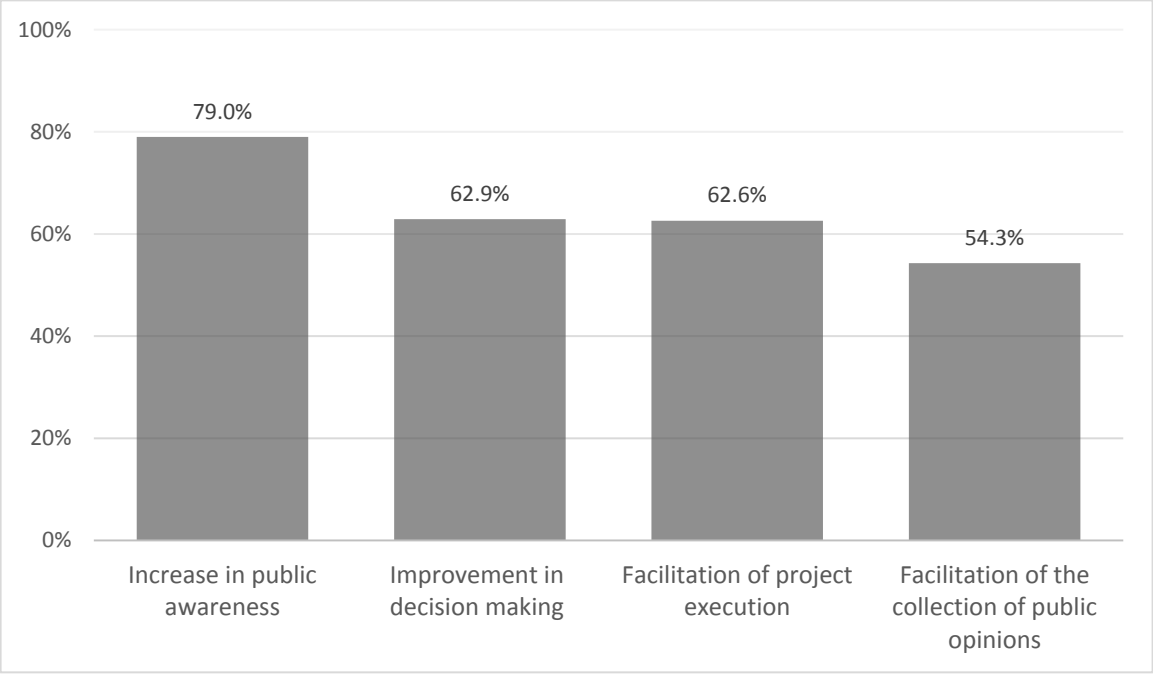


Figure 2.2: Benefits of participation in construction and infrastructure projects

Note. Adapted from "Understanding project stakeholders' perceptions of public participation in China's infrastructure and construction projects: Social effects, benefits, forms, and barriers.", by Xie, L. L., Yang, Y., Hu, Y., & Chan, A. P. C., 2014,. Engineering, Construction and Architectural Management, 21(2), p. 231.

2.4 The design of a participation process

Different studies have emphasized the importance of the design of a participation process. Reed et al. (2018) identified an increase in the literature that emphasizes the importance of the design of participatory processes. Thus, several researchers indicate the importance of an appropriate design of a participation process after evaluating case studies (Brody et al., 2003; Brooks, Waylen, & Mulder, 2013; Hall, Gilbertz, Anderson, & Ward, 2016; Storvang & Clarke, 2014; Vente De et al., 2016). For instance, Vente De et al. (2016) claimed that properly designed participation processes are associated with more informed, sustainable, and adaptable outcomes after performing quantitative and qualitative analysis on interviews with organizers and stakeholders of 24 international participation projects. In accordance, a statistical analysis on 136 participation case studies suggested that process design is crucial for successful project outcomes (Brooks et al., 2013). This is consistent for construction projects; a case study on a construction development project concluded that the participation process should be designed appropriately to gather useful information from the stakeholders (Storvang & Clarke, 2014). In addition, different literature reviews claimed that the design of a participatory process determines the quality of the outcome (Kessler, 2004; Reed, 2008; Reed et al., 2018).

Moreover, the participants must be taken into account when designing a participation process. A survey and sixty case studies of citizen involvement in local planning processes in Florida and Washington suggested that the choices made in designing participation programs are correlated with the number of participants (Brody et al., 2003). Quantitative and qualitative methods found that understanding the preference of people for public participation is crucial to design an appropriate, effective, and successful process (Webler & Tuler, 2006). Moreover, they concluded that distinct opinions of participants appear about what an appropriate stakeholder participation process is. Yu and Leung (2018) performed multiple regression analyses on a survey of 57 respondents, that participated in participation processes of construction projects in Hong Kong, to recommend further research should investigate how to enhance participation processes from a stakeholder's perspective. Furthermore, it is suggested to adapt the design of

a participatory process to the participants (Vente De et al., 2016). For this reason, Fung (2015) found that unsatisfactory consideration of the stakeholders in designing participation processes causes frustration, cynicism, or apathy by the participators. Accordingly, for infrastructure projects understanding the perspectives of how stakeholders prefer to be involved, results in more satisfied participants and more effective processes (Erkul et al., 2020).

Therefore, to increase understanding of features of an appropriate participation process, several studies have evaluated participation processes. In the next sections, a state-of-the-art overview of the findings and methods of previous stakeholder participation evaluation studies are elaborated. In accordance with Kessler (2004), broadly the following three types of studies for evaluating participation processes are identified in the existing literature: developing frameworks for evaluation (e.g. Rowe & Frewer, 2000; Webler & Tuler, 2006), defining factors for successful participation (e.g. Luyet et al., 2012; Reed, 2008), and evaluation of participatory processes (e.g. Brody et al., 2003; Korfmacher, 2001). These studies are evaluated on two foci suggested by Randolph (2009), respectively focus on research outcomes and – methods. The goal of the first part is to identify key variables of the design of participation processes and to examine whether a lack of information or agreement in research outcomes appears (Randolph, 2009). Subsequently, the goal of the second part is to identify strengths and weaknesses in methodologies of existing evaluation studies (Randolph, 2009).

2.4.1 Features to consider for participation processes

The existing evaluation studies on participation processes provide a wide range of criteria that should be considered for designing a participation process. Table 2.1 lists the most commonly cited aspects to consider for stakeholder participation processes.

Table 2.1: Features for participation processes

Feature	Reference(s)
Participation technique – what type(s) of participation mechanism to use	(Brody et al., 2003; Creighton, 2005; Fung, 2015; Luyet et al., 2012; Ng et al., 2012; Reed, 2008; Reed et al., 2018; Rowe & Frewer, 2000; Storvang & Clarke, 2014; Uittenbroek et al., 2019; Vente De et al., 2016)
Timing of the first involvement – when to start involving stakeholders in the process;	(Brody et al., 2003; Heravi et al., 2015; Reed, 2008; Reed et al., 2018; Rowe & Frewer, 2000; Storvang & Clarke, 2014; Uittenbroek et al., 2019)
Information provision – what types of information to provide and what techniques to use for providing information	(Brody et al., 2003; Creighton, 2005; Hall et al., 2016; International Association for Public Participation, 1990; Reed, 2008; Rowe & Frewer, 2000; Storvang & Clarke, 2014; Vente De et al., 2016; Webler & Tuler, 2006)
Objective of the involvement – what is the level of empowerment of stakeholders	(Arnstein, 1969; Brody et al., 2003; Fung, 2015; Hall et al., 2016; International Association for Public Participation, 1990; Irvin & Stansbury, 2004; Kessler, 2004; Korfmacher, 2001; Luyet et al., 2012; Ng et al., 2012; Reed, 2008; Reed et al., 2018; Rowe & Frewer, 2000; Storvang & Clarke, 2014; Vente De et al., 2016)
Identify relevant stakeholders – which and how many stakeholders to involve	(Brody et al., 2003; Bryson, Quick, Slotterback, & Crosby, 2013; Fung, 2015; International Association for Public Participation, 1990; Irvin & Stansbury, 2004; Korfmacher, 2001; Luyet et al., 2012; Ng et al., 2012; Reed, 2008; Reed et al., 2018; Rowe & Frewer, 2000; Simonofski, Asensio, De Smedt, & Snoeck, 2017; Storvang & Clarke, 2014; Vente De et al., 2016; Webler & Tuler, 2006)
Adopt ICT's – whether and what ICT's to adopt in the process	(Bryson et al., 2013; Creighton, 2005; Kessler, 2004; Luyet et al., 2012; Simonofski et al., 2017; Uittenbroek et al., 2019)
Administrative – how to organize the process	(Brody et al., 2003; Bryson et al., 2013; Creighton, 2005; Hall et al., 2016; Irvin & Stansbury, 2004; Reed, 2008; Reed et al., 2018; Rowe & Frewer, 2000; Storvang & Clarke, 2014; Vente De et al., 2016)

2.4.1.1 Participation technique

Several studies appoint that designing stakeholder participation process encompasses the selection of a participation technique to enable participants to be involved in the decision-making process (Creighton, 2005; Fung, 2015; Rowe & Frewer, 2000; Uittenbroek et al., 2019) Brody et al. (2003) found that the technique used to obtain information from stakeholders has a significant impact on the number of participators that became involved in participation processes. Consequently, they concluded that the choice of a participation technique is crucial for designing participation processes. In addition, the suggested framework to implement stakeholder participation processes in environmental projects contains a component for choosing a participation technique (Luyet et al., 2012). In consistence, for designing participation processes in construction and infrastructure projects, the selection of a technique used to involve stakeholders in the process is a key decision (Ng et al., 2012; Storvang & Clarke, 2014). Moreover, several studies found that the participation technique should be chosen and or adapted to fit the specific context of the participation process (Reed, 2008; Reed et al., 2018; Yang & Pandey, 2011).

Currently, many techniques exist to elicit participation from stakeholders. Rowe & Frewer (2005) listed more than 100 techniques and concluded that even more methods exist. Furthermore, the number of participation methods applied is increasing (Lowndes et al., 2001). Therefore, frequently mentioned participation techniques are presented in Table 2.2.

In literature, an evaluation of the participation techniques from the perspective of stakeholders is rarely performed. The limited awareness and knowledge of individuals regarding participation techniques could cause difficulties in examining preference related to participation techniques resulting (Lowndes et al., 2001) In an opinion poll, the participation forms questionnaire, face-to-face interviews, and public meetings were most favored, respectively 47 percent, 30 percent and 23 percent of the respondents indicated to participate in these forms (Lowndes et al., 2001).

Table 2.2: Different participation techniques

Participation technique	Reference(s)
Public meeting - an open gathering, in which stakeholders are permitted to offer comments	(Creighton, 2005; de Mello Ferreira, 2019; Kessler, 2004; Lowndes et al., 2001; Rowe & Frewer, 2000, 2005; Storvang & Clarke, 2014)
Survey – stakeholders answer specific questions to extracting data	(Creighton, 2005; Ferreira et al., 2020; Kessler, 2004; Lowndes et al., 2001; Reed, 2008; Rowe & Frewer, 2000)
Referenda – stakeholders vote on a particular proposal	(Arnstein, 1969; Berntzen & Johannessen, 2016; Creighton, 2005; Fung, 2015; Rowe & Frewer, 2000; Spada, Mellon, Peixoto, & Sjoberg, 2016)
Focus groups – representative stakeholders are selected to share thoughts	(Creighton, 2005; Kessler, 2004; Lowndes et al., 2001; Reed, 2008; Rowe & Frewer, 2000; Storvang & Clarke, 2014)
Face-to-face meeting – stakeholders share thoughts in a private interview	(Creighton, 2005; Ferreira et al., 2020; Lowndes et al., 2001)

2.4.1.2 Timing of the first involvement

Several studies, for instance Brody et al. (2003), Rowe and Frewer (2000), and Uittenbroek et al. (2019), determined the moment at which the stakeholders become involved in the participatory process is an important feature of the process. Brody et al. (2003) identified that selecting the phase of the planning process when citizens are encouraged to become involved is a crucial choice for participation programs. Similarly, Rowe and Frewer (2000) state that the stage at which the public becomes involved in the decision-making process is an important element of the process. More recently, it was found that an aspect of the participatory process is the stage in which participants are involved in the decision-making process (Uittenbroek et al., 2019). Correspondingly, the timing of involving participants is found as an aspect of the framework to implement stakeholder participation processes (Luyet et al., 2012). In compliance, in construction projects, the moment stakeholders are involved in the participation process is an

important aspect of the process and should be well-considered when staging the process (Storvang & Clarke, 2014).

Previous studies proved that participants should be involved at the earliest possible moment in the participation process. Stakeholder participation must be considered from the earliest stages through every important decision point (Brody et al., 2003). Accordingly, Reed (2008), Reed et al. (2018), and Rowe and Frewer (2005) suggest involving affected parties in the process as soon as possible. Equally, in stakeholder participation processes for construction projects, stakeholders must be considered from the earliest possible occasion, and the level of involvement decreases in later stages (Heravi et al., 2015).

2.4.1.3 Information provision

In the existing literature, many studies appoint the aspect of providing information to stakeholders in participation processes. According to the International Association for Public Participation (1990), stakeholders must be provided the information required to participate in the process. In addition, to be able to influence decisions participants should be provided with adequate information (Brody et al., 2003; Rowe & Frewer, 2000). Consequently, the accessibility to information is identified as an evaluation criterion of participation processes (Rowe & Frewer, 2000; Webler & Tuler, 2006). Furthermore, different studies appoint that stakeholders should have access to relevant, unbiased, and high-quality information (Hall et al., 2016; Reed, 2008; Vente De et al., 2016). To achieve that, Webler and Tuler (2006) concluded that information should be contributed openly and quickly shared with stakeholders.

Generally, for information provision in participation processes, the following two considerations are identified for participation processes. Firstly, an aspect to consider is the type of information provided to the participants; for participatory processes, it must be determined what type of information is provided to stakeholders (Brody et al., 2003). Similarly, for stakeholder participation processes in construction projects, it should be identified what type of information

participants require for participating (Storvang & Clarke, 2014). Brody et al. (2003) found that an increase of types of information provided results in more participants in participation processes. They concluded that information enables stakeholders to become involved and make influence the decision-making process. Secondly, the technique for providing information to stakeholders should be determined. This is crucial, while the approach used to provide information to stakeholders can encouraging or discourage the number of participants (Brody et al., 2003). Educational workshops and newspaper inserts encourage significantly more stakeholders to participate in the process (Brody et al., 2003). A more recent study found that stakeholders generally gather information about participation projects via social media and websites, respectively 59% and 47% of the respondents indicated to collect information in these ways (Zhou, Hou, Yang, Chong, & Moon, 2019).

2.4.1.4 Objective of the involvement

Several studies have found that stakeholders can impact a participation process at a number of different levels. The amount to which stakeholders are involved has been proved to be the first and most straightforward classifications for participatory processes (Reed, 2008). In addition, the objective of the participation process is an essential component of the participation process (Brody et al., 2003). Thus, in order to execute an appropriate participation process, the objectives and desired outcomes must be agreed upon (Bryson et al., 2013; Reed, 2008). To prevent confusion and dispute, the objectives of the process must be defined clearly (Rowe & Frewer, 2000). Consequently, the degree of involvement of stakeholders should be established when designing a participation process (Fung, 2015; Irvin & Stansbury, 2004; Luyet et al., 2012). In consistence, for participation processes in construction projects the influence of the stakeholders on the decision-making must be determined (Ng et al., 2012; Storvang & Clarke, 2014).

Different studies suggest that stakeholders should have a genuine impact on the decision-making of participation processes. For successful stakeholders participation processes,

participants should be able to influence the outcomes of the project (Hall et al., 2016; Korfmacher, 2001; Reed et al., 2018; Rowe & Frewer, 2000). The statements stakeholders make in the participation process should be considered in the decision-making (Hall et al., 2016). Additionally, Rowe and Frewer (2000) identified the influence of stakeholders on the decisions as an evaluation criterion of participation processes. The number of participants involved in participation processes increases when they perceive an opportunity to influence the decision (Brody et al., 2003; Kessler, 2004). Brody et al. (2003) came to this conclusion as they found a positive significant correlation between the level of empowerment and the number of groups involved in planning processes. Furthermore, participation processes that genuinely grant participants an opportunity to influence the decisions deliver more beneficial outcomes for the environment and society (Reed et al., 2018).

Many studies tried to categorize the impact of participants on decision-making. According to Brody et al. (2003), the choice of objectives is considered regularly in terms of a ladder of participation. Over time, different studies developed models of participation processes using the rungs of a ladder as a metaphor for the degree of involvement of participants. Arnstein (1969) was the first to categorize the participation processes using a participation ladder, and her classification is still widely used. Figure 2.3 presents Arnstein's (1969) participation ladder with eight participation categories that differentiate on the degree to which stakeholders are empowered to influence the decisions. Alternatively, a ladder of stakeholder empowerment was suggested that identified twelve different categories of stakeholder empowerment (Burns et al., 1995). In contrast, Brody et al. (2003) identified the following three levels of objectives in stakeholder participation processes: educate stakeholders, seek preferences of stakeholders, and grant stakeholder influence on the decision-making. A more recent study classified nine different objectives of participation (Uittenbroek et al., 2019).

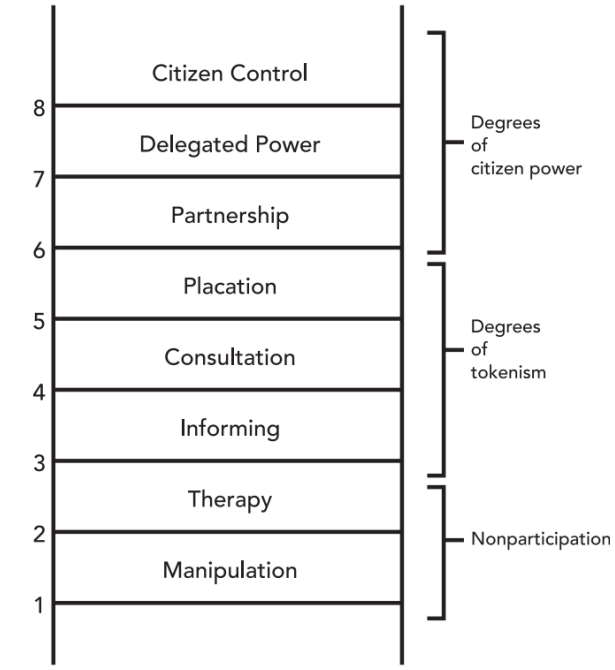


Figure 2.3: Ladder of participation

Note. Reprinted from "A Ladder of Citizen Participation." by Arnstein, S. R., 1969, Journal of the American Institute of Planners, 35(4), p. 26.

2.4.1.5 Identify relevant stakeholders

To design a participation process it is required to make choices about what participants to involve in the process (Brody et al., 2003; Fung, 2015; Luyet et al., 2012; Uittenbroek et al., 2019). For selecting participants that are involved in the process the following considerations are identified in the existing literature. Firstly, the number of stakeholders involved in the processes should be determined (Brody et al., 2003; Uittenbroek et al., 2019). Practitioners should consider whether to involve everybody or only representative stakeholders in the process (Uittenbroek et al., 2019). Secondly, for executing participation processes, it should be considered what kind of participants are involved in the process (Brody et al., 2003; Fung, 2015). Finally, the representation of interests, equal or skewed, must be established (Uittenbroek et al., 2019). In accordance, the selection of stakeholders that become involved in the process is a significant

aspect of the participation process for construction projects (Ng et al., 2012; Storvang & Clarke, 2014).

Several studies make suggestions about the relevance and representativeness of the involved stakeholders in participation processes. For effective and successful participatory processes, the stakeholders selected must be representative and relevant (Irvin & Stansbury, 2004; Reed, 2008). Moreover, a core value for successful participation processes is that those affected by a decision must have an opportunity to be involved in the participation process (International Association for Public Participation, 1990). Although ideally, all affected parties should have an opportunity to impact the outcome, in reality, it is not always possible to involve all stakeholders in the process (Reed et al., 2018). Therefore, at least key stakeholders should be involved in the participation process (Bryson et al., 2013). The involved participants should adequately represent an extensive sample of the affected population of the affected stakeholders (Reed et al., 2018; Rowe & Frewer, 2000; Simonofski et al., 2017).

2.4.1.6 Adopt ICT's

Whether and what Information and communications technologies (ICT) to adopt in the participation process should be considered for the staging of participation processes. An increase in availability and an increase of adoption of ICT technologies is expected for optimization of participation processes (Luyet et al., 2012). Bryson et al. (2013) instructed that participation processes should use ICT's to enhance engagement. Different studies confirmed ICT's improve participatory processes (Berntzen & Johannessen, 2016; Creighton, 2005; Kessler, 2004; Simonofski et al., 2017; Uittenbroek et al., 2019). The use of ICT's improves the access to information of the participatory process. Information can be made available in more ways, e.g. printed and online, and can be shared more easily (Kessler, 2004). Secondly, by combing multiple media types, such as websites and social media, participants have more access to information (Uittenbroek et al., 2019). In addition, newly developed technology instruments can assist the

participation process, for instance, geographic information system (GIS)-based decision-making tools (Kessler, 2004).

ICT's can also increase the number of participants involved in the process. Internet-based tools and social media give voice to participants or be used to collect feedback (Uittenbroek et al., 2019). For instance, the number of participants of a referendum in Brazil was associated with an increase of 8.2 percent while it was conducted online (Spada et al., 2016).

For both information provision and collection in participation processes, the additional advantage of ICT's is that the time and space constraint can be removed (Berntzen & Johannessen, 2016; Simonofski et al., 2017; Uittenbroek et al., 2019). In contrast, a disadvantage of using ICT's in participation processes is that it excludes stakeholders that are less experienced with it or have no access to it (Uittenbroek et al., 2019).

2.4.1.7 Administration

Various considerations regarding the organization of participation processes are categorized as administrative tasks.

In the first place, the resources committed to the process must be determined. According to Brody et al. (2003), the first choice designers should make refers to the level of resources committed to the participation process. Furthermore, several studies advocate that sufficient resources should be secured for successful participation (Brody et al., 2003; Bryson et al., 2013; Rowe & Frewer, 2000). For instance, Rowe and Frewer (2000) declared that to enable stakeholders to successfully participate it is required to provide them with appropriate resources. In addition to sufficient information provision, Rowe and Frewer (2000) enumerated the following three types of essential resources: (1) human resources, for example, access to scientists or experts, (2) material resources, (e.g. whiteboards), and (3) time resources, the stakeholder must have enough time to make decisions. Moreover, it should be determined if participants are given food, beverages, or snacks (Storvang & Clarke, 2014).

Secondly, The facilitator of the participation process should be determined (Storvang & Clarke, 2014). A facilitator can increase the group dynamics and encourage participants to give input (Irvin & Stansbury, 2004; Reed, 2008; Vente De et al., 2016). Moreover, competent facilitation can decrease the possibility of conflicts and reduce or resolve conflicts (Reed et al., 2018). The facilitator must safeguard that all stakeholders have an equal opportunity to contribute to the decision-making (Reed et al., 2018). A successful facilitator should be competent, unbiased, approachable, open to multiple perspectives (Irvin & Stansbury, 2004; Reed, 2008; Rowe & Frewer, 2000). Creighton (2005) suggests hiring a professional facilitator or that someone from within the organization takes on this role.

Thirdly, several studies affirm the design of the meeting place and the location must be well-deliberated in participation processes (Creighton, 2005; Hall et al., 2016; Storvang & Clarke, 2014; Uittenbroek et al., 2019). The atmosphere of the meeting room should enable convenient interactions (Hall et al., 2016; Storvang & Clarke, 2014). For designing a meeting place, various seating arrangements can be considered by practitioners (Creighton, 2005). The selected location must accommodate the preferred meeting format and seating arrangements, and the accessibility of the location is a crucial factor to consider (Creighton, 2005).

Finally, project managers should specify choices regarding process planning. The time or duration of participation processes can be a single point in time or multiple times over more years (Rowe & Frewer, 2000). Therefore, the duration of the participation process and the frequency of meetings should be determined (Creighton, 2005; Reed et al., 2018; Uittenbroek et al., 2019). Moreover, these meetings must be scheduled on specific dates (Creighton, 2005; Irvin & Stansbury, 2004).

2.4.2 Methodological review

Different methodologies are applied by existing literature on evaluating participation processes. Therefore, this section elaborates on different approaches applied by existing participation evaluation studies.

From reviewing the research approaches of existing literature, it appears that the majority of evaluation studies analyze case studies of participatory processes to gather understanding into the stakeholder participation processes. Moreover, the predominant part of these case studies uses qualitative techniques as the research method. For instance, Korfmacher (2001) proposed guidelines for appropriate participation practices and evaluated these guidelines in four cases of stakeholder participation processes in watershed modeling in the US. Additionally, an evaluation of a participatory watershed management initiative in the US determined key considerations of participation processes (Irvin & Stansbury, 2004). Luyet et al. (2012) suggested a comprehensive theoretical framework to implement stakeholder participation processes and tested it on a case study of a river restoration project in Switzerland. To gain an understanding of aspects that need to be considered for participation processes in construction projects, a single case study on a stakeholder participation process for the development of guest houses in Denmark is applied (Storvang & Clarke, 2014). They used action research to investigate the change in stakeholders' opinions, attitudes, or interests when they intervened or brought changes to the process. After evaluating international participation processes, Ng et al. (2012) identified key aspects that need to be considered for participation processes and proposed a framework to implement participation in infrastructure projects. To identify key factors of successful participation processes, a case study on participation in the scoping phase of a water management project in the US was conducted (Hall et al., 2016). Recently, Uittenbroek et al. (2019) evaluated three cases of participation processes for climate adaptation projects in the Netherlands with a theory-based framework. Their study linked the design of the participation processes with nine different objectives. The minority of case studies use quantitative techniques to evaluate participation processes. For instance, quantitative techniques were used to identify critical design choices for participation processes (Brody et al., 2003). Ten state growth management programs of different states of the US were firstly analyzed by Brody et al, (2003), to get an overall view on how participation is organized into planning mandates. Hereafter, they selected randomly 30 local governments in Florida and Washington as case studies of participation in local planning processes. Then, descriptive statistics and Pearson Product Moment Correlations analyzed the

relationship between the decisions of practitioners regarding the designing of participation processes and the number of groups involved in the process (Brody et al., 2003). Webler & Tuler (2006) used a Q methodology as a research method to analyze participants' perceptions of what an appropriate participation process should be. They integrated quantitative and qualitative techniques by applying the Q method to evaluate the perspectives of 117 participants involved in ten participation processes in the US. To evaluate the level of involvement of stakeholders during different phases of building projects, a survey was distributed to organizations that are involved in the residential building industry in Australia (Heravi et al., 2015). Heravi et al. (2015) analyzed a sample of 77 respondents with the non-parametric K-W and M–W tests, to evaluate the level of involvement in different phases. The main weakness in their study is that they limited their sample to owners, developers, project management, designers, and contractors. More recently, interviews with organizers, scientists, and participants in 11 cases of participatory decision-making in Spain and Portugal and interviews with facilitators of 13 cases of international participation processes were conducted to make recommendations for participation processes (Vente De et al., 2016). The interviews consisted of two parts, respectively open - and closed questions. To systematically analyze the open questions, Vente De et al. (2016) applied a grounded theory analysis, a qualitative approach, to develop a theoretical model from the text. In contrast, descriptive statistics and correlation analysis are performed on the closed questions to find factors impacting the outcomes of participation processes (Vente De et al., 2016).

A considerable number of theoretical evaluation studies on stakeholder participation processes are identified from existing literature. For instance, a framework to evaluate participation processes was established by reviewing existing literature (Rowe & Frewer, 2000). Accordingly, a synthesis of stakeholder participation literature was conducted to find consideration for designing and conducting a participatory process (Kessler, 2004). Moreover, a specific outline for creating participation processes was developed by evaluating existing literature and own experiences of approximately three hundred public participation cases (Creighton, 2005). Reed

(2008) conducted a Grounded Theory Analysis of the literature to identify different features of best stakeholder participation practices. He used Grounded Theory to systematically review existing literature to be able to develop ‘‘grounded’’ theoretical models. Similarly, to translate theory to practice more than 250 articles and books about designing participatory processes were reviewed, to create evidence-based design guidelines for participation processes (Bryson et al., 2013). Their synthesis used an applied design science approach to combine generally known practices and existing literature to establish design principles. An evaluation of current trends in citizen participation literature was performed, to suggest design choices for involvement processes (Fung, 2015). A more recent review of the literature developed a typology and theoretical framework to design stakeholder participation processes (Reed et al., 2018).

Overall, literature reviews and case studies seem to be the predominant research techniques in the evaluation of literature. Only limited case studies expanded their study with quantitative analyses (e.g. Brody et al., 2003; Heravi et al., 2015; Vente De et al., 2016; Webler & Tuler, 2006). Therefore, it is expected new insights about stakeholder participation can be gained by using quantitative techniques. Accordingly, Yang and Pandey (2011) concluded that stakeholder involvement studies have not exploited quantitative techniques enough. More recently, Uittenbroek et al. (2019) found a shortage in empirical studies that investigate the design of participation processes. Additionally, only limited studies seem to evaluate the participation process from the perspective of stakeholders. This is consistent with the suggestion of Maguire et al. (2011) that there lack of studies that evaluate to participation process from the perspective and preferences of the stakeholders.

2.5 Conclusion

The literature review has provided a state-of-the-art overview of the concept of stakeholder participation and the importance of the concept in construction and infrastructure projects. By involving stakeholders in the decision-making several benefits are identified. Likewise, projects in the construction sector can also benefit from stakeholder participation. A well-designed participation process can generate more successful outcomes. Moreover, for an appropriate participation process stakeholders should be taken into account for the design. To understand the features of successful participation processes, several evaluation studies have been executed. Based on these evaluation studies, the following features to consider for participation processes are identified:

- what type(s) of participation mechanism to use;
- when to start involving stakeholders in the process;
- what types of information to provide and what techniques to use for providing information;
- what is the level of empowerment of stakeholders;
- which and how many stakeholders to involve;
- whether and what ICT's to adopt in the process; and
- how to organize the process.

However, there seems no general agreement on these features, and there lacks a guide to the design participation process. These different guidelines and the possible options for these guidelines are not evaluated or compared sufficiently yet. Consequently, there is little understanding of the impact of different guidelines.

Moreover, existing research appears to focus on qualitative techniques rather than quantitative techniques to evaluate features of participation processes. Theoretical- and case studies are identified as predominantly research techniques in the evaluation stakeholder participation

research. Although case studies might gain an in-depth understanding of participation processes, these findings are harder to generalize to other contexts. Furthermore, a few case studies have expanded their analyzes using quantitative research. Some by evaluating the case study quantitatively and others by performing interviews or questionnaires on the involved stakeholders in the case study. These studies only used descriptive statistics, correlation analysis, and Q methodology as research methods.

Although the importance of considering stakeholders for the design of participation processes is stated regularly, limited studies have evaluated the design of participation processes from the perspective of the stakeholders. Additionally, the main limitation of the studies that did evaluate the process from the perspective of the stakeholders is that they only involve stakeholders that are already participating in their analyses. Hereby, no information was generated about stakeholders that are less familiar with the concept.

This paper sheds new light on current knowledge of the design of participatory processes. By using a different quantitative research method, this research contributes to existing literature. More specifically, discrete choice analyses are used to review features of participation processes identified by preliminary studies from the perspective of stakeholders. This method is chosen because it is one of the most practical ways to evaluate the individual's preferences for specific alternatives (Hensher, Rose, & Greene, 2015). Moreover, discrete choice models enable the evaluation of hypothetical alternatives with different features in a survey (Kemperman, 2000). Furthermore, multiple observations per respondent can be made and new elements or combinations that not yet exist can be included in discrete choice models (Kemperman, 2000). Hereby, this research extends to current knowledge of participation processes by involving individuals in the analyses that have no experience yet with participating. Finally, this research is executed for the specific context of construction projects, while involving stakeholders in these projects is important.

3 Methodology

This section describes the research cycle, scientific methods, and – procedures used to gain more insights into stakeholders' preferences regarding participation processes.

3.1 Research cycle

The goal of this research is to increase the understanding of features of participation processes from the perspective of stakeholders. Hereby, this research aims to advance scientific knowledge about stakeholder participation. Therefore, following the suggestions of Wieringa (2014), the empirical cycle is used in this research, while the goal is to answer knowledge questions. Figure 3.1 presents the empirical cycle developed by Wieringa (2014).

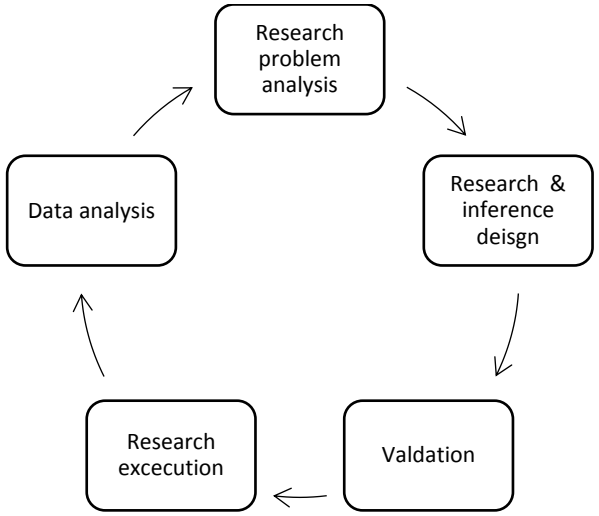


Figure 3.1: Empirical cycle

Note. Adapted from: "Design science methodology: For information systems and software engineering.", by Wieringa, R. J., 2014, Berlin Heidelberg: Springer.

The first step in this cycle is to state the research problem, develop a conceptual framework that defines the relevant constructs, and define the population (Wieringa, 2014). The conceptual framework defines the architectural and/or statistical structures of the research (Wieringa, 2014). The research questions of this study are described in section 1.2. The population is the

complete set of objects that satisfies the characteristics set by the researcher (Wieringa, 2014). In this research, the population consists of adult individuals living in the Netherlands as it is considered that all individuals are potential stakeholders for participation processes. Figure 3.2 illustrates the conceptual framework applied in this research. The aim of this research to get insights into the preferences of potential stakeholders for participation processes. To test whether different demographic groups differ in motivation or familiarity for participating, the relation between socio-demographic - and general participation characteristics is constructed. After analyzing this relationship, the third sub-question can be answered: *"Are there differences in willingness to participate and familiarity with the concept of participation for different demographic groups?"*. Thereafter, the relation between the characteristics of the process and the preferences of potential stakeholders analyzes what characteristics are most preferred by the population. Consequently, this relation represents the fourth research question: *"What attributes are important in participation processes of real-estate development projects and to what degree?"*. Finally, to test whether differences appear in potential stakeholders' preferences, the social-demographic and general participation characteristics are modeled to impact the relationship between the characteristics of the participation process and the preferences of the stakeholders. After analyzing these relations the fifth sub-question can be answered: *"Are there differences in preferences regarding the participation process in real-estate development projects for different groups?"*.

Hereafter, the research setup is created. To be able to answer the knowledge questions, objects of study (OoS) are required (Wieringa, 2014). For selecting OoS's, the simple random sample technique is used. Hereby, this research studies a sample of the population to be able to statistically generalize the population, Wieringa (2014) classifies this sample-based research. Moreover, no treatment is applied to the sample, thus this research can be classified as observational research (Wieringa, 2014). In the next step, the research setup and inferences are validated. In this research statistical inference is applied, while based on a random sample of respondents inferences are made for the entire population (Wieringa, 2014). In order to perform

statistical analysis different assumptions are made. Therefore, the statistical conclusion validity relies on the validity of these assumptions (Wieringa, 2014). According to Wieringa (2014), violations of these assumptions could result in low statistical conclusion validity. In the theoretical explanation of this research, the assumptions of analysis are given. In this research, two violations regarding data collection could arise. First, selection bias could appear in the dataset. In this case, the participants are not truly random; one demographic group could be over-or under-represented in the sample. Secondly, the collected sample could be too small. Subsequently, the research is executed following the research design, and relevant observations for the interpretation of the results are recorded (Wieringa, 2014). During the execution of the survey, the additional comments about the survey, the research, and stakeholder participation are kept to ensure that no errors or misinterpretations appear. Finally, in the data analysis, the data collected are analyzed according to the inference design (Wieringa, 2014).

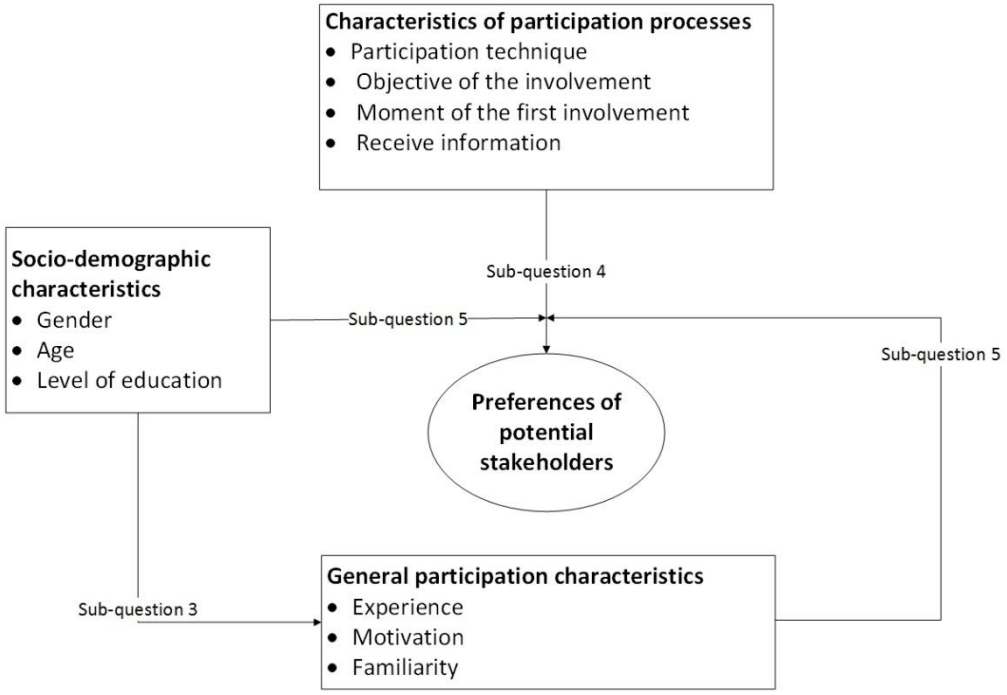


Figure 3.2: Conceptual model

3.2 Discrete choice model

A discrete choice model is applied to explain the preferences of stakeholders for participation processes, while this is a well-approved multivariate technique to measure individuals' preferences and analyze choice behavior (Hensher et al., 2015). A discrete choice model can be used to explain and predict choices between at least two alternatives (Train, 2009). The alternatives, also referred to as profiles, might represent different products, processes, or any other item over which choices must be made (Train, 2009). Hence, the alternatives in this research represent different stakeholder participation processes. In discrete choice models, an individual makes a choice from a set of alternatives, also referred to as a choice set (Hensher et al., 2015; Train, 2009). Therefore, choice sets in this study represent at least two participation processes. The alternatives are represented by combinations of different attribute levels, and individuals obtain a certain utility from these attributes (Kemperman, 2000). Consequently, the attribute levels identified in this study represent characteristics of participation processes. Discrete choice models are used to explain and predict the choices between different participation processes. In this section, a discrete choice model is constructed and the theoretic background is discussed.

To fit within a discrete choice framework, the set of alternatives, are required consists of the following three aspects according to Hensher et al. (2015) and Train (2009): (1) the alternatives must be mutually exclusive, to ensure that the decision-maker is able to choose only one alternative per choice set, (2) each choice set must be exhaustive, which implies that all relevant alternatives are captured (3) it is required that the number of choice sets is finite. The alternatives are viewed as different combinations of attribute levels, and individuals are assumed to derive utility from these attributes (Kemperman, 2000). Moreover, it is assumed that individuals show rationale and utility-maximizing behavior (Kemperman, 2000; Train, 2009). To integrate the probabilistic character of choice behavior, the random utility theory is be used (Kemperman, 2000; Train, 2009). The random utility theory assumes that the utility (U_i) for an alternative consists of an observable and a random competent, respectively V_i and ε_i (Hensher

et al., 2015; Kemperman, 2000; Train, 2009). A random competent is included since not all aspects of the utility can be observed (Train, 2009). Different distributions can be assumed for this random component, resulting in different probabilistic discrete choice models. The utility of an alternative i can be expressed by the following equation:

$$U_i = V_i + \varepsilon_i$$

where V_i is the structural utility and ε_i the random utility (Hensher et al., 2015; Kemperman, 2000; Train, 2009). Subsequently, the structural utility is commonly modeled by the following linear equation:

$$V_i = \sum_k \beta_k X_{ik}$$

where β_k represents the parameter estimates of the attribute and X_{ik} represents the attribute levels for all attributes k (Hensher et al., 2015; Kemperman, 2000). As a result of the premise, that individuals show utility-maximizing behavior, Hensher et al. (2015) and Kemperman (2000) indicate that the likelihood that an alternative i is chosen over alternative m is explained by the following expression:

$$P(i|A) = P(U_i > U_m), \forall\, i \neq m$$

where the likelihood an individual chooses alternative i from the choice set A is equal to the likelihood that the utility of alternative i is larger than the utility of alternative m.

In order to construct this discrete choice model, the following steps are executed following Kemperman (2000):

1) identification of relevant attributes and attribute levels
2) selection of a measurement task;

3) creating of experimental design;
4) constructing the questionnaire;
5) and analyzing the results.

3.2.1 Attributes and attribute level

The attributes and attribute levels included in the choice experiment are listed in Table 3.1. The following steps are executed steps to identify these attributes and attribute levels.

Table 3.1: Attributes and attribute levels of stakeholder participation processes

Attributes	**Attribute levels**
1) Participation technique	a) survey b) face-to-face meeting c) public meeting
2) Objective of the involvement	a) stay informed b) share preferences c) influence decision
3) Moment of the first involvement	a) feasibility phase b) design phase c) construction phase
4) Receive information	a) social media b) websites c) newspaper

First, from the literature research, the most identified features of successful participation processes are identified in Table 2.1. Not all factors are included in the experiment to preserve that the choices are hard to understand for respondents and make the experimental design complicated (Kemperman, 2000). Therefore, different selection criteria are applied to the features in Table 2.1 to reduce the number from seven to four relevant features that are included

in the experiment. The most important criterion is that understandable and recognizable attribute levels can be identified for the factors. In addition, this research only includes attributes that are relevant to potential stakeholders. These procedures resulted in including the following four attributes: (1) participation technique, (2) objective of the involvement, (3) moment of the first involvement, and (4) receive information. The features identify relevant stakeholders, adopt ICT's, and administrative features are not included in the experimental design.

Hereafter, appropriate attribute levels of each attribute are selected for the experiment. For all attributes, the same number of levels is chosen, respectively three. Since creating an experimental design for attributes with a different number of levels is more difficult (Kemperman, 2000). Moreover, in line with Kemperman (2000), the attribute levels included are attempted to represent trade-offs for stakeholders. To select attribute levels, the main criteria applied was to be able to compare the results with other studies. For the attribute participation techniques, the most preferred techniques found by Lowndes et al. (2001) are selected as attribute levels. Their results are used as this was the only comparison of participation techniques from the perspective of participants found in the existing literature. Consequently, the following participation techniques are selected as attribute levels: (a) survey, (b) face-to-face meeting, and (c) public meeting. The categorization of Brody et al. (2003) is applied to specify attribute levels for objectives because they identified three levels of objectives. By transforming their categorization into objectives from the perspective of stakeholders, the following attribute levels are identified: (a) stay informed, (b) share preferences, and (c) influence decision. To identify levels for the moment of the first involvement, the construction phases identified by Antunes and Gonzalez (2015) are used. The operation phase is excluded from the attribute levels as this phase is outside the scope of this research. Consequently, the following levels are included for the moment of the first involvement: (a) feasibility phase, (b) design phase, and (c) construction phase. According to Zhou et al. (2019) stakeholders mostly gather information via social media and websites, therefore these are included as attribute levels. In the past, newspapers were found as an important information source of information (Brody et al., 2003).

To test if this is still relevant, newspapers are included as an attribute level. Resulting in the attribute level for receive information the following attribute levels are included: (a) social media (b) websites, and (c) newspapers.

3.2.2 Measurement task

From Figure 3.3 it can be derived that different preference and choice measurement approaches exist.

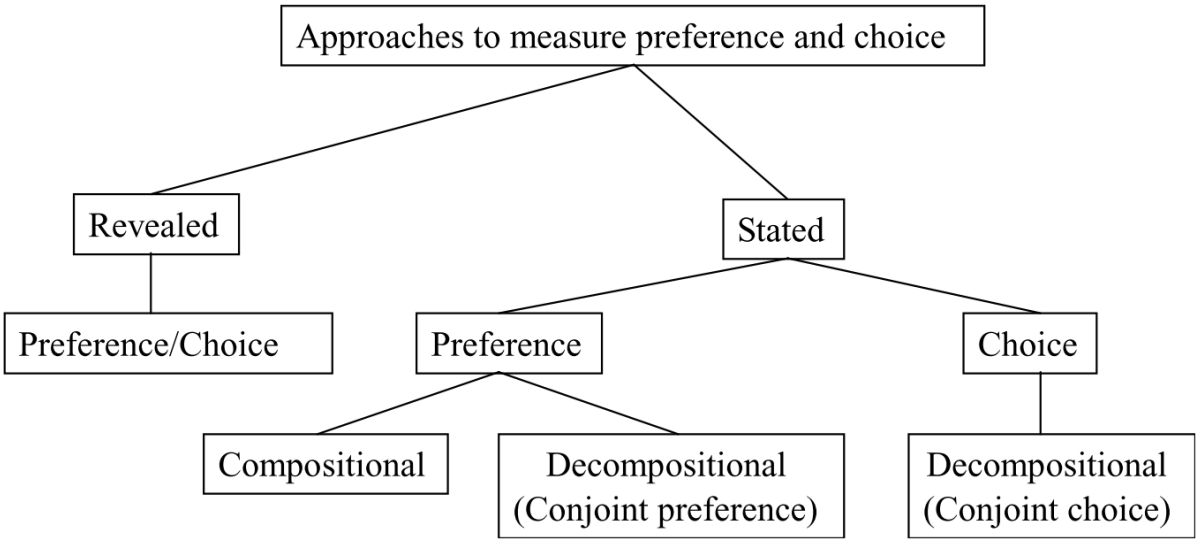


Figure 3.3: An overview of preference and choice measurement approaches

Note. Reprinted from "Temporal aspects of theme park choice behavior : modeling variety seeking, seasonality and diversification to support theme park planning.", by Kemperman, A. D. A. M., 2000,. Technische Universiteit Eindhoven.

Although, the definition of utility values and attribute weights are equal for stated and revealed modeling approaches, the types of data used differs (Kemperman, 2000). The data of stated models are collected by observing responses to hypothetical situations in a survey, whereas revealed models observe actual behavior in real-world situations (Kemperman, 2000). In contrast to existing evaluation studies of participation processes, this research is not focusing on a specific case, therefore the stated choice approach is applied. Stated choice approaches show

clear advantages over revealed choice approaches. In stated choice approaches it can be ensured that the attributes vary for the alternatives, multiple observations per respondent can be observed, new elements or combinations that not yet exist can be included (Kemperman, 2000). Oppositely, a disadvantage of stated choice approaches is that individuals might make different choices in real-world conditions (Kemperman, 2000). Consequently, it is assumed that the stated choice method has many useful applications to evaluate stakeholder participation processes.

Although compositional and decompositional approaches both derive the utility of an alternative by multiplying the attraction of an attribute with the weight of each attribute, the approach to derive these values differs. Compositional approaches ask participants to indicate the attraction of the levels of every attribute and to give relative weight to every attribute (Kemperman, 2000). Contrarily, decompositional, or conjoint modeling methods derive attraction of attribute levels and weights of attributes by evaluating choices to specified alternatives (Kemperman, 2000).

In conjoint preference and - choice approaches, respondents indicate choices differently. In conjoint preference approaches, respondents rate or rank hypothetical alternatives, whereas in conjoint choice approaches, respondents indicate a choice between two or more profiles (Kemperman, 2000). Kemperman (2000) identified the three fundamental advantages of conjoint choice in comparison to conjoint preference models: (1) represent real-world behavior more appropriately, (2) do not require ad hoc assumptions for decision rules to predict choices, and (3), allow both existing alternatives and non-existing options to be included in the models. However, a drawback of conjoint choice models is that these models provide less information about non-chosen alternatives than conjoint preference models (Kemperman, 2000). In conclusion, the conjoint choice model is used to evaluate the stakeholder participation process since the advantages outweigh the disadvantage.

3.2.3 Experimental design

In this section, the design strategies to develop alternatives of participation processes and generate choice sets are elaborated.

To generate profiles for the experimental design, a full factorial design or a fractional factorial design can be used. All possible combinations that can be created with the attribute levels are included in a full factorial design (Kemperman, 2000). Applying the full factorial design approach on the attribute levels presented in Table 3.1 results in an experimental design consisting of 64 (3*3*3*3) profiles. It is assumed that including all the profiles is not useful. Since the task to fill in the survey becomes a lot of effort, more ignorance of attributes or response patterns are expected from respondents (Kemperman, 2000). Fortunately, fractional factorial designs create a subset of all possible attribute level combinations which still allows independent estimation of attribute effects (Hensher et al., 2015; Kemperman, 2000). Consequently, to create the experimental design a fractional factorial design approach is used. Although software usually generates not the best designs, SPSS is able to generate feasible designs (Hensher et al., 2015). Therefore, an orthogonal design is performed in IBM SPSS Statistics 25 to reduce the number of profiles to 18. The profiles of the experimental design are listed in Table 3.2.

Hereafter, these profiles are combined into nine choice sets consisting of two participation process profiles. Only limited profiles are included, because when the effort to fill in the survey takes too long the quality of the data decreases and it might not deliver the information required (Kemperman, 2000). These choice sets are established by combining the first profile with the 18th profile, the second profile to the 17th, etcetera. Consequently, every participant is presented with nine choice sets. The option “not participate” is always added as a base alternative. Hereby, the choice sets represent real-life better, since some participants might prefer not to be involved (Hensher et al., 2015). For each choice set, respondents indicate what alternative they are most likely to participate in the decision-making process for the development of an imaginary apartment complex that is executed in their neighborhood. Figure

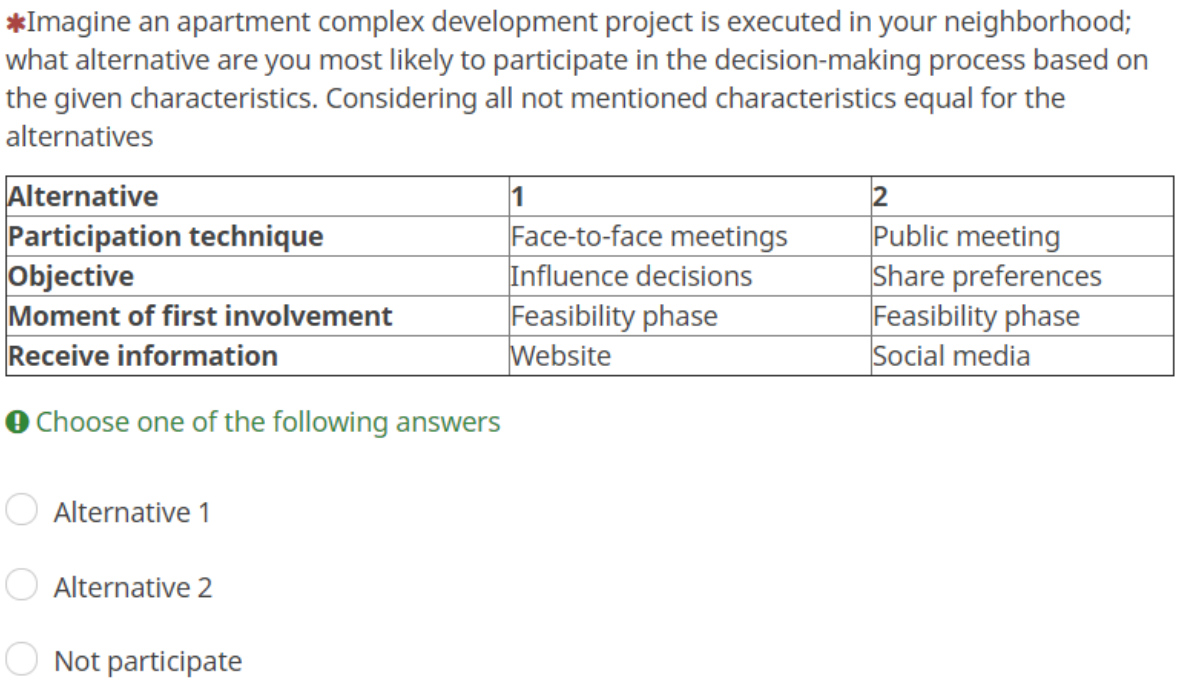
3.4 shows the first choice of the survey and a complete overview of the choice tasks can be found in Appendix I.

Table 3.2: Participation process profiles

Profile	Technique	Objective of involvement	Timing of first involvement	Receive information
1	Face-to-face meeting	Influence decision	Feasibility phase	Website
2	Face-to-face meeting	Share preferences	Design phase	Website
3	Public hearing	Share preferences	Feasibility phase	Newspaper
4	Survey	Influence decision	Design phase	Newspaper
5	Public hearing	Influence decision	Construction phase	Website
6	Public hearing	Stay informed	Design phase	Website
7	Survey	Share preferences	Construction phase	Website
8	Face-to-face meeting	Share preferences	Design phase	Social media
9	Survey	Stay informed	Feasibility phase	Website
10	Face-to-face meeting	Stay informed	Construction phase	Newspaper
11	Face-to-face meeting	Stay informed	Construction phase	Social media
12	Face-to-face meeting	Influence decision	Feasibility phase	Newspaper
13	Public hearing	Influence decision	Construction phase	Social media
14	Survey	Influence decision	Design phase	Social media
15	Survey	Share preferences	Construction phase	Newspaper
16	Survey	Stay informed	Feasibility phase	Social media
17	Public hearing	Stay informed	Design phase	Newspaper
18	Public hearing	Share preferences	Feasibility phase	Social media

Hereafter, these profiles are combined into nine choice sets consisting of two participation process profiles. Only limited profiles are included, because when the effort to fill in the survey takes too long the quality of the data decreases and it might not deliver the information required

(Kemperman, 2000). These choice sets are established by combining the first profile with the 18th profile, the second profile to the 17th, etcetera. Consequently, every participant is presented with nine choice sets. The option “not participate” is always added as a constant base alternative. Hereby, the choice sets represent real-life better, since some participants might prefer not to be involved (Hensher et al., 2015). For each choice set, respondents indicate what alternative they are most likely to participate in the decision-making process for the development of an imaginary apartment complex that is executed in their neighborhood. Figure 3.4 shows the first choice of the survey and a complete overview of the choice tasks can be found in Appendix I.



*Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Face-to-face meetings	Public meeting
Objective	Influence decisions	Share preferences
Moment of first involvement	Feasibility phase	Feasibility phase
Receive information	Website	Social media

Choose one of the following answers

Alternative 1

Alternative 2

Not participate

Figure 3.4: An example of a choice set

3.2.4 Constructing the questionnaire

To collect quantitative data about the preferences of stakeholders for a participation process an online questionnaire is executed using LimeSurvey. The complete questionnaire is given in Appendix I. The questionnaire consists of three parts. The first part contains questions about the demographic characteristics of respondents. The characteristics that are collected are gender, age, and, level of education, and employment. In the second part, three general questions are asked to assess the respondents' awareness of stakeholder participation. Zhou et al. (2019) is used as inspiration for these questions. In the first general question, participants indicate whether they have ever been involved in a participation process for a construction project that took place in their neighborhood. Hereafter, respondents indicate to what extent they agree with two statements about participating on a five-point Likert scale. For the first statement, they indicate to what extent they are familiar with the concept of stakeholder participation. The second statement is about the willingness to be involved in a participation process. In the final part of the survey, respondents are presented with the nine choice sets and are asked to indicate in what alternative they are most likely to participate. For constructing a questionnaire for conjoint choice models, Kemperman (2000) stated it is essential: (1) to supply the respondents with understandable and straightforward instructions, (2) to avoid interpretation issues, (3) to supply the respondents an example of an alternative, (4) to supply information about the context of the experiment, and (5) to communicate the objectives of the research. These points are taken into account for developing the survey. At the start of the survey, the participants are provided with general information and the objectives of the study. Before the part with choice sets, respondents are given clear instructions and explanations of the context, the attributes, and attribute levels. A limitation could be that no example of a participation process alternative is showed to participants in the survey.

The following general rule to determine the minimum sample size of discrete choice models is recommended:

$$n \geq 500 \times \frac{c}{(t \times a)}$$

where n represents the amount of respondents, t represents the number of choice sets, a represents the number of alternatives per task (excluding the none alternative), and c equals the largest number of levels for any one attribute (de Bekker-Grob, Donkers, Jonker, & Stolk, 2015; Orme, 2010). Applying this rule of thumb to the experimental design of this study results in a minimum sample size of 84 (500*3/(9*2).

The survey is spread within the network of the researcher by phone and mail. Moreover, the survey is posted in a Facebook group for finding respondents. Hereby, 150 responses are collected.

3.2.5 Data preparation and analyses

The data must first be labeled and cleaned before it can be used for statistical analyses. In order to gain more insights into the preferences of stakeholders for the design the data collected from the questionnaire are statistically analyzed. The statistical analyses are undertaken in IBM SPSS Statistics 25 and NLOGIT. The program used to perform the descriptive analyses is IBM SPSS Statistics 25. Hereafter, NLOGIT is used to develop discrete choice models; this is a package published by Econometric Software Inc. (ESI) that is widely used for discrete choice modelling in many disciplines (Hensher et al., 2015).

3.2.5.1 Data preparation

The first step of the data preparation is to exclude the non-complete responses from the dataset. 22 responses are excluded because these were not complete. Hereafter, the data is checked for missing data. Next, four respondents that indicated ‘not participate’ for all choice sets are

excluded since these have no impact on the discrete choice model. Only 1 respondent indicated 'Prefer not to say' for the variable 'Gender', while this demographic group is too small for statistical analyses is it excluded from the sample. Similarly, the category '80+' is excluded from the rest of the study as none of the respondents is within this group. Finally, no outliers are derived from plots. Hereby, the dataset is reduced to a sample of 123 cases.

Hereafter, the variables are transformed by executing the following steps. The most straightforward and most applied coding schemes for transforming attribute levels are dummy coding and effect coding (Hensher et al., 2015; Kemperman, 2000). In dummy coding, all attribute levels, except for the base level, are transformed into new variables; if the attribute level corresponds with the variable it is coded as 1 and otherwise as zero (Hensher et al., 2015; Kemperman, 2000). In comparison, effect coding differs only in how the base level is coded; the base level is coded as minus one (−1) for each variable (Hensher et al., 2015; Kemperman, 2000). Table 3.3 compares the coding schemes for dummy and effect coding for the attribute levels of 'Participation technique'. Hensher et al. (2015) claim effect coding has the following advantages over dummy coding; (1) the base level generates a unique utility value that is not confounded with the other levels, and (2) it enables comparison of the impact on the utility of two base levels. Therefore, this research applies the effect coding scheme to transform attribute levels. The complete coding scheme applied is given in Appendix II. Moreover, for the first and second alternatives, respectively 'Constant 1' and 'Constant 2' are included. The 'not participate' option has no constant, and is coded 0 for both constants.

Table 3.3: Coding schemes for attribute levels of 'Participation technique'

Attribute level	**Dummy coding**		**Effect coding**	
Survey	1	0	1	0
Face-to-face meeting	0	1	0	1
Public meeting (base level)	0	0	-1	-1

3.2.5.2 Descriptive analyses

First, the socio-demographic variables are visualized in tables to get insights into the frequencies of different groups in the sample. Thereafter, the representativeness of the sample for the complete population is examined. A Chi-square test the goodness-of-fit test is executed to test the goodness-of-fit of the distribution of a sample to the distribution of the complete population (Montgomery & Runger, 2003). The observed frequencies of the sample are compared with expected frequencies derived from data of the Centraal Bureau voor de Statistiek (CBS). The Chi-square test requires compares the observed frequencies (O_i) with the expected frequencies (E_i) with the following equation:

$$X_0^2 \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

where k represents the class intervals (Montgomery & Runger, 2003). If the chi-square test is found to be significant ($p \leq 0.05$), then the sample is not representative of the complete population (Montgomery & Runger, 2003). The values for the expected frequencies (E_i) for different groups are derived by multiplying the sample size with the ratio of that frequency in the data of CBS.

3.2.5.3 Analyses general questions

The frequencies of the three general questions are plotted in histograms and descriptive tables are created to get preliminary insight. To test the impact of different socio-demographic characteristics and experience with participation on the variables 'familiar' and 'motivation', the data is divided into different groups. To gain information about the different groups, the Mean (M), Standard Deviation (SD), and the frequencies per group are derived and presented in tables.

The M of the variables is calculated by performing a descriptive analysis, using the following expression:

$$\bar{x} = \sum_{i=1}^{n} \frac{x_i}{n}$$

where x_i is the value of the variable in indicated by respondent i and n the number of observations in a group (Montgomery & Runger, 2006). Subsequently, the SD of the samples are derived with the following expression:

$$SD = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

where x_i represents the value of the variable in indicated by respondent i, $\bar{x}$ the M and n the number of observations (Montgomery & Runger, 2006).

Hereafter, the K–W and M–W non-parametric tests are executed. These tests compare whether the mean of two or more groups are statistically different (Heravi et al., 2015; Montgomery & Runger, 2006). Following Heravi et al. (2015), these tests are applied in this research as the variables 'familiar' and 'motivation' are ordinal and measured using a Likert scale. The K–W and M–W differ in the number of groups compared. The K–W test is used to compare the means of more than two groups, whereas the M–W test compares the mean value of two groups (Heravi et al., 2015; Montgomery & Runger, 2006). A significant result of the K–W or M–W tests indicates a significant difference in the mean of the group(s). A significant K–W can be followed up by the M–W test to compare the mean values of two groups. In the case of multiple comparisons, Bonferroni Correction is required, which adjusts the *p*-value by diving it with the number of comparisons being made (Heravi et al., 2015). For instance, the levels of significance equals 0.008 (0.05/3) for six comparisons.

3.2.5.4 Multinomial logit model

The multinomial logit (MNL) model, the most used and most convenient model in discrete choice analysis, predicts the probability that an alternative will be chosen (Kemperman, 2000; Train, 2009). The MNL model assumes that the distribution of random components to be independently and identically distributed (IID) according to the Gumbel distribution (Kemperman, 2000; Train, 2009). Consequently, the likelihood an individual choose a certain alternative from J alternatives in the choice set A is given with the following equation (Hensher et al., 2015; Kemperman, 2000; Train, 2009):

$$P(i|A) = \frac{\exp(V_i)}{\exp(\sum_{j=1}^{J} \exp(V_j))}; \; j = 1, \dots, i, \dots, J; J \in A$$

where $P(i|A)$ represents the probability alternative i is chosen from the choice set A, and V_i represents the structural utility of alternative i. The MNL model assumes the Independence of Irrelevant Alternatives (IIA) property, which indicates the ratio of probabilities is independent of other alternatives (Kemperman, 2000; Train, 2009). This assumption of IIA property is a well-known limitation of the MNL model (Kemperman, 2000; Train, 2009). It could be argued that this assumption is not realistic in every situation, particularly if the choice probabilities of alternatives are expected to be affected by introducing alternatives in the choice set (Kemperman, 2000). Despite this limitation, the significant advantage of IIA is that the parameters of the model can be derived using a subset of alternatives (Train, 2009).

To estimate the unknown parameters of the MNL model, maximum likelihood estimation is a common approach (Hensher et al., 2015; Kemperman, 2000; Train, 2009). The dependent variable (DV) is represented by the discrete choice (y_{ni}) and the independent variables (IV) are coded attribute levels (Kemperman, 2000).

The likelihood individual n selecting the alternative which he/she was observed to select, is represented by:

$$\prod_i (P_{ni})^{y_{ni}}$$

where y_{ni} is equal to 1 if person n picks i and equals 0 else (Train, 2009). Since it is presumed that decisions of the decision-makers are independent, the likelihood every individual of the sample selecting the alternative which he/she was observed to select can be expressed as:

$$L(\beta) = \prod_{n=1}^{N} \prod_i (P_{ni})^{y_{ni}}$$

where β is a vector containing the parameters of the model (Train, 2009). Then, the log likelihood is expressed by the following function and the estimator is the value of β that maximizes this function (Train, 2009):

$$LL(\beta) = \prod_{n=1}^{N} \prod_i y_{ni}\, ln(P_{ni})$$

Likelihood ratio index is often used in choice models to measure the fit of the model (Train, 2009). Folowing Kemperman (2000) and Train (2009), McFadden's rho square is used to indicate the goodness-of-fit of the derived MNL model:

$$\rho^2 = 1 - \frac{LL(\beta)}{LL(0)}$$

where $LL(\beta)$ represents the value of log likelihood function of estimated parameters and $LL(0)$ represents the value of log likelihood function when all the parameters are zero. A rho square

value between 0.2 and 0.4 indicates an extremely good models fit (Hauber et al., 2016; Louviere, Hensher, Swait, & Adamowicz, 2000).

Hensher et al. (2015) determine whether a model is statistically significant using likelihood-ratio test; this test compares the log likelihood function of an estimated model ($LL(\beta)$) with the log likelihood function of the base model ($LL(0)$) with the following equation:

$$-2\big(LL(0) - LL(\beta)\big) \sim \mathrm{X}^2_{(number\ of\ new\ parameters\ estimated\ in\ the\ estimated\ model)}$$

If the value of the likelihood-ratio test exceeds the critical Chi-square value for the associated degrees of freedom the *p*-value is less or equal to 0.05, then the null hypothesis that the estimated model is no better than the base model is rejected (Hensher et al., 2015). This implies that the estimated model exceeds the base model.

3.2.5.5 Latent class model

The latent class (LC) model is executed to test if clusters of individuals with similar parameters appear in the sample. The LC model assumes that the population contains a finite number, c, of heterogeneous classes with comparable β parameters, and β parameters are discretely distributed for the population (Hensher et al., 2015; Train, 2009). In LC models the utility of individual n gets from alternative i is given by

$$U_{ni} = \beta_m x_{ni} + \varepsilon_{ni}$$

where ε_{ij} is the unobserved (BLA) and β_n depends on the class of individual i. De discrete distribution of β_m is expressed as:

$$f(\beta_m) = \begin{cases} s_1\ if\ \beta_m = \beta_1 \\ s_2\ if\ \beta_m = \beta_2 \\ \cdots \\ s_C\ if\ \beta_m = \beta_C \\ 0\ otherwise \end{cases}$$

where c are classes, the β parameters of individuals in class c equals β_c, and s_c equals the share of the population in class s (Train, 2009). Subsequently, the LC model can estimate the β parameters for specific groups or specific classes in the sample (Hensher et al., 2015).

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4 Results and Discussion

In this section, the findings of this research are textually and visually presented. The results are examined and interpreted to draw inferences and conclusions. The first section gives an overview of the descriptive analyses. The second section presents the analyses on the general questions. In the third section, the MNL model is presented. The next section examines the LC model. In the final section, the main conclusions are drawn.

4.1 Descriptive analyses

Table 4.1 compares the frequencies of the variable 'Gender' for the sample and the population. The number of females and males are nearly evenly distributed in the sample, respectively 63 and 60.

Table 4.1: Gender frequencies

Category	**Sample**		**Population (Centraal Bureau voor de Statistiek, 2020)**	
	N	**Percentage**	***N***	**Percentage**
Female	63	51.2%	6,630,936	50.1%
Male	60	48.8%	6,617,316	49.9%
Total	123	100%	13,248,252	100%

Table 4.2 summarizes the data based on the variable 'Age'. The distribution of the variables 'Age' does not seem evenly distributed; the category '18 – 39' is overrepresented in the sample.

Table 4.2: Age frequencies

Category	Sample		Population (Centraal Bureau voor de Statistiek, 2020)	
	N	**Percentage**	***N***	**Percentage**
18 – 39	92	74.8%	4,819,493	36.4%
40 – 64	21	17.1%	5,858,292	44.2%
65 – 79	10	8.1%	2,570,467	19.4%
Total	123	100%	13,248,252	100%

Table 4.3 reports the frequencies of the variable 'Education'. Categories 'Primary education' and 'Lower vocational education' do not appear in the sample, however, they are still assumed to be in the population. To be able to compare results with the data of Centraal Bureau voor de Statistiek (CBS), the categories are adjusted. The categories 'Primary education', 'Lower vocational education', 'Secondary general education' and 'Senior secondary vocational education' are adjusted to the category 'Lower education'. Similarly, the category 'Higher general and preparatory scientific education' are adjusted to the category 'Medium education'. Finally, the categories 'Higher professional education' and 'University' are renamed to 'High education'. The distribution of the variables 'Education' does not seem to be evenly distributed; the category 'Lower education' is underrepresented in the sample. In the rest of the study, the adjusted category 'Low education' is used to increase the size of the group.

Table 4.3: Education frequencies

Category	**Sample**					**Population (Centraal Bureau voor de Statistiek, 2021).**[1]	
	N	**Percentage**	**Adjusted category**	***N***	**Percentage**	***N***	**Percentage**
Primary education	0	0%	Low education	11	8.9%	6,909,000	53.5%
Lower vocational education	0	0%					
Secondary general education	1	0.8%					
Senior secondary vocational education	10	8.1%					
Higher general and preparatory scientific education	24	19.5%	Medium education	24	19.5%	1,304,000	10.1%
Higher professional education	29	23.6%	High education	88	71.5%	4,690,000	36.3%
University	59	48%					
Total	123	100%		123	100%	12,903,000	100%

[1] These ratios are based on a Dutch population of 15 to 75 years; more specific data was not available.

Different chi-square tests of goodness-of-fit are performed to determine whether the distribution of the socio-demographic characteristics of the sample is representative of the population. Table 4.4 reports the main results and the complete tests are given in Appendix III. The expected frequencies in the population of females and males are respectively 62 and 61 (Centraal Bureau voor de Statistiek, 2020). The relation between the observed and expected frequencies is non-significant, X^2 (1, *N* = 123) = .064, *p* = .801. Consequently, the frequencies of the variable 'Gender' in the sample are found to be equally distributed with the population. The expected frequencies for the categories '18 – 39', '40 – 64', and '65 – 79' are respectively, 44.4, 54.4, and 24.2 (Centraal Bureau voor de Statistiek, 2020). The relation between the observed and expected frequencies is significant, X^2 (2, *N* = 123) = 78.642, *p* ≤ .001. Thus, the frequencies of the variable 'Age' in the sample are not equally distributed as the population. The expected frequencies for the categories 'Lower', 'Medium', 'Lower', and 'High' are respectively, 64.9, 12.4, and 44.7 (Centraal Bureau voor de Statistiek, 2021).[1] The relation between the observed and expected frequencies is significant, X^2 (2, *N* = 123) = 98.421, *p* ≤ .001. Therefore, the frequencies of 'Education' in the sample are not equally distributed as in the population.

Table 4.4: Results chi-square goodness-of-fit

Variable	**Category**	O_i	E_i	**Residual**	**Chi-Square**
Gender	Female	63	61.6	1.4	.064
	Male	60	61.4	-1.4	*p* = .801
Age	18 – 39	92	44.7	47.3	78.642
	40 – 64	21	54.4	-33.4	*p* ≤ .001
	65 – 79	10	23.9	-13.9	
Education	Low	11	65.9	-54.9	98.421
	Medium	24	12.4	11.6	*p* ≤ .001
	High	88	44.7	43.3	

4.2 Analyses general questions

From the descriptive analysis, it is derived that the majority of the sample (86.2%) has never participated in a decision-making process of a construction project that took place in their neighborhood. However, Figure 4.1 pinpoints that most participants would like to be involved in the decision-making process if a new apartment is to be constructed in their neighborhood. Interestingly, Figure 4.2 highlights that the majority of respondents is familiar with the concept of participation. More details on the descriptive analyses of these variables are given in Appendix IV.

Figure 4.1: Histogram of 'Motivation'

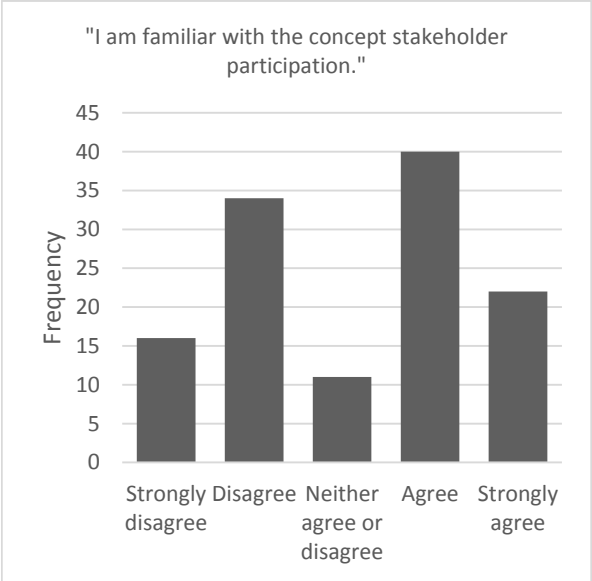

Figure 4.2: Histogram of 'Familiar'

From Appendix V, it can be derived that the mean of the variable 'Familiar' is numerically bigger for respondents with participation experience (M = 2.65, SD = 1.17) compared to the respondents that have no experience in participating (M = 2.07, SD = 1.37). Similarly, it can be derived in Appendix VI that the mean of the variable 'Motivation' is numerically bigger for respondents with participation experience (M = 3.18, SD = 0.53) compared to the respondents that have no experience in participating (M = 2.37, SD = 1.03). Consequently, the M-W tests (See

Appendix VII) are conducted to test whether the means of the variables for non-experienced participants are statistically significantly different compared to experienced participants. The M-W test on the variable 'Familiar' indicated that this difference is not statistically significant, U = 683.0, p = .099. However, the M-W test indicated that the 'Motivation' was statistically greater for experienced participants, U = 487.0, p =.001.

It can be derived from Appendix V that mean value of the variable 'Familiar' of males (M = 2.58, SD = 1.33) is numerically bigger compared to females (M = 1.73, SD = 1.24). A M-W test on the variable 'Familiar' (See Appendix VIII) indicated that this difference is statistically significant, U = 1213.0, $p \leq .001$. Similarly, it can be derived from Appendix VI that the mean of the variable 'Motivation' is numerically bigger for males (M = 2.82, SD = 0.85) compared females (M = 2.16, SD = 1.05). A M-W test (Appendix VIII) indicated that mean of 'Motivation' was significantly greater for males than for females, U = 1225.5, $p \leq .001$.

The mean values of the variable 'Familiar' for the different 'Age' categories have small numerical differences (See Appendix V). The mean value of 'Familiar' of is the greatest for the category '40 – 64' (M = 2.67, SD =.97) followed by '65 – 79' (M = 2.20, SD = 1.32) and then by '18 – 39' (M = 2.02, SD = 1.41). A K-W test indicated (See Appendix IX) that the age of respondents does not significantly affect their familiarity with the concept of participation, $H(2)$ = 3.42, p = .18. In contrast, the mean values of 'Motivation' for different 'Age' categories are characterized by bigger numerical differences (See Appendix VI). The mean value of the category '40 – 64' (M = 3.00, SD =.99) is the biggest, followed by '65 – 79' (M =3.14, SD =.85), and '18 – 39' (M = 2.27, SD =.99). A K-W test (See Appendix IX) indicated that the age of respondents significantly affects their motivation to participate, $H(2)$ = 15.90, $p \leq .001$. Consequently, post-hoc M-W tests (See Appendix X) using a Bonferroni adjusted alpha level of 0.017 (0.05/3) are used to compare all pairs of 'Age' groups. The M-W test between the groups '18 – 39' and '40-64' indicated that the difference in the mean is statistically significant, U = 501.5, $p \leq .001$. None of the other two comparisons is found to be significant.

The mean values of the variable ‘Familiar’ for the ‘Education’ categories have small numerical differences (See Appendix V). The mean value of ‘Familiar’ is the greatest for the category ‘University’ (M = 2.36, SD = 1.42) followed by ‘Higher general and preparatory scientific education’ (M = 2.04, SD = 1.23), ‘Higher professional education’ (M = 1.93, SD = 1.25) and then by ‘Lower education’ (M = 1.81, SD = 1.47). A K-W test indicated (See Appendix XI) that the level of education of respondents does not significantly affect their familiarity with the concept of participation, $H(3) = 3.15$, $p = .369$. Similarly, the mean values of the variable ‘Motivation’ for the ‘Education’ categories have small numerical differences (See Appendix VI). The mean value of the variable ‘Motivation’ is the biggest for the ‘Lower education’ (M = 2.91, SD = .94), followed by ‘Higher general and preparatory scientific education’ (M = 2.54, SD =.83), and then by both ‘Higher professional education’ (M = 2.41, SD = 1.12) and ‘University’ (M = 2.41, SD = 1.04). A K-W test indicated (See Appendix XI) that the difference in the mean values for the different levels of education are not significant, $H(3) = 2.32$, $p = .510$.

4.3 Multinomial logit model

In this section, the main results of the MNL analysis are presented and the complete NLOGIT output can be found in Appendix XII.

4.3.1 Performance of the model

The log likelihood function of the models ($LL(\beta)$) and the log likelihood-function of the base model ($LL(0)$) equal, respectively, -921.76, and -986.79. Consequently, the McFadden Pseudo R-square value equals:

$$\rho^2 = 1 - \frac{-921.76}{-986.80} = 0.0659$$

The same R-square value is being observed in the NLOGIT output (See Appendix XII). Unfortunately, this McFadden Pseudo R-square does not indicate an extremely goodness-of-fit of the derived MNL model. A possible explanation for this relatively low R-square value is the limited sample size used for deriving the MNL model.

Subsequently, the log-likelihood ratio of the model is derived:

$$-2(-986.80 - (-921.76)) = 130.1 = \ \mathrm{X}_8^2$$

While, the derived log likelihood-ratio is bigger than the critical Chi-square value with 8 degrees of freedom of 15.5 (Bosch & Kamps, 2007). Consequently, the derived MNL model represents a significant improvement compared to the null model, X^2 (8, *N* = 1107) = 130.1, $p \leq .001$.

4.3.2 Parameters estimates

Table 4.5 presents the parameter estimates of the MNL. The parameter values of 'Constant 1' and 'Constant 2' are relatively high, this indicates that respondents more often chose the first and second participation alternative then the 'not participate' option. The third level of the attributes represents the reference level, and the parameter value of this level is calculated

following Hauber et al. (2016) by taking the negative sum of the other parameters of the corresponding attribute level. Moreover, the *p*-values of the estimated parameters are presented in Table 4.5; these values measure the statistical significance of the difference between the estimated parameter and the mean of the value of the parameters of the corresponding attribute (Hauber et al., 2016).

Table 4.5: Results of the MNL model

Attribute	**Attribute level**	**Parameters value (β)**
Constant 1	-	1.633***
Constant 2	-	2.041***
Participation technique	Survey	0.277***
	Face-to-face meeting	-0.435***
	Public meeting	(0.158)
Objective of the involvement	Stay informed	-0.558***
	Share preferences	0.131**
	Influence decision	(0.426)
Moment of the first involvement	Feasibility phase	0.217**
	Design phase	0.366***
	Construction phase	(-0.583)
Receive information	Social media	-0.168
	Websites	0.467***
	Newspaper	(-.299)

*Note: ***, **, * → Significance at 1%, 5%, 10% level.*

4.3.2.1 Participation technique

From the MNL model, it can be derived that the values of the parameters of the attribute level 'Survey' equals 0.277 and is significant at a 99% confidence level. The parameter estimate of the next attribute level, 'Face-to-face meeting' equals -0.435 and is significant at a 99% confidence level. Consequently, the difference between these parameters values and the mean is

statistically significant The parameter value of the attribute level 'Public meeting' is calculated to be 0.158.

In order to compare the different parameter values for the attribute levels of 'Participation technique', Figure 4.3 is constructed. Interestingly, applying a survey as the technique to involve stakeholders in participation processes for the development of an apartment complex generates the most utility in comparison to the other techniques. The next most preferred participation technique in the MNL model is public meetings. The negative parameter value of face-to-face meeting implies a negative impact on the utility of participants.

Therefore, the MNL model advocates not use face-to-face-meeting to involve stakeholders in the decision-making process. Consequently, this study has confirmed previous research of Lowndes et al. (2001) that a survey is the most favored form for participation. However, in contradiction, they found face-to-face-meeting to be the second most favored participation technique.

4.3.2.2 Objective of the involvement

The MNL model revealed a parameter value of -0.558 at a 99% significance level for the attribute level 'Stay informed'. Additionally, the parameter value of 'Share preferences' equals 0.131 at a 99% significance level. The *p*-values of the estimated parameters indicate a statistical significance difference between the estimated parameters and the mean value of the attribute objective of the involvement. Finally, the attribute level 'Influence decision' is the reference level and its parameter value equals 0.426.

As can be observed in Figure 4.4, the parameter value of 'Influence decision' is noticeably bigger compared to the other attribute levels. Consequently, stakeholders derive the most utility from participation processes in which they can influence decisions. Thereafter, 'Sharing preferences' would generate the most utility for the respondents in this study. The objective 'Stay informed'

is determined to be the least popular objective for participatory processes and impacts the utility of respondents negatively.

These findings confirm previous findings in the literature. As suggested by Brody et al. (2003) and Kessler (2004), this study found that stakeholders prefer to have an opportunity to impact the decisions. Moreover, the increase of utility when attribute levels represent an increased level of empowerment matches the findings of Brody et al. (2003) that increasing levels of empowerment are correlated with an increase of participants involved.

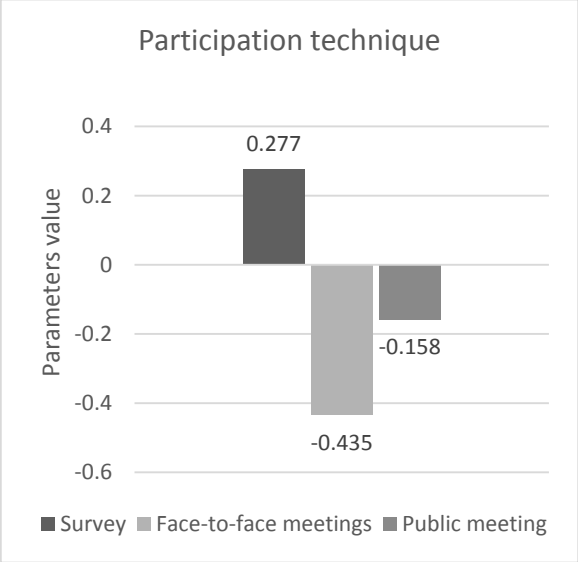

Figure 4.3: Parameter values of participation technique

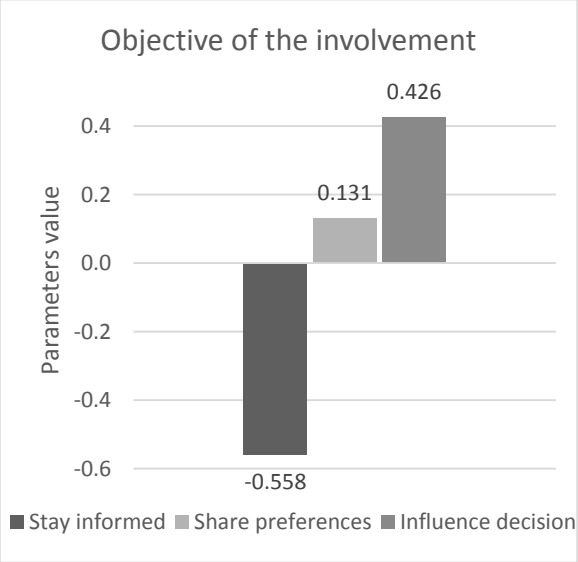

Figure 4.4: Parameter values of objective of the involvement

4.3.2.3 Moment of first involvement

The MNL model established a parameter value of 0.217 for the attribute level 'Feasibility phase' at a 90% confidence level. The parameter value of the next attribute level, 'Design phase', equals 0.366 and is significant at a 99% confidence level. Thus, for the estimated parameter 'Feasibility phase' and 'Design phase', the difference between its parameter value is statistically significant compared to the mean value. Subsequently, the value of the parameter for 'Construction phase' is calculated to be equal to -0.583.

Figure 4.5 shows that the moment of the first involvement in participation processes causes different utilities. The parameter values of the MNL model suggest that respondents prefer to be involved for the first time in participation processes in the 'Design phase'. Thereafter, the 'Feasibility phase' is indicated to be the most preferred phase to become involved in the participation process. As expected, involving stakeholders in the 'Construction phase' is demonstrated to impact the utility negatively. Thus, it can be suggested not to start involving stakeholders in the 'Construction phase'.

These findings do not completely support findings of previous research, for instance, Heravi et al. (2015) and Reed et al. (2018), that stakeholders should be involved in the participation process at the earliest possible moment. On contrary, it was found that participants favor being involved from the 'Design phase'. However, the findings do not contradict previous findings. Since the attribute level of the latest moment, 'Construction phase', to involve stakeholders has a substantial negative impact on the utility compared to the other attribute levels. Moreover, the difference between the values of the parameters of the 'Feasibility phase' and 'Design phase' is relatively small.

4.3.2.4 Receive information

The MNL model determined a parameter value of the attribute level 'Social media' of -0.168. The parameter value of the attribute level 'Websites' equals 0.467 and is significant at a 99% confidence level. Hereby, it is proved that the estimated parameter value of 'Websites' is statically different compared to the mean value of the attributes. Finally, the attribute level 'Newspaper', the reference level, equals -0.299.

Figure 4.6 visualizes the different parameter values of techniques to receive information in participation processes. Interestingly, the MNL model advocates that stakeholders should be provided information about the project using 'Websites', while the estimated parameter is the greatest and the only positive value. Remarkably, both 'Social media' and 'Newspapers' have negative parameters, which indicates that these impact the utility negatively. However, the

negative impact of ‘Newspapers’ is bigger compared to ‘Social media’. Consequently, the MNL model suggests not to use ‘Social media’ or ‘Newspapers’ to provide information to stakeholders in participation processes.

Despite the findings of Brody et al. (2003) that suggested stakeholders prefer to be informed about the project by newspapers, this study found that respondents do not favor newspapers for information provision. A possible explanation for this is that the way people consume information has changed over time. Moreover, the estimated parameters refute the study of Zhou et al. (2019) that stakeholders prefer social media over websites to collect information regarding the project.

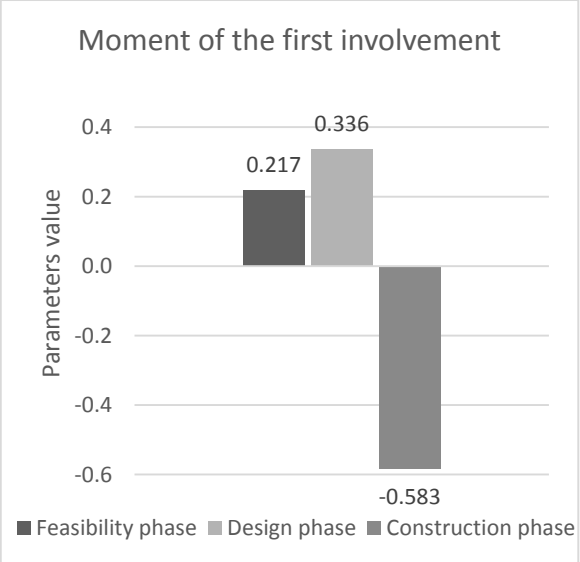

Figure 4.5: Parameter values of moment of first involvement

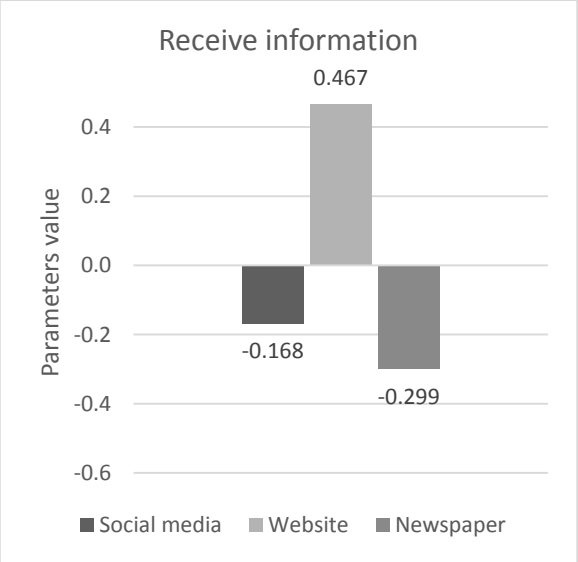

Figure 4.6: Parameter values of receive information

4.3.3 Relative importance

The ordered ranges and the relative importance of the different attributes are compared in Table 4.6. The range of an attribute equals the difference between the highest and lowest parameter estimate. Subsequently, the relative importance of an attribute is derived by dividing the range of the corresponding attribute by the sum of the all ranges. A high score of relative importance

indicates a high impact on the choice behavior of the respondents in this experiment. The relative importance of the attributes 'Objective of the involvement' (28.8%) and 'Moment of the first involvement' (27.8%) are the biggest. Respondents attach relatively the same value to these attributes for participating in the decision-making process of real-estate construction projects. Moreover, Table 4.6 indicates that the relative importance of 'Participation technique' (22.4%) and 'Receive information' (20.9%) are relatively similar and the smallest. These results suggest that especially the timing of beginning to involve stakeholders and the objective of the participation process should be carefully considered for a participation process.

Table 4.6: Ordered relative importance of attributes

Attribute	**Range**	**Relative importance**
Objective of the involvement	0.98	28.8%
Moment of the first involvement	0.95	27.8%
Participation technique	0.77	22.4%
Receive information	0.71	20.9%
Total	3.41	100%

4.4 Latent class model

A latent class (LC) model is created to test if parameter values can be determined for classes that show similar choice behavior. The complete NLOGIT output of the derived LC models can be found in Appendix XIII. In these analyses, the number of classes is increased with one for every iteration. A maximum of three classes is found for this sample, while after including four classes the LC model gives an error.

The log likelihood function of the LC models with two - and three classes equal respectively -856.36 and -831.03. Consequently, the log likelihood-ratio of the LC model with three classes compared to the LC model with two classes equals:

$$-2(-831.03 - (-856.36)) = 50.76 = \ \mathrm{X}_{11}^2$$

While the derived log likelihood-ratio is bigger than the critical Chi-square value with 11 degrees of freedom of 19.7 (Bosch & Kamps, 2007). Consequently, the LC model with three classes represents a significant improvement compared to the LC model with two classes, X^2 (11, *N* = 1107) = 50.76, $p \leq .001$. This indicates that three classes with similar preferences appear in the sample. This confirms earlier findings of Webler and Tuler (2006) that participants have different perspectives on what a proper participation process is. The rest of this section elaborates the LC model with three classes.

4.4.1 Performance of the model

The McFadden Pseudo R-square value of the LC model with three classes equals:

$$\rho^2 = 1 - \frac{-831.03}{-1216.16} = 0.3167$$

The same value can be observed in the NLOGIT output (See Appendix XIII). This R-square value indicates an extreme goodness-of-fit of the LC model, while it is between 0.2 and 0.4.

Thereafter, the log likelihood-ratio of the LC model with three classes compared to the null mode equals:

$$-2(-831.03 - (-1216.16)) = 770.27 = \ \mathrm{X}^2_{32}$$

While, the derived log likelihood-ratio is bigger than the critical Chi-square value with 32 degrees of freedom of 46.2 (Bosch & Kamps, 2007). Consequently, the LC model with three classes represents a significant improvement compared to null model, X^2 (32, *N* = 1107) = 770.27, $p \leq .001$.

By subdividing the sample into three classes with similar choice behavior, the LC model with three classes outperforms the MNL model. The R-square value of the LC model with three classes is bigger than the R-square value of the MNL model, respectively 0.3167 and 0.0659. Moreover, the log likelihood-ratio of the LC model with three classes compared to the MNL models equals:

$$-2(-831.03 - (-921.76)) = 181.47 = \ \mathrm{X}^2_{23}$$

While, the derived log likelihood-ratio is bigger than the critical Chi-square value with 23 degrees of freedom of 35.2 (Bosch & Kamps, 2007). Consequently, the LC model with three classes represents a significant improvement compared to MNL model, X^2 (23, *N* = 1107) = 181.47, $p \leq .001$.

4.4.2 Parameter values

The main results of the LC model with three classes are given in Table 4.7. The class probabilities of classes 1, 2, and 3 are respectively 65.3%, 28.0%, and 6.7%. First, the parameter values of the individual classes are discussed, and thereafter the classes are compared.

Table 4.7: Results from LC analysis

Attribute	Attribute level	Class 1	Class 2	Class 3
Constant 1	-	2.409***	1.644***	-1.696**
Constant 2	-	2.538**	2.506***	-0.751
Participation technique	Survey	-0.392**	0.899***	2.382***
	Face-to-face meeting	0.113	-1.721***	-1.409***
	Public meeting	(0.280)	(0.822)	(-0.974)
Objective of the involvement	Stay informed	-0.707***	-0.179	-0.531
	Share preferences	-0.008	0.265*	0.852*
	Influence decision	(0.714)	(-0.086)	(-0.321)
Moment of the first involvement	Feasibility phase	0.114	-0.167	0.728
	Design phase	0.648***	0.352	0.809
	Construction phase	(-0.762)	(-0.185)	(-1.537)
Receive information	Social media	0.241	-0.277	-0.274
	Websites	0.443	0.616	0.871
	Newspaper	(-0.685)	(-0.339)	(-0.597)
Class membership probability		65.3%	28.0%	6.7%

*Note: ***, **, * → Significance at 1%, 5%, 10% level.*

4.4.2.1 Class 1

For class 1, the estimated parameter value of 'Constant 1' equals 2.409 at a 99% confidence level, and the estimated parameter value of 'Constant 2' equals 2.538 at a 95% confidence level. Thus, respondents in class 1 are more likely to choose a participation option compared to the 'not participate' option.

For the attribute 'Participation technique', the derived parameter estimates for the attribute levels 'Survey', 'Face-to-face meeting', and 'Public meeting' are, respectively -0.392, 0.113, and 0.280. Thus, contrary to the expectations based on the MNL model and the study of Lowndes et

al. (2001), the survey is the least preferred participation technique in class 1. Moreover, the parameter estimate of 'Survey' is found to statistically different compared to the mean value at a confidence level of 95%. In accordance with the MNL model, based on the estimated parameter values, it is concluded that respondents in class 1 favor 'Public meeting' over 'Face-to-face meeting'.

In class 1, for the attribute 'Objective of the involvement' only the attribute level 'Influence decision' is related with a positive parameter estimate, namely 0.714. However, the negative impact of the attribute level 'Stay informed' is far bigger than the impact of 'Share preferences', while the parameter estimates equal respectively -0.707 and -0.008. As the magnitude of the derived parameter values increases when the amount of power increases, these findings confirm previous findings in the literature and are in accordance with the MNL model.

For the attribute 'Moment of the first involvement', the derived parameter estimates for the attribute levels 'Feasibility phase', 'Design phase', and 'Construction phase' are, respectively -0.114, 0.648, and -0.762. Thus, similar to the MNL model, respondents in class 1 derive the most utility from being involved from the 'Design phase' followed by 'Feasibility phase', and derive a negative utility from the 'Construction phase'. The parameter value of 'Design phase' is found to be statistically different compared to the mean at a 99% confidence level. Therefore, the LC model suggests people in class 1 should be involved first in the 'Design phase'.

For the attribute levels of 'Receiving information' the order from most to least preferred attribute is 'Website', followed by 'Social media' and then by 'Newspaper', while the estimated parameter values are, respectively 0.443, 0.241, and -0.685. None of these values is statistically significant. These findings are in accordance with the MNL model.

Similar to the MNL model, Table 4.8 compares the range and relative importance of attributes of the classes. For class 1, the relative importance of the attribute level 'Objective of the involvement' (30.7%) is the biggest, shortly followed by 'Moment of the involvement' (30.4%).

The attribute level 'Receive information' (24.4%) is the third most relevant important in class 1, and the least important is 'Participation technique' (14.5%). The relative importance of the attributes is visualized in Figure 4.7. From Figure 4.7, it is derived that the relative importance of the three most important attributes is comparable, and the relative importance of the 'Participation technique' is much lower. The ordered relative importance of class 1 is comparable to the findings in the MNL model; they only differ on the least important attribute.

Table 4.8: Comparison of relative importance of attributes for different classes

Attribute	**Class 1**		**Class 2**		**Class 3**	
	Range	Relative importance	Range	Relative importance	Range	Relative importance
Objective of the involvement	1.41	30.7%	0.44	9.7%	1.38	15.4%
Moment of the first involvement	1.41	30.4%	0.54	11.8%	2.35	26.1%
Receive information	1.13	24.4%	0.96	21.0%	1.47	16.3%
Participation technique	0.67	14.5%	2.62	57.5%	3.79	42.2%
Total	4.62	100%	4.56	100%	8.99	100%

4.4.2.2 Class 2

The estimated parameter for 'Constant 1' and 'Constant 2' for class 2 equal, respectively 1.644 and 2.506 at a 99% confidence level. These values indicate that respondents in class 2 more often chose the first and second participation alternative compared to the 'not participate' option.

For the attribute level ‘Participation technique’, respondents in class 2 favor ‘Survey’ the most as participation technique; shortly followed by ‘Public meetings’, while the estimated parameter values of these attributes equal respectively 0.899 and 0.822. The estimated parameter of ‘Survey’ differs statically compared to the mean value at a confidence level of 99%. The parameter value of ‘Face-to-face- meeting’ equals -1.721 at a confidence level of 99%. The relatively high negative parameter estimate indicates that participants in class 2 do not favor ‘Face-to-face-meeting’ at all.

Interestingly, the most favored ‘Objective of the involvement’ for respondents in class 2 is ‘Share preferences’, while this attribute is associated with the highest parameter estimate of 0.265 at a 90% confidence level. Moreover, the utility of respondents in class 2 is slightly negatively impacted by the attribute level ‘Influence decision’, while the estimated parameter value equals -0.086. These findings contradict previous findings in the literature and the MNL model. However, the parameter value of ‘Stay informed’ equals -0.179, which implies that this is the least preferred objective of respondents in class 2.

For the attribute ‘Moment of the first involvement’, the derived parameter estimates for the attribute levels ‘Feasibility phase’, ‘Design phase’, and ‘Construction phase’ are, respectively -0.167, 0.352, and -0.185. Therefore, the most favorite stage to be involved in the process for the first time is the ‘Design phase’. Moreover, involving respondents from class 2 at the other moments impacts the utility negatively.

The parameter estimates for the attribute levels ‘Social media’, ‘Websites’, and ‘Newspaper’ for class 2 equal respectively -0.277, 0.616, and -0.339. Therefore, in accordance with the MNL model, the respondents in class 2 favor receiving information from ‘Websites’, and their utility is negatively impacted by other techniques.

Table 4.8 compares the relative importance of the different attributes. The ordered relative importance of the most important to least important attribute for respondents in class 2 is:

'Participation technique' (57.5%), 'Receive information' (21.0%), 'Moment of the first involvement' (11.8%), and 'Objective of the involvement' (9.7%). Interestingly, the relative importance of the attribute 'Participation technique' is substantially greater compared to the other attributes. The same result can be observed in Figure 4.7.

4.4.2.3 Class 3

In class 3, the estimated parameters of 'Constant 1' and 'Constant 2' equal respectively -1.996 and -0.751. The estimated parameter of 'Constant 1' is significant at a 95 percent confidence level. These negative values for the constants imply that respondents in class 3 prefer the 'not participate' option more than the participation process alternatives.

The estimated parameter values of the attribute levels 'Survey', 'Face-to-face meeting', and 'Public meeting' equal, respectively 2.382, -1.409, and -0.974. The parameter values of 'Survey' and 'Face-to-face meeting' differ statically significantly from the mean at a 99% confidence level. From these parameter values, it can be derived that respondents in class 3 prefer a 'Survey' as the participation technique, and their utility is negatively impacted by the other attribute levels.

The most favored objective of respondents in class 3 is 'Share preferences', while this attribute level is associated with the highest parameter estimate of 0.852 at a 90% confidence level. Thus, it is statically different compared to the mean value of the attribute. The parameter values of 'Influence decision' and 'Stay informed' equal respectively -0.321 and -0.531. Therefore, the utility of respondents in class 3 is negatively impacted by these attribute levels.

The estimated parameter values of the attribute levels 'Feasibility phase', 'Design phase', and 'Construction phase' for respondents in class 3 equal sequentially 0.728, 0.809, and -1.537. These parameter estimates suggest that class 3 members prefer to be involved in earlier stages and do not want to be involved in the construction phase.

The parameter estimates of the attribute 'Receive information' for class 3 are similar to the MNL model. The most preferred method to receive information in this class is 'Websites' with a parameter estimate of 0.871. The other attribute levels are associated with a negative parameter estimate; for 'Social media' the parameter estimate equals -.274, and for 'Newspaper' -0.597. Thus, these attribute levels impact the utility of respondents in class 3 negatively.

Table 4.8 shows that the relative importance of the attribute 'Participation technique' (42.2%) is substantially greater compared to the other attributes. The second most important attribute level is 'Moment of the first involvement' (26.1%). The least important attributes, 'Receive information' (16.3%) and 'Objective of the involvement' (15.4%), are comparable in magnitude. The same results are observed in Figure 4.7.

4.4.2.4 Comparison classes

From comparing the parameter values for the attributes 'Constant 1' and 'Constant 2' of the different classes, it can be observed that class 3 has negative values for the constants. This suggests that respondents in class 3 more often choose the 'not participate' option than the participation process alternatives. Inversely, based on parameter values of the constants, respondents in classes 1 and 2 more often chose a participation option compared to the 'not participate' option.

From comparing the estimated parameter values for the variable 'Participation technique' of the three classes interesting differences can be noticed. Respondents within class 1 favor 'Public meeting' the most as a participation technique, followed by 'Face-to-face meeting', and their utility is negatively impacted by a 'Survey'. On the contrary, respondents within class 2 derive most utility from 'Survey' followed by 'Public meetings, but their utility is negatively impacted by 'Face-to-face meeting'. Finally, class 3 favor 'Survey' the most to be involved in participation processes and for their utility is negatively impacted by the other attribute levels.

Interestingly, the utility of respondents of all classes is negatively impacted by the attribute level 'Stay informed'. For the class 2 and 3 only the attribute level 'Share preferences' impacts the utility positively. In contrast, respondents in class 1 prefer the attribute level 'Influence decision' the most.

The most favored moment to be involved in a participation process is at the 'Design phase' for all classes. In accordance with the MNL model, the utility of respondents in all classes is negatively impacted by the attribute level 'Construction phase'. The attribute level 'Feasibility phase' impacts the utility of respondents in class 1 and 3 positively, whereas it impacts class 2 negatively.

Respondents in all classes prefer to receive information about the project from 'Websites'. The utility of respondents in classes 2 and 3 are negatively impacted by the other attribute levels, whereas the respondents' utility in class 1 is positively impacted by 'Social media'.

Similar to the MNL model, Table 4.8 compares the ranges and relative importance of attributes for the three classes in the LC model. Strikingly, the ordered importance of the attributes for class 1 is the exact opposite for class 2. Consequently, the relatively most important attribute for respondents in class 1 is the least important in class 2 and vice versa. Moreover, the ordered relative importance of class 3 is similar to class 2; only the relative importance of 'Moment of the first involvement' and 'Receive information' are reversed in position. Moreover, the ordered relative importance of the attributes in class 1 is similar to the MNL model and the magnitudes also show similarities. The results on the relative importance of the attributes of different classes are also visualized in Figure 4.7.

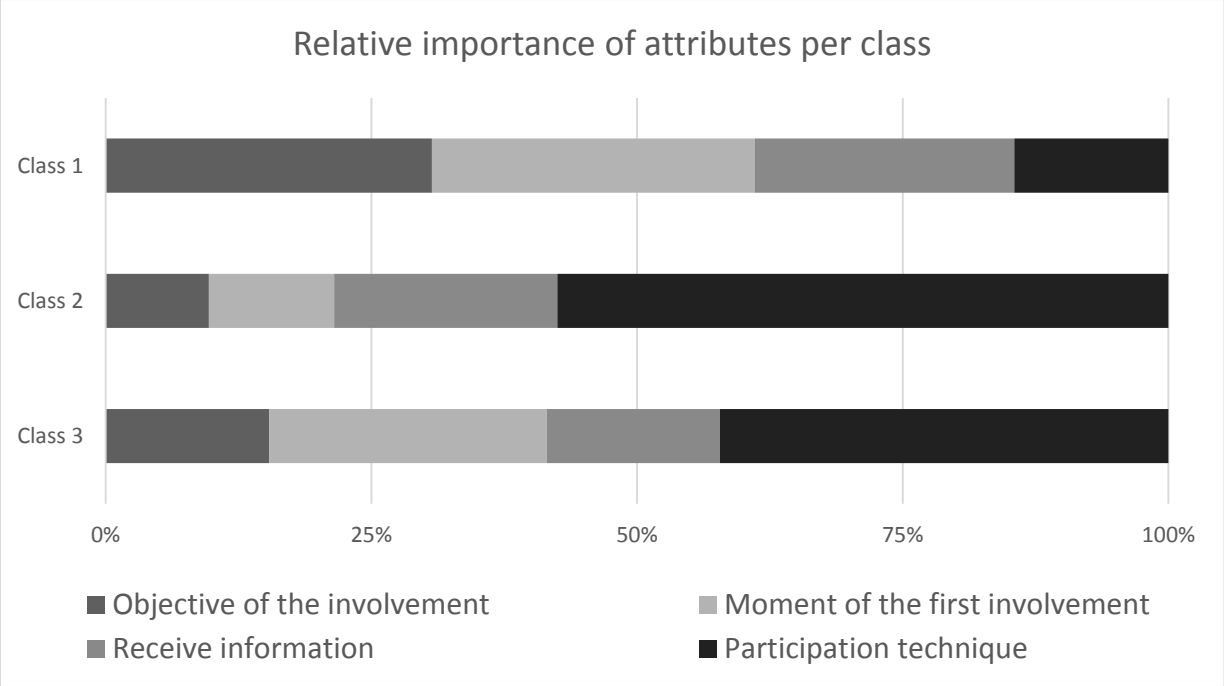

Figure 4.7: Visualization of relative importance for the classes

4.4.3 Class description

The LC model calculates for every respondent the probability that the respondent's choice behavior is represented by each class. Subsequently, respondents are allocated to the class with the highest probability. Hereby, 82 (66.7%) are allocated to class 1, 33 respondents (26.8%) to class, 8 (6.5%) to class 3. To gain more information about the classes, the distribution of the socio-demographic and general questions of the classes are compared in respectively Table 4.9 and Table 4.10. In the last column, the result of the Chi-Square Test of Independence are given; these tests determine whether there is an association between the categorical variables. These tables are derived by creating crosstabs and the entire procedures can be found in Appendix XIV.

Table 4.9 compares the distributions of the classes for different socio-demographic characteristics. For the variable 'Gender' it can be observed that the percentage of males in class 1 is bigger than the percentage of females. On the other hand, the number of females in classes 2 and 3 is bigger than the number of males. The chi-square test of independence indicates that

the relation between these variables is significant at a 99% confidence level, X^2 (2, *N* = 123) = 9.444, *p* = .009. Consequently, the chi-square test suggests an association between class and gender. In contrast, the distributions of the variables 'Age' and 'Education' in the different classes show comparable percentages. Accordingly, no significant association is identified by the chi-square tests.

Table 4.9: Socio-demographic percentages per classes

Variable	**Category**	**Class 1**	**Class 2**	**Class 3**	**Chi-square**
Gender	Female	41.5%	69.7%	75.0%	9.444
	Male	58.5%	30.3%	25.0%	*p* = 0.009
Age	18 – 39	74.4%	75.8%	75.0%	1.076
	40 – 64	17.1%	15.2%	25.0%	*p* = 0.898
	65 – 79	8.5%	9.1%	0.0%	
Education	Lower education	8.5%	9.1%	12.5%	4.995
	Higher general and preparatory scientific education	22.0%	12.1%	25.0%	*p* = 0.554
	Higher professional education	19.5%	36.4%	12.5%	
	University	50.0%	42.4%	50.0%	

The percentages for the general questions are compared in Table 4.10 for the different classes. The frequencies of the categories for the variable 'Experience' are comparable for the different classes. Accordingly, the chi-square tests indicated no significant association between the classes and the variable 'Experience'. However, the percentages of the variable 'Familiar' differ substantially for the different classes. Compared to the other classes, more respondents in class 3 indicated to be not familiar with the concept of stakeholder participation. Similarly, respondents in class 1 seem to be more familiar with the concept of stakeholder participation compared to respondents in class 2. From the chi-square test of independence it is derived that

the relation between the categories of the variable 'Familiar' and the class is significant at a 90% confidence level, X^2 (8, *N* = 123) = 14.148, *p* = .078. Consequently, the chi-square test suggests an association between the class and familiarity of respondents. The distributions for the categories of the variable 'Motivation' show that respondents in class 1 indicated more frequently that they want to be involved in a participation process if a construction project is executed in their neighborhood compared to the other classes. Similarly, respondents in class 2 seem to be more motivated to be involved in participation processes than respondents in class 3. The chi-square tests indicated a significant association between the classes and the categories of the variable 'Motivation' at a 99% confidence level, X^2 (8, *N* = 123) = 22.703, *p* = .004. Therefore, the chi-square test suggests an association between class and motivation. Broadly speaking, these findings demonstrate that significantly more respondents in class 1 indicated to be familiar and motivated for participation and that in class 3 the most respondent indicated not to be familiar and motivated for participation.

Table 4.10: General questions percentages per class

Variable	Category	Class 1	Class 2	Class 3	Chi-square
Experience	Yes	12.2%	18.2%	12.5%	0.721
	No	87.8%	81.8%	87.5%	*p* = 0.697
Familiar	Strongly disagree	8.5%	15.2%	50.0%	14.148
	Disagree	26.8%	30.3%	25.0%	*p* = 0.078
	Neither agree or disagree	9.8%	9.1%	0.0%	
	Agree	32.9%	36.4%	12.5%	
	Strongly agree	22%	9.1%	12.5%	
Motivation	Strongly disagree	1.2%	9.1%	50%	22.703
	Disagree	7.3%	27.3%	25.0%	*p* = 0.004
	Neither agree or disagree	22.0	24.2%	0.0%	
	Agree	54.9	33.3%	12.5%	
	Strongly agree	14.6%	6.1%	12.5%	

4.5 Discussion

This study revealed interesting results regarding participation processes from the perspective of stakeholders. Of the study population, 123 subjects completed and returned a useful questionnaire.

The most intriguing result is that males appear to be more motivated to participate in the decision-making process if an apartment complex is developed in their neighborhood. This finding emerged from both the general question and the LC model. The general analyses derived a significantly greater motivation for males. Additionally, the LC model found class 1 to be significantly associated with more motivated and male respondents compared to the other classes. Unfortunately, there is not enough information to explain this finding.

The single most striking finding is that the objective and the moment of the first involvement are the most important features of participation processes. Since these are the most important attributes in both the MNL model and in class 1 with comparable magnitudes. Consequently, it is essential to consider these features properly for stakeholder participation processes.

Comparisons of the estimated parameter values of the LC classes and the MNL suggest similarities and differences in the preferences of attribute levels. The attribute levels that represent receiving information from websites and being involved from the design phase are the favorite in all LC classes and the MNL model. For the objective of the involvement, stakeholder prefer either to share preferences or to influence decisions the most. In contrast, stakeholders do not favor the attribute levels stay informed, construction phase, and newspapers. In contrast, the derived parameter values of the attribute levels for the participation technique differ substantially, which implies that stakeholders' preferences for participation techniques differ considerably. This supports previous findings in the literature that stakeholders should have a substantial impact in the decision-making of participation processes (e.g. Hall et al., 2016; Kessler, 2004). Similarly, this is in good agreement with the general-accepted suggestion to

involve stakeholders promptly (e.g. Heravi et al., 2015; Reed et al., 2018). Finally, as expected, in contrast to Brody et al. (2003), newspapers are not relevant anymore.

The findings of the analyses on the general questions support the idea that the willingness to participate and familiarity with the concept of stakeholder participation alter for different groups. Males appear to be significantly more motivated to participate and familiar with the concept of stakeholder participation. Thus, this suggests that males are more motivated and familiar with stakeholder participation. In addition, a significant difference in motivation appeared between the age groups '18 – 39' and '40-64'. This implies that older people are more motivated to be involved in participation processes. Interestingly, the motivation to participate is high for the majority of the sample. However, the analyses suggest that the willingness to participate is statistically greater for people who have experience with participation. Furthermore, the majority of sampled participants indicate to have no experience with participation. These findings point out that a substantial amount of stakeholders want to be involved in participation processes despite their lack of experience with participating.

Although the performance of the MNL model was not perfect, differences in the relative importance of attributes and attribute levels give insights into stakeholder preferences regarding participation processes in real-estate development projects. Probably, the limited sample size or differences in choice behavior of the participants have led to this performance. Moreover, the assumption of the IIA property is a limitation of the MNL model. According to the MNL model, the most important attributes of participation processes are the objective of the involvement and moment of the first involvement, with almost the same relative importance. Therefore, it suggests to well-consider these factors for the development of a participation process. In support with previous research, for instance Hall et al. (2016) and Kessler (2004), stakeholders should have an impact on the decisions, while the most preferred objective of the involvement is to influence the decision, followed by share preferences. This study has not confirmed previous research that stakeholders should be involved at the earliest moment

possible (e.g. Heravi et al., 2015; Reed et al., 2018), while the most preferred moment to become involved in the process is the design phase. Nevertheless, the findings do no completely contradict previous research, while respondents give no preference to be involved in the construction stages. In line with previous research, the survey is found to be the most favored participation technique (Lowndes et al., 2001). A possible explanation could be that participants are more interested in the activities of the design phase. In contradiction to expectations, public meetings are more favored than face-to-face meetings. Remarkably, the MNL model suggests using websites to inform the stakeholder with information regarding the project, whereas previous research suggested and newspapers as techniques to provide information to stakeholders (Brody et al., 2003). Probably, the preferences of stakeholders found by Brody et al. (2003) are outdated and changed substantially over time. Moreover, the findings support the results of Zhou et al. (2019) that social media and websites are the most favored techniques to receive information partly.

The performance of the LC model is perfect, which indicates that differences in preferences regarding the participation process exist for different groups. This supports previous findings in the literature that stakeholders have different views on what a proper participation process is (Webler & Tuler, 2006). The following three classes of participants with similar choice behavior are derived in the LC model: class 1 (66.7%), class 2 (26.8%), and class 3 (6.5%). Members of class 3 represent people that would not prefer to be involved in participation processes, while these respondents more often choose the ‘not participate’ option than the participation process alternatives. For respondents in class 1, the participation technique is insignificant, while the other attributes are comparable in importance. The relative importance of the attributes is comparable to the MNL model. In contrast, the ordered importance of the attributes for class 2 is the exact opposite of class 1. Moreover, the participation technique is crucial for class 2 members. The ideal participation process for class 1 members appears to be the following: to influence decisions from the design phase in public meetings and receive information from

websites. In contrast, the ideal participation process for class 2 is: to share preferences from the design phase in surveys and receive information regarding the project from websites.

In order to increase the understanding of the members of the LC classes, the class descriptions are analyzed. These analyses indicated statistical differences between the classes regarding the variables gender, familiarity, and motivation. The percentage of males in class 1 is bigger compared to the other classes. In addition, members in class 1 are motivated mostly, followed by class 2, and then by class 3. This is in good agreement with the fact that respondents in class 3 more often choose the 'not participate' option. Finally, respondents in class 1 seem to be most familiar with the concept of participation, followed by class 2, and then by class 3.

Based on the frequencies of the socio-demographic and the results of the Chi-square tests, it seems that the representativeness of the sample for the complete population could be argued. The age characteristics of the population are adjusted to a population of people that are 18 to 79 years old. The distribution of females and males of the sample represents this population adequately. However, the distribution of the variables 'Age' and 'Education' do not represent the population sufficiently. Consequently, the sample might not represent a random sample of the population. A possible cause of this could be a selection bias as the survey is online shared within the network of the researcher. In addition, given the relatively small sample size, caution must be exercised. Therefore, the findings of this study need to be interpreted with attention, especially when generalizing the results on the complete population and low statistical conclusion validity must be taken into account.

The findings increased the understanding of stakeholders' preferences regarding participation processes. It is expected that the quality of participation processes enhances if these findings are taken into account by project managers and governments that want to develop construction projects. This results in increased quality of decisions and projects.

5 Conclusions

Since the quality of the decisions of stakeholder participation processes depends on the quality of the process that leads to it, it is essential to understand stakeholders' preferences regarding features of participation processes. In this study, discrete choice experiments provide a powerful tool to gain insights into the perceptions, motivations, and experiences of potential stakeholders.

This section elaborates on the answers to the sub- and main research questions. Furthermore, it discusses the limitations of this study and recommendations for future research.

5.1 Sub-questions

The first two sub-questions are answered based on a literature review. The third, fourth, fifth, and sixth sub-questions are answered based on the results of the quantitative analyses.

5.1.1 What are the advantages of participation processes in construction projects?

Several benefits are identified in the existing literature. The main benefit of stakeholder participation is that it can improve the quality of decisions. Furthermore, stakeholder participation integrates different interests and opinions into decisions, can resolve conflicts, creates trust in decisions and institutions, and informs and educates stakeholders.

5.1.2 What attributes should be considered for successful participation processes?

From previous studies, it is derived that the following attributes should be taken into account for participation processes:

- Participation technique – what type(s) of participation mechanism to use;
- Timing of the first involvement – when to start involving stakeholders in the process;
- Information provision – what types of information to provide and what techniques to use for providing information;
- The objective of the involvement – what is the level of empowerment of stakeholders;

- Identify relevant stakeholders – which and how many stakeholders to involve;
- Adopt ICT's – whether and what ICT's to adopt in the process; and
- Administrative – how to organize the process.

5.1.3 Are there differences in willingness to participate and familiarity with the concept of participation for different demographic groups?

Both findings of the analyses on the general questions as the LC model indicate differences in motivation for and familiarity with stakeholder participation for different groups. Strikingly, these analyses suggest that males are more motivated to participate in the decision-making process than females. Additionally, the analyses on the general questions pinpoint males to be more familiar with the concept of participation compared to females. In addition, the age group '40-64' is more motivated compared to the age group '18 – 39'.

5.1.4 What attributes are important in participation processes of real-estate development projects and to what degree?

Different groups with similar relative importance of attributes are identified. For the majority of the respondents, the relative importance of the attributes the objective of the involvement (30.7%) and the moment of the first involvement (30.7%) are the biggest. Hereafter, the attribute receive information (24.4%), is the most important for them and followed by the attribute participation technique (14.5%). Interestingly, the ordered relative importance that represents the second biggest group of participants is the exact opposite of the one described above. Furthermore, the most important attribute for these participants is relatively far more important, namely participation technique with a relative importance of 57.5 percent.

5.1.5 Are there differences in preferences regarding the participation process in real-estate development projects for different groups?

The LC model denotes that three groups with similar preferences for participation processes exist. These groups differ in favorite attribute levels and importance of the attributes. The biggest group favors influencing decisions from the design phase in public meetings and receive information from websites. The second biggest group prefers to share preferences from the

design phase in surveys and receive information from websites. The third group represents people that would not want to be involved in participation processes.

5.2 Main research question

The main research question of this research is: *"What stakeholder participation process attributes are preferred by neighboring stakeholders in the Netherlands for participating in real-estate development projects?".*

The answers to the sub-questions indicate that similarities and dissimilarities in preferences of neighboring stakeholders appear for participation process attributes in real-estate development projects. The preferences for the moment of the first involvement, receive information, and objective of the involvement show similarities. For the moment of the first involvement, the most preferred attribute level is the design phase and the least preferred attribute level is the construction phase. Similarly, for receive information the most preferred attribute level is websites and the least preferred attribute level is newspapers. For the objective of the involvement, stakeholders prefer to impact the decisions, while the least preferred attribute level is to stay informed. However, the favorite attribute level of the majority of the stakeholders is to influence decisions and for the remaining part to share preferences. In contrast, differences in preferences appear for the participation technique. For the majority of the participants, Face-to-face meetings are the most favored attribute level and survey the least favored. However, the remaining part favors surveys the most and face-to-face meetings the least.

The importance of the attributes differs across stakeholders. For the majority of the stakeholders, the attributes objective of the involvement and moment of the first involvement are the most important. For the remaining part of the participants, participation technique is the most important attribute.

5.3 Scientific relevance

This research sheds new light on existing stakeholder participation research. It evaluates features of participation processes from a different perspective and with other methods than existing studies. Hereby, it provided further evidence for the importance of these features and contributed to scientific knowledge. Furthermore, it proved that discrete choice experiments are useful to increase the understanding of stakeholders' perception of participation processes features.

5.4 Societal relevance

Society benefits from the enhanced quality of the decision that can be achieved as a result of increased understanding of the preferences of stakeholders. In addition, findings suggest that most of the potential stakeholders are motivated to be involved in participation processes, which indicates that the concept of participation is promising. Moreover, the outcome of the analyses provides governments and project managers a practical guide and useful aid for executing participation processes.

5.5 Limitations

5.5.1 Discrete choice experiments

The most important limitation lies in the fact that this study assumes participation processes to be represented by the selected attributes. It is arguable if participation processes can be represented by this set of attributes. Moreover, only components of the participation process that can be represented by clear and logical attributes and attribute levels for respondents can be included. In addition, only a limited number of attributes and attribute levels are taken into account in this study. Therefore, the participation process alternatives do not completely represent real-life situations.

5.5.2 Sample

Two potential limitations need to be considered regarding the sample used in this study. First, the sample might not sufficiently represent a random sample of the population. A selection bias appears in the sample, while some demographic groups are overrepresented in the sample. Secondly, although the minimum sample size was used in the analyses of this research, it could be argued that a sample of 123 respondents is relatively small. Therefore, given the selection bias and the small size caution must be taken into account when interpreting the research outcomes.

5.6 Recommendations

Firstly, it is suggested that further research should be done with adding or adapting participation process attributes of the experimental design. Although discrete choice experiments provided an effective methodology to examine stakeholders' preferences for participation process attributes, only limited attributes are included. Consequently, further work needs to be performed with different experimental design attributes, for instance, administrational factors could be included.

Secondly, further investigation needs to be performed on the relationship between gender and motivation to participate. Since the findings of this research revealed that males are more motivated to be involved in the decision-making process if an apartment complex is developed in their neighborhood. Further work needs to be carried out to establish whether this is an accidental finding or to explain this relation. This is especially relevant while it is generally accepted that the involved stakeholders should represent the affected population.

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Appendix I Questionnaire

Stakeholder participation in construction projects

Dear Participant,

Thank you for taking part in this survey on stakeholder participation!

The following survey aims to gain more insight into the preferences of residents to be involved in construction projects.

The participation of residents in construction projects is of increasing interest for regulators, researchers, and construction companies. By involving residents in the decision-making and taking their wishes into account, better decisions can be made in construction projects.

This survey is part of the master graduation project of J.J. Wabeke at the Eindhoven University of Technology (TU/e). The findings of this research are anonymized and your data will be treated confidentially in accordance with the guidelines of the TU/e.

Filling in the survey takes 5 to 10 minutes and your participation is voluntary.

Jurjen Wabeke,

Eindhoven University of Technology (TU/e),

j.j.wabeke@student.tue.nl

There are 17 questions in this survey.

Demographic questions

Please indicate your age? *

Please choose **only one** of the following:

- ◯ Under 18
- ◯ 18 - 39
- ◯ 40 - 64
- ◯ 65 - 79
- ◯ 80 +

What gender do you identify with? *

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Please choose **only one** of the following:

- ◯ Female
- ◯ Male
- ◯ Prefer not to say

Which of the following describes the highest level of your education? *

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Please choose **only one** of the following:

- ◯ Primary education (vglo, lavo)
- ◯ Lower vocational education (lts, ito, leao, lhno, domestic school, vmbo-b, vmbo-g, vmbo-k)
- ◯ Secondary general education (mavo, ulo, mulo, ivo, vmbo-t)
- ◯ Senior secondary vocational education (mbo, mts, meao, mhno, inas, mis)
- ◯ Higher general and preparatory scientific education (havo, vwo, mms, hbs, gymnasium, lyceum, atheneum)
- ◯ Higher professional education (hbo, hts, heao, candidate)
- ◯ University (BA, MA, doctoral)
- ◯ None

Unfortunately, you do not meet the age qualification for this survey.

Thank you for your time and effort!

Only answer this question if the following conditions are met:
Answer was 'Under 18' at question '1 [D1]' (Please indicate your age?)

General questions

As a resident, have you ever participated in the decision-making process of a construction project that took place in your neighborhood?
*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Please choose **only one** of the following:

- ◯ Yes
- ◯ No

Please indicate for the following statements to what extent you agree or disagree? *

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Please choose the appropriate response for each item:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I am familiar with the concept stakeholder participation.	◯	◯	◯	◯	◯
If there is a new apartment complex to be constructed in my neighborhood, I would like to participate in the decision-making process.	◯	◯	◯	◯	◯

Please answer the questions based on your current living situation

Choice sets

In the following part of the survey, nine choice sets with two alternatives of a participation process are presented to you. The alternatives have different characteristics. You indicate per choice set in what process you want to participate in the decision-making of an imaginary construction project for an apartment complex that takes place in your neighborhood. The characteristics are explained here.

During the survey, you can return to this screen.

Characteristic	Possibilities
Participation technique	The method with which you are involved: • Survey • Face-to-face meeting • Public meeting
Objective	The intention of your participation: • Stay informed • Share preferences • Influence decisions
Moment of the first involvement	Construction phase in which you are involved firstly: • Feasibility: exploration and identification • Design: plan and design • Construction: build the project
Receive information	The method that informs you about the project: • Social media • Website • Newspaper

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Face-to-face meetings	Public meeting
Objective	Influence decisions	Share preferences
Moment of first involvement	Feasibility phase	Feasibility phase
Receive information	Website	Social media

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Face-to-face meetings	Public meeting
Objective	Share preferences	Stay informed
Moment of first involvement	Design phase	Design phase
Receive information	Website	Newspaper

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Public meeting	Survey
Objective	Share preferences	Stay informed
Moment of first involvement	Feasibility phase	Feasibility phase
Receive information	Newspaper	Social media

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Survey	Survey
Objective	Influence decisions	Share preferences
Moment of first involvement	Design phase	Construction phase
Receive information	Newspaper	Newspaper

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Public meeting	Survey
Objective	Influence decisions	Influence decisions
Moment of first involvement	Construction phase	Design phase
Receive information	Website	Social media

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Public meeting	Public meeting
Objective	Stay informed	Influence decisions
Moment of first involvement	Design phase	Construction phase
Receive information	Website	Social media

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Survey	Face-to-face meeting
Objective	Share preferences	Influence decisions
Moment of first involvement	Construction phase	Feasibility phase
Receive information	Website	Newspaper

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Face-to-face meeting	Face-to-face meeting
Objective	Share preferences	Stay informed
Moment of first involvement	Design phase	Construction phase
Receive information	Social media	Social media

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Imagine an apartment complex development project is executed in your neighborhood; what alternative are you most likely to participate in the decision-making process based on the given characteristics. Considering all not mentioned characteristics equal for the alternatives

Alternative	**1**	**2**
Participation technique	Survey	Face-to-face meeting
Objective	Stay informed	Stay informed
Moment of first involvement	Feasibility phase	Construction phase
Receive information	Website	Newspaper

*

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

❗ Choose one of the following answers
Please choose **only one** of the following:

◯ Alternative 1
◯ Alternative 2
◯ Not participate

Please answer the questions based on your current living situation where a fictional construction project for an apartment complex is taking place in your neighborhood.

Comment section

If you have any additional comments or suggestions about stakeholder participation, this research, or this survey, you can share them in the comment box.

Only answer this question if the following conditions are met:
Answer was NOT 'Under 18' at question '1 [D1]' (Please indicate your age?)

Please write your answer here:

Thank you for participating in this survey!

With your answers, more insights are gathered about the preferences of stakeholders for participating.

If you have any questions, you can contact us via the email below,

Kind regards,

Jurjen Wabeke

j.j.wabeke@student.tue.nl

Submit your survey.
Thank you for completing this survey.

Appendix II Coding scheme

Attribute	Variable	Attribute level	Coding	
Constant	CONST	Constant 1	1	0
		Constant 2	0	1
Participation technique	Tech	Survey	1	0
		Face-to-face meeting	0	1
		Public meeting	-1	-1
Objective of the involvement	Obje	Stay informed	1	0
		Share preferences	0	1
		Influence decision	-1	-1
Moment of the first involvement	Time	Feasibility phase	1	0
		Design phase	0	1
		Construction phase	-1	-1
Receive information	Info	Social media	1	0
		Websites	0	1
		Newspaper	-1	-1

Appendix III Chi-square analyses

Gender

	Observed N	Expected N	Residual
Female	63	61,6	1,4
Male	60	61,4	-1,4
Total	123		

Test Statistics

	Gender
Chi-Square	,064[a]
df	1
Asymp. Sig.	,801

a. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 61,4.

Age

	Observed N	Expected N	Residual
18 - 39	92	44,7	47,3
40 - 64	21	54,4	-33,4
65 - 79	10	23,9	-13,9
Total	123		

Test Statistics

	Age
Chi-Square	78,642[a]
df	2
Asymp. Sig.	,000

a. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 23,9.

Education

	Observed N	Expected N	Residual
Low education	11	65,9	-54,9
Medium education	24	12,4	11,6
High education	88	44,7	43,3
Total	123		

Test Statistics

	Education
Chi-Square	98,421[a]
df	2
Asymp. Sig.	,000

a. 0 cells (0,0%) have expected frequencies less than 5. The minimum expected cell frequency is 12,4.

Appendix IV Descriptive analyses

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	13,8	13,8	13,8
	No	106	86,2	86,2	100,0
	Total	123	100,0	100,0	

Familiar

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	16	13,0	13,0	13,0
	Disagree	34	27,6	27,6	40,7
	Neither agree or disagree	11	8,9	8,9	49,6
	Agree	40	32,5	32,5	82,1
	Strongly agree	22	17,9	17,9	100,0
	Total	123	100,0	100,0	

Motivation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	4,1	4,1	4,1
	Disagree	17	13,8	13,8	17,9
	Neither agree or disagree	30	24,4	24,4	42,3
	Agree	56	45,5	45,5	87,8
	Strongly agree	15	12,2	12,2	100,0
	Total	123	100,0	100,0	

Appendix V Preliminary analyses – 'Familiar'

Variable	Category	*N*	M	SD
Experience	Yes	17	2.65	1.17
	No	106	2.07	1.37
Gender	Female	63	1.73	1.24
	Male	60	2.58	1.33
Age	18 – 39	92	2.02	1.41
	40 – 64	21	2.67	.97
	65 – 79	10	2.20	1.32
Education	Lower education	11	1.81	1.47
	Higher general and preparatory scientific education	24	2.04	1.23
	Higher professional education	29	1.93	1.25
	University	59	2.36	1.42

Appendix VI Preliminary analyses – 'Motivation'

Variable	**Category**	***N***	**M**	**SD**
Experience	Yes	17	3.18	.53
	No	106	2.37	1.03
Gender	Female	63	2.16	1.05
	Male	60	2.82	.85
Age	18 – 39	92	2.27	.99
	40 – 64	21	3.14	.85
	65 – 79	10	3.00	.82
Education	Lower education	11	2.91	.94
	Higher general and preparatory scientific education	24	2.54	.83
	Higher professional education	29	2.41	1.12
	University	59	2.41	1.04

Appendix VII Mann-Whitney Test – 'Experience'

Ranks

	Experience	N	Mean Rank	Sum of Ranks
Familiar	Yes	17	74,82	1272,00
	No	106	59,94	6354,00
	Total	123		
Motivation	Yes	17	86,32	1467,50
	No	106	58,10	6158,50
	Total	123		

Test Statistics[a]

	Familiar	Motivation
Mann-Whitney U	683,000	487,500
Wilcoxon W	6354,000	6158,500
Z	-1,651	-3,218
Asymp. Sig. (2-tailed)	,099	,001

a. Grouping Variable: Experience

Appendix VIII Mann-Whitney Test – 'Gender'

Ranks

	Gender	N	Mean Rank	Sum of Ranks
Familiar	Female	63	51,25	3229,00
	Male	60	73,28	4397,00
	Total	123		
Motivation	Female	63	51,45	3241,50
	Male	60	73,08	4384,50
	Total	123		

Test Statistics[a]

	Familiar	Motivation
Mann-Whitney U	1213,000	1225,500
Wilcoxon W	3229,000	3241,500
Z	-3,541	-3,571
Asymp. Sig. (2-tailed)	,000	,000

a. Grouping Variable: Gender

Appendix IX Kruskal-Wallis Test – 'Age'

Ranks

	Age	N	Mean Rank
Familiar	18 - 39	92	58,99
	40 - 64	21	74,36
	65 - 79	10	63,70
	Total	123	
Motivation	18 - 39	92	55,05
	40 - 64	21	84,71
	65 - 79	10	78,25
	Total	123	

Test Statistics[a,b]

	Familiar	Motivation
Kruskal-Wallis H	3,419	15,902
df	2	2
Asymp. Sig.	,181	,000

a. Kruskal Wallis Test

b. Grouping Variable: Age

Appendix X Post-hoc Kruskal-Wallis Test –'Age'

Ranks

	Age	N	Mean Rank	Sum of Ranks
Motivation	18 - 39	92	51,95	4779,50
	40 - 64	21	79,12	1661,50
	Total	113		

Test Statistics[a]

	Motivation
Mann-Whitney U	65-00
Wilcoxon W	4779,500
Z	-3,646
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Age

Ranks

	Age	N	Mean Rank	Sum of Ranks
Motivation	18 - 39	92	49,60	4563,00
	65 - 79	10	69,00	690,00
	Total	102		

Test Statistics[a]

	Motivation
Mann-Whitney U	285,000
Wilcoxon W	4563,000
Z	-2,100
Asymp. Sig. (2-tailed)	,036

a. Grouping Variable: Age

Ranks

	Age	N	Mean Rank	Sum of Ranks
Motivation	40 - 64	21	16,60	348,50
	65 - 79	10	14,75	147,50
	Total	31		

Test Statistics[a]

	Motivation
Mann-Whitney U	92,500
Wilcoxon W	147,500
Z	-,565
Asymp. Sig. (2-tailed)	,572
Exact Sig. [2*(1-tailed Sig.)]	,603[b]

a. Grouping Variable: Age

b. Not corrected for ties.

Appendix XI Kruskal-Wallis Test – 'Education'

Ranks

	Education	N	Mean Rank
Familiar	Lower education	11	54,09
	Higher general and preparatory scientific education	24	58,71
	Higher professional education	29	56,31
	University	59	67,61
	Total	123	
Motivation	Lower education	11	76,32
	Higher general and preparatory scientific education	24	62,60
	Higher professional education	29	60,50
	University	59	59,82
	Total	123	

Test Statistics[a,b]

	Familiar	Motivation
Kruskal-Wallis H	3,147	2,315
df	3	3
Asymp. Sig.	,369	,510

a. Kruskal Wallis Test

b. Grouping Variable: Education

Appendix XII Multinomial logit model

```
|-> DISCRETECHOICE;Lhs=CHOICE;Choices=1,2,3;Rhs=CONST1,CONST2,TECH_1,TECH_2,OBJE_1
    ,OBJE_2,TIME_1,TIME_2,INFO_1,INFO_2$
Iterative procedure has converged
Normal exit:   6 iterations. Status=0, F=    .9217572D+03

------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function       -921.75722
Estimation based on N =   1107, K =  10
Inf.Cr.AIC  =   1863.5 AIC/N =    1.683
--------------------------------------
           Log likelihood R-sqrd R2Adj
Constants only   -986.7933  .0659 .0617
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1107, skipped    0 obs
--------+---------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+---------------------------------------------------------------------
  CONST1|    1.63297***      .14758    11.06  .0000     1.34371   1.92222
  CONST2|    2.04077***      .18900    10.80  .0000     1.67033   2.41122
  TECH_1|     .27706***      .09766     2.84  .0046      .08565    .46846
  TECH_2|    -.43503***      .08426    -5.16  .0000     -.60018   -.26988
  OBJE_1|    -.55752***      .11081    -5.03  .0000     -.77470   -.34034
  OBJE_2|     .13144**       .06437     2.04  .0412      .00527    .25760
  TIME_1|     .21677**       .10765     2.01  .0440      .00578    .42777
  TIME_2|     .36598***      .11559     3.17  .0015      .13942    .59254
  INFO_1|    -.16797         .13173    -1.28  .2023     -.42616    .09021
  INFO_2|     .46663***      .17649     2.64  .0082      .12071    .81255
--------+---------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jun 18, 2021 at 04:20:01 PM
 ------------------------------------------------------------------------------
```

Appendix XIII Latent class model

LC model 2 classes

```
Latent Class Logit Model
Dependent variable                CHOICE
Log likelihood function       -856.36348
Restricted log likelihood    -1216.16380
Chi squared [ 21](P= .000)     719.60064
Significance level               .00000
McFadden Pseudo R-squared       .2958486
Estimation based on N =   1107, K =  21
Inf.Cr.AIC  =   1754.7 AIC/N =    1.585
---------------------------------------
           Log likelihood R-sqrd R2Adj
No coefficients -1216.1638  .2958 .2891
Constants only   -986.7933  .1322 .1239
At start values  -921.7549  .0709 .0620
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
---------------------------------------
Response data are given as ind. choices
Number of latent classes =            2
Average Class Probabilities
     .678  .322
LCM model with panel has     123 groups
Fixed number of obsrvs./group=        9
Number of obs.=  1107, skipped    0 obs
--------+------------------------------------------------------------------------
        |                     Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z     |z|>Z*         Interval
--------+------------------------------------------------------------------------
        |Random utility parameters in latent class -->>  1...................
CONST1|1|     2.27795***       .25781     8.84  .0000     1.77265    2.78326
CONST2|1|     2.43203***       .35722     6.81  .0000     1.73190    3.13216
TECH_1|1|     -.37595**        .15743    -2.39  .0169     -.68451    -.06739
TECH_2|1|      .09986          .14972      .67  .5048     -.19358     .39330
OBJE_1|1|     -.69755***       .18389    -3.79  .0001    -1.05797    -.33714
OBJE_2|1|      .02225          .10241      .22  .8280     -.17847     .22297
TIME_1|1|      .10840          .15151      .72  .4743     -.18855     .40535
TIME_2|1|      .64039***       .18145     3.53  .0004      .28475     .99603
INFO_1|1|      .23330          .25682      .91  .3637     -.27007     .73667
INFO_2|1|      .43878          .32040     1.37  .1709     -.18920    1.06676
        |Random utility parameters in latent class -->>  2...................
CONST1|2|     1.16955***       .30426     3.84  .0001      .57321    1.76590
CONST2|2|     1.11245***       .35751     3.11  .0019      .41175    1.81315
TECH_1|2|     1.35657***       .25336     5.35  .0000      .85999    1.85314
TECH_2|2|    -1.64604***       .27744    -5.93  .0000    -2.18981   -1.10227
OBJE_1|2|      .13193          .21480      .61  .5391     -.28908     .55294
OBJE_2|2|      .21102          .14060     1.50  .1334     -.06455     .48659
TIME_1|2|      .14000          .25914      .54  .5890     -.36791     .64791
TIME_2|2|     -.08819          .21275     -.41  .6785     -.50517     .32879
INFO_1|2|     -.02177          .27401     -.08  .9367     -.55882     .51527
INFO_2|2|      .01043          .34310      .03  .9757     -.66202     .68289
        |Estimated latent class probabilities.............................
 PrbCls1|      .67814***       .05291    12.82  .0000      .57443     .78184
 PrbCls2|      .32186***       .05291     6.08  .0000      .21816     .42557
--------+------------------------------------------------------------------------
```

```
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jun 15, 2021 at 01:28:28 PM
--------------------------------------------------------------------------------
```

LC model 3 classes

```
Latent Class Logit Model
Dependent variable                CHOICE
Log likelihood function       -831.02712
Restricted log likelihood    -1216.16380
Chi squared [ 32](P= .000)     770.27336
Significance level               .00000
McFadden Pseudo R-squared       .3166816
Estimation based on N =   1107, K =  32
Inf.Cr.AIC  =   1726.1 AIC/N =    1.559
-------------------------------------
           Log likelihood R-sqrd R2Adj
No coefficients -1216.1638  .3167 .3067
Constants only   -986.7933  .1579 .1455
At start values  -921.7726  .0984 .0852
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
-------------------------------------
Response data are given as ind. choices
Number of latent classes =            3
Average Class Probabilities
     .653  .280  .067
LCM model with panel has     123 groups
Fixed number of obsrvs./group=        9
Number of obs.=  1107, skipped    0 obs
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Random utility parameters in latent class -->>  1...................
CONST1|1|    2.40870***      .26997     8.92  .0000     1.87957   2.93782
CONST2|1|    2.53794***      .39177     6.48  .0000     1.77008   3.30579
TECH_1|1|    -.39238**       .16484    -2.38  .0173     -.71547   -.06929
TECH_2|1|     .11264         .15752      .72  .4746     -.19610    .42138
OBJE_1|1|    -.70658***      .19793    -3.57  .0004    -1.09451   -.31865
OBJE_2|1|    -.00780         .11126     -.07  .9441     -.22587    .21027
TIME_1|1|     .11394         .16460      .69  .4888     -.20867    .43655
TIME_2|1|     .64795***      .19582     3.31  .0009      .26415   1.03176
INFO_1|1|     .24146         .28551      .85  .3977     -.31813    .80105
INFO_2|1|     .44317         .35328     1.25  .2097     -.24925   1.13558
        |Random utility parameters in latent class -->>  2...................
CONST1|2|    1.64401***      .36174     4.54  .0000      .93501   2.35301
CONST2|2|    2.50648***      .74664     3.36  .0008     1.04308   3.96987
TECH_1|2|     .89914***      .30139     2.98  .0029      .30842   1.48987
TECH_2|2|   -1.72103***      .33810    -5.09  .0000    -2.38369  -1.05837
OBJE_1|2|    -.17926         .33167     -.54  .5889     -.82931    .47080
OBJE_2|2|     .26488*        .15778     1.68  .0932     -.04437    .57413
TIME_1|2|    -.16657         .36233     -.46  .6457     -.87673    .54358
TIME_2|2|     .35206         .34505     1.02  .3076     -.32423   1.02835
INFO_1|2|    -.27692         .44411     -.62  .5329    -1.14736    .59352
INFO_2|2|     .61620         .56375     1.09  .2744     -.48873   1.72113
        |Random utility parameters in latent class -->>  3...................
```

```
CONST1|3|   -1.69603**       .79227    -2.14  .0323    -3.24884   -.14321
CONST2|3|    -.75078         .65479    -1.15  .2515    -2.03415    .53259
TECH_1|3|    2.38249***      .53695     4.44  .0000     1.33009   3.43488
TECH_2|3|   -1.40869***      .51204    -2.75  .0059    -2.41228   -.40510
OBJE_1|3|    -.53107         .55228     -.96  .3363    -1.61351    .55138
OBJE_2|3|     .85194*        .50379     1.69  .0908     -.13547   1.83936
TIME_1|3|     .72757         .50396     1.44  .1488     -.26019   1.71532
TIME_2|3|     .80940         .51453     1.57  .1157     -.19906   1.81786
INFO_1|3|    -.27413         .60440     -.45  .6502    -1.45873    .91048
INFO_2|3|     .87093         .69209     1.26  .2082     -.48555   2.22741
        |Estimated latent class probabilities.............................
 PrbCls1|     .65262***      .05633    11.59  .0000      .54222    .76302
 PrbCls2|     .28002***      .05439     5.15  .0000      .17342    .38662
 PrbCls3|     .06736**       .02711     2.48  .0130      .01423    .12049
--------+--------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jun 15, 2021 at 01:32:46 PM
--------------------------------------------------------------------------------
```

LC model 4 classes

```
--------------------------------------------------------------------------------
Discrete choice (multinomial logit) model
Dependent variable                Choice
Log likelihood function      -921.75722
Estimation based on N =   1107, K =  10
Inf.Cr.AIC  =   1863.5 AIC/N =    1.683
--------------------------------------
           Log likelihood R-sqrd R2Adj
Constants only   -986.7933  .0659 .0474
Note: R-sqrd = 1 - logL/Logl(constants)
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
--------------------------------------
Response data are given as ind. choices
Number of obs.=  1107, skipped    0 obs
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
  CHOICE|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
CONST1|1|    1.63297***      .14758    11.06  .0000     1.34371   1.92222
CONST2|1|    2.04077***      .18900    10.80  .0000     1.67033   2.41122
TECH_1|1|     .27706***      .09766     2.84  .0046      .08565    .46846
TECH_2|1|    -.43503***      .08426    -5.16  .0000     -.60018   -.26988
OBJE_1|1|    -.55752***      .11081    -5.03  .0000     -.77470   -.34034
OBJE_2|1|     .13144**       .06437     2.04  .0412      .00527    .25760
TIME_1|1|     .21677**       .10765     2.01  .0440      .00578    .42777
TIME_2|1|     .36598***      .11559     3.17  .0015      .13942    .59254
INFO_1|1|    -.16797         .13173    -1.28  .2023     -.42616    .09021
INFO_2|1|     .46663***      .17649     2.64  .0082      .12071    .81255
--------+-----------------------------------------------------------------------
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jun 15, 2021 at 01:31:27 PM
--------------------------------------------------------------------------------

Iterative procedure has converged
Normal exit:  80 iterations. Status=0, F=    .8236992D+03
Error   1027: Models - estimated variance matrix of estimates is singular
```

Appendix XIV Crosstabs

Class * Gender

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Gender	Female	Count	34	23	6	63
		% within Class	41,5%	69,7%	75,0%	51,2%
	Male	Count	48	10	2	60
		% within Class	58,5%	30,3%	25,0%	48,8%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9,444[a]	2	,009
Likelihood Ratio	9,684	2	,008
Linear-by-Linear Association	8,559	1	,003
N of Valid Cases	123		

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is 3,90.

Class * Age

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Age	18 - 39	Count	61	25	6	92
		% within Class	74,4%	75,8%	75,0%	74,8%
	40 - 64	Count	14	5	2	21
		% within Class	17,1%	15,2%	25,0%	17,1%
	65 - 79	Count	7	3	0	10
		% within Class	8,5%	9,1%	0,0%	8,1%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1,076[a]	4	,898
Likelihood Ratio	1,691	4	,792
Linear-by-Linear Association	,101	1	,751
N of Valid Cases	123		

a. 3 cells (33,3%) have expected count less than 5. The minimum expected count is ,65.

Class * Education

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Education	Lower education	Count	7	3	1	11
		% within Class	8,5%	9,1%	12,5%	8,9%
	Higher general and preparatory scientific education	Count	18	4	2	24
		% within Class	22,0%	12,1%	25,0%	19,5%
	Higher professional education	Count	16	12	1	29
		% within Class	19,5%	36,4%	12,5%	23,6%
	University	Count	41	14	4	59
		% within Class	50,0%	42,4%	50,0%	48,0%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4,995[a]	6	,544
Likelihood Ratio	4,910	6	,555
Linear-by-Linear Association	,070	1	,792
N of Valid Cases	123		

a. 5 cells (41,7%) have expected count less than 5. The minimum expected count is ,72.

Class * Experience

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Experience	Yes	Count	10	6	1	17
		% within Class	12,2%	18,2%	12,5%	13,8%
	No	Count	72	27	7	106
		% within Class	87,8%	81,8%	87,5%	86,2%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	,721[a]	2	,697
Likelihood Ratio	,687	2	,709
Linear-by-Linear Association	,276	1	,599
N of Valid Cases	123		

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is 1,11.

Class * Familiar

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Familiar	Strongly disagree	Count	7	5	4	16
		% within Class	8,5%	15,2%	50,0%	13,0%
	Disagree	Count	22	10	2	34
		% within Class	26,8%	30,3%	25,0%	27,6%
	Neither agree or disagree	Count	8	3	0	11
		% within Class	9,8%	9,1%	0,0%	8,9%
	Agree	Count	27	12	1	40
		% within Class	32,9%	36,4%	12,5%	32,5%
	Strongly agree	Count	18	3	1	22
		% within Class	22,0%	9,1%	12,5%	17,9%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14,148[a]	8	,078
Likelihood Ratio	12,048	8	,149
Linear-by-Linear Association	6,448	1	,011
N of Valid Cases	123		

a. 7 cells (46,7%) have expected count less than 5. The minimum expected count is ,72.

Class * Motivation

Crosstab

			Class			
			Class 1	Class 2	Class 3	Total
Motivation	Strongly disagree	Count	1	3	1	5
		% within Class	1,2%	9,1%	12,5%	4,1%
	Disagree	Count	6	9	2	17
		% within Class	7,3%	27,3%	25,0%	13,8%
	Neither agree or disagree	Count	18	8	4	30
		% within Class	22,0%	24,2%	50,0%	24,4%
	Agree	Count	45	11	0	56
		% within Class	54,9%	33,3%	0,0%	45,5%
	Strongly agree	Count	12	2	1	15
		% within Class	14,6%	6,1%	12,5%	12,2%
Total		Count	82	33	8	123
		% within Class	100,0%	100,0%	100,0%	100,0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22,703[a]	8	,004
Likelihood Ratio	25,072	8	,002
Linear-by-Linear Association	16,273	1	,000
N of Valid Cases	123		

a. 9 cells (60,0%) have expected count less than 5. The minimum expected count is ,33.