Improving Community Acceptance to Accelerate Dynamic Wireless Charging for Public Transportation in the Netherlands

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- ERS: Electric Road System
- DWCPT: Dynamic Wireless Charging Power Transmission
- DWC: Dynamic Wireless Charging
- CA: Community acceptance
- SAF: Social Acceptance Framework
- DWC/IPT: Dynamic Wireless Charging Induction Power Transmission
- FCM: Fuzzy Cognitive Map

Abstract

This thesis endeavours to improve community acceptance to accelerate the implementation of dynamic wireless charging (DWC) for public transportation in the Netherlands. Dynamic wireless charging is an innovative technology with the potential to revolutionize the public transportation sector by enabling continuous and efficient charging capabilities for electric buses, thereby eliminating the need for traditional charging infrastructure. The successful deployment of DWC is contingent upon the acceptance and support of local communities. Consequently, this research adopts a mixed-methods approach, encompassing public and expert surveys, to gather comprehensive data from community members and industry experts. The collected data is then analyzed to examine the relationship between demographic factors, awareness levels, perceived benefits, and concerns within the community. This analysis aims to evaluate the community's response to these factors and elaborate on how they influence people's perceptions, either rejecting or supporting the implementation of the DWC project in their neighbourhood. To accomplish this, the study employs fuzzy cognitive mapping, a visual representation of causal relationships, to illustrate the intricate interplay between the factors affecting community acceptance of dynamic wireless charging. By utilizing this mapping technique, the study seeks to define scenarios based on the energy policy of the Netherlands. These scenarios assess the potential outcomes within the complex network of causal relationships among different factors if specific improvements are imposed on the current situation, as depicted in the map. It is hoped that the findings of this research contribute to an enhanced understanding of community acceptance of innovative transportation technologies in the Netherlands. The results offer insights into the underlying factors that drive or hinder acceptance and provide valuable guidance for policymakers, transit operators, and industry stakeholders. The study emphasizes the importance of increasing awareness and understanding of DWC technology and its associated benefits. Furthermore, the research identifies potential concerns, including health and safety as well as the reliability of the technology, which must be effectively addressed through transparent information sharing, and emphasis on the importance of R&D for addressing the challenges of the technology. Ultimately, by fostering community acceptance, this thesis seeks to accelerate the adoption of dynamic wireless charging, leading to a cleaner, more sustainable, and efficient transportation system for the country.

1 Introduction

1.1 Background Study

Nowadays, climate change is considered the main threat to human existence on mother earth and has inspired global leaders to take this phenomenon more seriously. In fact, the emergence of the Paris Agreement is a direct action with short and long-term ambitious targets to mitigate the situation. The ambitious targets of the Paris Agreement have been introduced through meticulous and achievable checkpoints for the years 2030 and 2050, the most well-known objective of this agreement is to reduce the global temperature below 2 degrees Celsius when it is compared to the pre-industrial level (The Paris Agreement | UNFCCC, 2015).

The EU as one the most active contributors in fighting against climate change has decided to significantly reduce its CO2 emissions by 55% by 2030, as part of its efforts to combat climate change, and different countries in the European Union have taken different level of responsibilities to be aligned with the EU targets (Consilium. (n.d.). Climate change: What the EU is doing, July 23). This contribution is defined by Nationally Determined Contribution (NDCS) by which different countries have explained to what extent they are willing to contribute to reducing the GHG and mitigating the negative effects of climate change accordingly (Nations, n.d. July 23) Nationally Determined Contributions (NDCs) | UNFCCC, n.d.; The Paris Agreement | UNFCCC, 2021) (The Paris Agreement | UNFCCC, 2015).

The Netherlands, as a member state of the EU, has submitted its own NDC as part of the EU's overall target and also to meet the targets of the Netherlands National Climate Agreement (Dutch Goals within the EU | Climate Change | Government.Nl, 2022, August 15). According to the Climate Act, the Netherlands has an ambitious plan to reduce the current amount of GHG in this country by 49% compared to the level of GHG in the year 1990 or in another world restrict the GHG level up to 51% higher than 1990. This is considered the main target of this country to have a positive contribution in fighting against climate change and meet the country's NDC targets. For the year 2050, the Netherlands is following a very ambitious goal which is achieving net-zero greenhouse gas emissions (Climate Policy | Climate Change | Government.Nl, 2020, January 31).

According to the Dutch government (Government.nl, 2022, August 15) energy sector, the agriculture sector the and transport sector are the most significant contributors to the greenhouse gas emission. When comparing the contribution of three sectors in GHG emission, transportation receives a high significance due to its cross-sectoral connection with other sectors. According to Miklautsch & Woschank (2022) when analyzing the statistics providing records of each sector's contribution to GHG emission, it is vitally important to take the interconnection of these sectors into account in such a way that the functioning of other sectors is dependent on the transportation. In fact, the movement of goods and people in different sectors relies on transportation, and therefore reducing emissions by transportation has a significant impact on the overall carbon footprint of the economy (Miklautsch & Woschank, 2022). In other words, other sectors like energy sectors and agriculture are intertwined with the performance of the transportation system and less emission in transportation would result in the reduction of emissions in other sectors (Miklautsch & Woschank, 2022).

The Netherlands has appropriately recognized the importance of the transportation sector in reducing GHG emission and accordingly has developed extensive plans for its electrification. As a result of these plans, in 2020, by using 81% of electric buses, the Netherlands was the leader in electric public transportation (the Netherlands Leads the Way on New Electric Buses - Analysis, 2022, February 22). However, this extensive use of electric buses and electrification of public transportation come with some challenges such as expensive batteries, range anxiety, and a shortage of charging infrastructure which needs to be addressed (Kawashima, 2012). The Electric Road System (ERS) or E-Road Infrastructure is a promising approach to support the widespread adoption of electric buses in public transportation which relies on providing the buses to be charged while in motion (Fig. 1) (Gil & Taiber, 2014). To reach the highest potential of electrification within the Netherland's public transportation, the Dutch government is working on addressing the challenges of this electrification to make the existing situation even better. (Policies to Promote Electric Vehicle Deployment – Global EV Outlook 2021 – Analysis - IEA, n.d.).

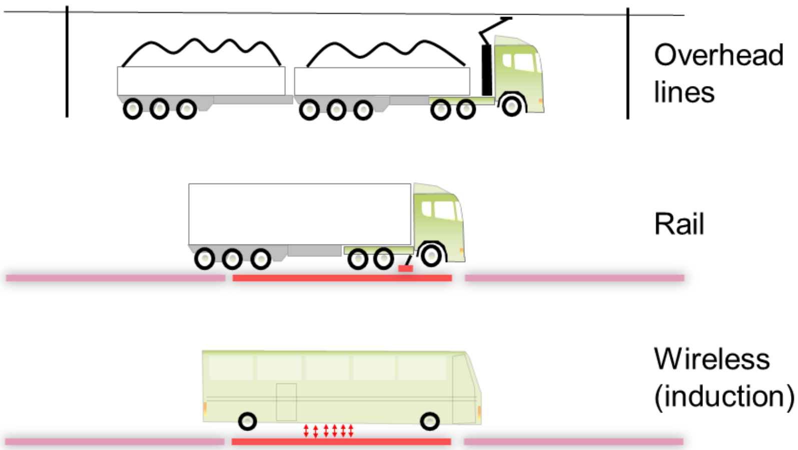

Figure 1 Electric road system technologies Source: (the Netherlands Leads the Way on New Electric Buses - Analysis, 2022, February 22)

1.2 Problem Statement

The use of ERS and specifically inductive power transfer (dynamic wireless charging) is one answer to the transport electrification challenges that has captured the attention of public transportation developers in the Netherlands (E-Moss Testing "Completely Climate-Neutral" Wireless Charging Bus in the Netherlands - Autoblog, n.d.) . However, the successful implementation of this technology heavily depends on addressing the technical and social challenges. In this regard, little attention has been devoted to the importance of social aspects and specifically community acceptability of this project, which might ultimately negatively affect its success rate, despite the fact that numerous studies are focused on enhancing the technical compatibility and feasibility of DWPT as well as decreasing the costs of this project's implementation. As noted by Gadgil (2022) the success of a technology is not just dependent on its technical and economic feasibility but also on its community acceptance. The lack of community acceptance can result in public resistance, which can hinder the implementation of the technology. Therefore, the objective statement of this thesis is to investigate the community acceptance of the Dynamic Wireless Charging/Inductive Power Transfer for electrified public transportation in the Netherlands and identify ways to improve this acceptance to accelerate the adoption of this technology.

1.3 Research Objectives

The main objective of this study is to investigate how to accelerate the adoption of DWC for electrified public transportation by improving community acceptance of this technology in the Netherlands. Accordingly, the main objective of this study has been divided into three sequential sub-objectives followed to address the main objective of this study (Table. 1).

Table 1 Research Objectives

Objective 1	To identify and describe the factors that influence the predetermined indicators used to measure the level of community acceptance of DWPT technology for electrified public transportation in the Netherlands**.**
Objective 2	To assess the current level of community awareness of DWPT technology in the context of electrified public transportation in the Netherlands using the identified indicators
Objective 3	To propose effective scenarios for decision-makers to improve DWPT technology implementation in the Netherlands, by analyzing variables and causal relationships related to community acceptance of electrified public transportation

1.4 Research Questions

In this section, the questions which determine the outline of this study are introduced. To answer the main research question three consequential sub-questions have been defined each addressing a specific aspect of the research problem. The sub-questions focus on identifying the key factors and related indicators that reflect community acceptance, determining the current level of community acceptance, and identifying scenarios for improving community acceptance (Table. 2).

Table 2 Research Question

Main Question	How can community acceptance of DWC/IPT for electrified public transportation be supported in order to accelerate its adoption in the Netherlands?
Sub-Question 1	What are the key factors and their related indicators affecting the community acceptance of DWC/ITP technology in the context of electrified public transportation in the Netherlands?
Sub-Question 2	What is the current level of community awareness of DWC/ITP technology in the context of electrified public transportation in the Netherlands, based on the identified indicators/factors?
Sub-Question 3	What are the different scenarios that decision-makers can consider to improve the community acceptance of DWC/ITP technology in the context of electrified public transportation in the Netherlands?

2 Conceptual Framework

As discussed earlier, the long-term success of new technologies relies on their social acceptance and the adoption process. This can include engaging with communities and interest groups, providing clear communication about the benefits and risks of the technology, and addressing ethical and social considerations(Devine-Wright et al., 2017). By taking a holistic approach toward the intertwined social impacts of novel development, the likelihood of success of its diffusion increases (Gadgil et al., 2022). As a result, the present study firstly define the under study technology (dynamic wireless charging) and then utilizes the Social Acceptance Framework (SAF) to have an integrated approach toward the social acceptability of the DWC/IPT technology in the Netherlands.

2.1 Dynamic Wireless Charging

Conventional buses with internal combustion engines have always been a major contributor to greenhouse gas emission in urbanized areas. However, the invention of Electric cars and then their further development into Electric buses has created a reliable foundation for the promotion of sustainable transportation systems (Deveci & Torkayesh, 2022). The brilliant outcomes of the extensive use of electric buses have convinced many countries to work on increasing the number of electric buses in their public transportation (Deveci & Torkayesh, 2022). However, the extensive use of electric buses imposes several challenges including, expensive batteries, range anxiety, and a shortage of charging infrastructure which needs to be addressed (Kawashima, 2012).

The expensive batteries for electric buses contribute to their high initial cost and their heavy weight reduces overall performance, emphasizing their reliance on charging infrastructure. (Miles & Potter, 2014). The need for extensive charging infrastructure necessitates considering strategic locations along the route, such as bus stops and depots, to ensure that electric buses have access to charging when needed (Z. Liu & Song, 2017).

The Electric Road System (ERS) is a promising approach to support the widespread adoption of electric buses in public transportation. ERS has a rich history spanning over a century, from early experiments with overhead wires and rail charging to the latest development in Dynamic Wireless Power Transfer (DWPT) (Gil & Taiber, 2014). The main idea for the ERS is to reduce the reliance of road transportation on fossil fuel by addressing the E-Vehicles challenges such as range anxiety, shortage of charging infrastructure, and heavy batteries (Kawashima, 2012). In fact, ERS has the potential to dramatically decrease emissions from the transportation sector, which is accountable for a considerable percentage of air pollution and greenhouse gas emissions (Gil & Taiber, 2014), by enabling the E-buses to be charged while in motion. The Electric Road System (ERS) allows electric buses to operate continuously without frequent recharging, improving efficiency and reducing downtime. ERS enables the use of lighter batteries, leading to cost reduction, increased efficiency, and better performance (Balde & Sardar, 2019). It also extends battery lifespan, reducing battery waste and benefiting the environment (Szilassy et al., 2022). ERS has gained significant attention from researchers and developers, with numerous technical articles exploring its potential for electrifying the road system (Deveci & Torkayesh, 2022).

The primary emphasis of this study lies on DWC/IPT due to its status as one of the promising solutions(Sundelin et al., 2016). Its invisibility to outside observers, lack of add-on technology with moving parts, and absence of mechanical wear in the power receiver contribute to reduced waste production and enhance its potential for social acceptance (Sundelin et al., 2016). Currently, the focus is on improving the technical challenges of Dynamic Wireless Power Transmission (DWPT) as it utilizes power transmission to wirelessly charge electric vehicles while in motion, eliminating the need for overhead cables, providing more flexibility in vehicle routes, and reducing the size and weight of onboard batteries, thereby lowering costs and improving energy efficiency (Gil & Taiber, 2014).

One of the significant technical challenges is to improve the wireless power transfer system that can transfer a high amount of power safely and efficiently while the vehicle is in motion (Ushkewar et al., 2022). The development of effective power electronics, reliable communication systems, and efficient electromagnetic systems are some other critical technical aspects that need to be improved to ensure the successful implementation of DWPT and consequently accelerate its adoption (Long et al., 2018). However, to increase the success rate of the technology there is a crucial need to make a social assessment of the impacts of this technology implementation which is missed in the literature (Kalantari & Akhyani, 2021).

2.2 Social Acceptance Framework

In this study, the Social Acceptance Framework will be used to explore the extent to which the Dutch communities accept the adoption of dynamic wireless charging technology for electrified public transportation. By considering various factors such as attributes, beliefs, and values affecting community members' recognition of novel development, the SAF works as a useful tool to realize the acceptance and consequently the success rate of diffusion of new technologies in society (Devine-Wright et al., 2017).

Wüstenhagen and colleagues (2007) identified three categories of Social Acceptance including socio-political acceptance, community acceptance, and market acceptance (Fig. 2). Socio-political acceptance involves the acceptance of policies and technologies by various stakeholders, including the public, policymakers, and key stakeholders. Community acceptance is related to factors that affect fairness justice, as well as the level of trust within communities. Market acceptance, on the other hand, is related to the adoption level by consumers and investors. (Wüstenhagen et al., 2007).

Figure 2 Social Acceptance Triangle Source : (Wüstenhagen et al., 2007)

2.3 Community acceptance

This thesis focuses on enhancing community acceptance of dynamic wireless charging for public transportation in the Netherlands. The prioritization of community acceptance over market and socio-political acceptance is justified due to the nature of the technology. Market acceptance is not directly applicable as it depends on decisions made by transportation authorities and policymakers, not individual consumers (Wüstenhagen et al., 2007). In order to increase the socio-political acceptance of an innovative technology, it is important to understand the factors of community acceptance first and then define the policies accordingly. On the other hand, the thesis aims to understand the factors influencing community acceptance, including trust-building and community engagement. By prioritizing community acceptance, the thesis provides targeted strategies to promote the adoption of dynamic wireless charging in communities, considering the unique challenges and opportunities in this context.

To acquire a better understanding for the community acceptance it is needed to make a distinction between community acceptance and social acceptance to prevent any confusion throughout the study. There are several publications that have examined the distinctions between the the two in a variety of fields (Hemström et al., 2014). In fact, community acceptance is one aspect of its broader context which is social acceptance which involves different aspects including political acceptance, market acceptance along with community acceptance (Wüstenhagen et al., 2007). In this context, "acceptance" refers to the process of considering technologies to be sufficient, believable, or perceivable (Kalantari & Akhyani, 2021) while The term "community acceptance" (CA) describes the degree of local adoption of a new development or technology. According to Wolsink (2012), community acceptance refers to people's behavioral responses to having a technical device placed in or close to their house by another person who made the decision, managed the situation, or owned the thing. CA focuses on the relationships between social factors, such as norms, values, trust, and technological developments to evaluate the circumstance around the CA of an emerging technology. By understanding these factors, researchers and practitioners can develop strategies to promote the community's acceptance of new technologies and innovations, ultimately contributing to their successful implementation within complex systems (Wüstenhagen et al., 2007).

Community acceptance involves a variety of aspects, including personal, psychological, and contextual aspects (Devine-Wright et al., 2017). Personal and psychological aspects, which include views, attitudes, and values, are tied to the target groups' demographic characteristics, which include elements like age, gender, and socioeconomic position. Contextual factors reflect the social, cultural, and institutional norms and values that shape public opinion which eventually affect people's behavior in supporting or rejecting the implementation of a new technology (Devine-Wright et al., 2017).

To acquire a holistic view over the community acceptance of a novel development, it is crucial to consider the mutual relationships between above mentioned aspects. In many cases, the Dutch culture places a high value on sustainability and environmental protection, which may positively influence the community's acceptability of dynamic wireless charging technology for electrified public transportation (Dutch Vision on Global Climate Action | Climate Change | Government.Nl, n.d.) . On the other hand, factors such as concerns over privacy and data security may negatively affect the community's acceptability of this technology (Dutch Vision on Global Climate Action | Climate Change | Government.Nl, n.d.). Therefore, a multidimensional approach that takes into account the interplay of personal, psychological, and contextual factors is necessary to fully understand the community acceptance of dynamic wireless charging technology for electrified public transportation in the Netherlands (Wüstenhagen et al., 2007).

This broad inclusiveness of this framework comes with some restrictions. One significant restriction of the Social Acceptance Framework (SAF) pertains to its evaluation of factors influencing the successful implementation of projects in a specific area. The SAF recognizes the theory of NIMBY (Not In My Backyard), which suggests that community acceptance follows a U-curve pattern over time, starting with high acceptance, decreasing during the siting phase, and eventually increasing once the project is operational (Wüstenhagen et al., 2007). However, this temporal aspect makes the framework time-bounded, necessitating a tool to anticipate and capture the transition process.

3 Research Design and Methodology

To address the previous studies' limitation as discussed above, the present study incorporated a fuzzy cognitive map (FCM) to capture the transient response of the system. By utilizing the FCM's mind-map concept, all three phases of technological transition—before, during, and after—were represented, allowing for a comprehensive analysis of the dynamic nature of community acceptance throughout the project lifecycle.

In this section, the outline of the research design and methodology for this study is introduced. To further demonstrate the general view of this study data collection methods, and data analysis methods have been described to answer the research questions (Fig. 3). By doing so, the rigor and validity of the research approach have been overviewed and the methods are justified to achieve the research objectives.

3.1 Case Selection

The selection of a case is a crucial aspect of this research proposal as it specifies the investigation of community acceptance of dynamic wireless charging for public transportation. To achieve a better understanding of community acceptance, the research has selected Den Bosch city as the case location because of the prototype testing of dynamic wireless charging in this city by a company named E-moss (E-Moss Testing "Completely Climate-Neutral" Wireless Charging Bus in the Netherlands - Autoblog, n.d.). In fact, the main reason for choosing Den Bosch as the case study is that this city is the only municipality in the Netherland which has implemented dynamic wireless charging for electric buses and this helped the study to evaluate the consequential effects of implementing this technology in a real world case scenario. Additionally, by concentrating on a particular area, this research has the chance to get in-depth knowledge of the particular characteristics, such as social, cultural, and institutional norms and values that would be similarly shared across the community under study. This would save the study from being complicated by several variables that could differ significantly when compared across a larger region(Kumar et al., 2017). More importantly, directing attention to a particular case presents an opportunity to mitigate the complexity arising from varying values and beliefs across different communities, including personal psychological and environmental perspectives (Kumar et al., 2017).

3.2 Methodology

The methodology section of this thesis outlines the steps that are taken to gather and analyze data to answer the research questions (Fig.3). This section scrutinizes the data collection methods and data analysis techniques. The research design is guided by the main research question "How can community acceptance of DWPT for electrified public transportation be supported in order to accelerate its adoption in the Netherlands?" and involves selecting appropriate data collection methods. Qualitative techniques, including desktop research, public survey and expert survey were used to collect data. The data was then analyzed using a fuzzy cognitive map to identify patterns and themes. It is worth noting that ethical considerations were prioritized for participant safety and privacy.

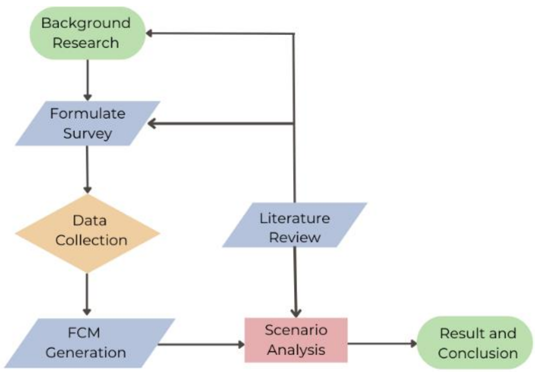

Figure 3 Research Methodology

3.2.1 Data Collection

The data collection section of this article outlines the methods used to gather data for the study. The primary data collection methods utilized were literature review and two surveys.

3.2.1.1 Literature Review

The desk research is devoted to determining the factors defining the community acceptance indicators mentioned earlier in the conceptual framework. To do this, I conducted a systematic review based on the first research question of this study. I used relevant literature, reports, and case studies related to community acceptance of novel developments in the same or similar contexts to acquire a comprehensive understanding of the main factors of the previously determined indicators. A wide range of databases such as Google Scholar and Scopus were utilized to access the articles of interest. Based on my findings I arranged another desk research with the use of grey literature, including reports and policy documents from government agencies, to have a wider view of the DWC/ITP in the Netherlands which is the main source of this study for formulating different scenarios which will be discussed in the study. The search was conducted based on specific keywords and phrases related to community acceptance indicators and the specific novel development in question. The studies and reports are assessed based on their relevance, quality, and reliability. I extracted data from the studies and reports on the factors that define community acceptance indicators.

3.2.1.2 Public Survey

To further investigate the extent to which community acceptance aligns with the adoption of dynamic wireless charging technology for electrified public transportation in the Netherlands, a survey was conducted with a representative sample of Dutch citizens. This survey was designed to gather the attitudes of the local community who are living in Den Bosch City. The survey is carefully designed to measure the weights and the casual relationships of the key community acceptance indicators with at least one representative. The chosen approach to collect the required information is a survey conducted in the city of Den Bosch asking people to fill out a form activated by a QR scan code. Conducting a survey was deemed more suitable than interviews due to factors such as language barriers, as many locals may not possess sufficient English proficiency or exhibit a preference for being interviewed. Therefore, to address these language obstacles effectively, a questionnaire in Dutch was prepared to capture the concerns and perspectives of the residents regarding dynamic wireless charging.

To achieve optimal engagement from individuals aged 18 and older, an extensive outreach strategy was implemented, resulting in the participation of 50 respondents for the study. The number of respondents is decided based on Slovin’s formula (equation 1) considering the population of Den Bosch city (156000) and the feasibility of the survey with error margin of 15%. The Appendix section contains the text version of the survey. The questionnaire is designed to gather valuable insights from the participants regarding their opinions on the dynamic wireless charging of electric buses in Den Bosch. It begins with an introduction that outlines the purpose of the case project and the research affiliation. Additionally, participants are requested to provide their consent by signing a form that contains statements pertaining to research ethics, ensuring the protection of participants' rights and privacy.

Equation 1: $\frac{1}{1+N.e^2}$

3.2.1.3 Expert Survey

The goal of the second survey was to gather insights from experts regarding the weight assigned to the relationships between the 14 identified concepts, which serve as factors and indicators of community acceptance, despite not having a direct relationship with community acceptance. The text version of the survey is provided in the Appendix section, enabling experts to conveniently access and participate in the survey. Utilizing an online questionnaire offers significant advantages over conducting interviews, as it provides flexibility to respondents. The aim of the study was to target 5 experts in the field of energy transition specialized in social science, E-mobility, E-vehicle developers, charging infrastructure and electricity grid. Fortunately, considering the time limitation, the study collected the answers for this survey from 13 experts. They completed the questionnaire at their preferred time and location, ensuring convenience and comfort during the participation process. The survey comprises a total of 31 questions, with the majority requiring respondents to provide scores using the Likert scale. Prior to proceeding with the questionnaire, participants are requested to review and acknowledge the consent form. To maintain the anonymity of the participants, the only demographic information requested is their field of activity within their organization. This approach ensures that the participation remains as anonymous as possible, fostering openness and honesty in responses. Each question in the survey presents the relationship between two concepts within the Fuzzy Cognitive Map (FCM).

3.2.1.4 Ethical Consideration

As mentioned above data collection method in this study consist of a Survey and consequently, it was necessary to be ensured to be ethically responsible during this study. To do this, I ensured the confidential matter by receiving permission from the prospective respondents before the filling of the survey form, and the consent form located in the first part of the survey. The concepts of informed consent, data privacy, and voluntary participation were used in this study to fully address the ethical consideration and prevent any privacy intervention. Only data-collecting findings with participant agreement were taken into account in the current study. The respondents' option to answer anonymously is protected by the secrecy of the process. Moreover, I submited my research project to the Ethics Committee BMS of the University of Twente for ethical assessment before the start of the research. Finally, to fully ensure that the respondents were participating in this research voluntary, the following information was provided to them and they could reach out to the main question merely by answering yes to the question asking them whether or not they are willing to participate in this survey.

> *In this voluntary survey, you are free to stop responding at any time and stop the survey altogether. I want to reassure you that maintaining your privacy is my top concern in this survey. This survey's anonymity assures that names, email addresses, and other personally identifying information cannot be accessed. It is important to note that only the overall results will be discussed with peers and academics; individual replies won't be disclosed; and when the research is over, all the data will be permanently removed. Please feel free to contact me at a.chavoushiforooshani@student.utwente.nl if you have any queries or reservations about the questionnaire.*

3.2.2 Data Analysis

3.2.2.1 FCM Generation

Various fields, including environmental science, social sciences, and engineering have used FCM to explore and understand complex systems and make informed decisions (Falcone et al., 2019) (Özesmi & Özesmi, 2004). The most considerable strength of the FCM is its capability to use a mathematical tool that captures the complexity of systems involving various variables with intertwined casual relationships to acquire a comprehensive cognition of the system. The fuzzy logic of this mathematical tool equips the user to incorporate impreciseness, uncertainty, or incomplete information into the model (Kosko, 1986). In Fuzzy Cognitive Mapping (FCM), mathematical functions play a crucial role in transforming the matrix of causal relationships into a simplified matrix of results. These functions help conceptualize and quantify the impact of various factors within the system under study.

The transfer function employed in FCM determines how the causal relationships are translated into numerical values. The most commonly used transfer function in FCM is the sigmoid function, which typically takes the form of a sigmoidal curve. This function ensures that the measured value of each concept falls within the interval of (0,1] (see equation 2). The sigmoid function is useful when the value of a concept represents a probability or a degree of membership in a particular category (Carvalho, 2013). It allows for gradual transitions between values, capturing the gradual influence of one concept on another (Özesmi & Özesmi, 2004).

Equation 2: $f(x) = \frac{1}{1+e^{-\gamma x}}$

However, FCM also allows for the utilization of other nonlinear functions as transfer functions. The alternative mathematical function which is used in this study is the hyperbolic tangent function which, unlike the sigmoid function, has the capability to capture all the possible negative and positive casual relationships and produce results that span the entire real number line, from -1 to +1 (see equation 3). This flexibility is particularly useful in cases where causal relationships can have both positive and negative influences on the concepts being modeled. In this study, the hyperbolic tangent function has been chosen as the transfer function. This decision is motivated by the presence of both positive and negative causal relationships in the system being studied. By using the hyperbolic tangent function, the researchers can accurately represent and quantify the impact of these relationships, ensuring that the resulting matrix captures the complexities of the system dynamics (Kokkinos, 2020).

Equation 3: $f(x) = \tan h\mu x$

FCM employs an iterative method, supported by the hyperbolic tangent function, to iteratively reach an answer. Initially, each concept is assigned an initial weight of casual relationships, reflecting its current state. The resulting values are passed through the hyperbolic tangent function, which transforms them into updated output values. This iterative process continues, with the output values becoming the new input values for the next iteration. Through each iteration, the concepts gradually adjust and converge towards a stable state, capturing the system dynamics. The hyperbolic tangent function ensures that both positive and negative causal relationships are appropriately considered, allowing for a comprehensive representation of complex systems. Ultimately, the iterative process with the hyperbolic tangent function helps FCM to converge towards an answer, providing insights into the relationships and dynamics within the system being modeled (Özesmi & Özesmi, 2004).

In this study, the FCM method is employed to analyze the gathered data and examine the intricate network of causal relationships that impact the community's acceptance of DWC/ITP (technology. Within the FCM, these concepts are depicted as nodes, while the connections between them are represented as weighted edges and a sample of FCM could be viewed in Fig. 4. The weights assigned to these edges are determined by the strength of the relationships between the concepts, as derived from public and expert surveys. The public survey fed the FCM networks with direct connection to community acceptance while the expert survey is utilized to determine the weight of casual relationships of nodes affecting the community acceptance indirectly. Once the FCM is developed, it is utilized to simulate the consequences of various scenarios and policy interventions on the community's acceptance of DWC technology. The FCM used in this study encompasses 14 components and 31 connections, which are categorized into key indicators: Trust, Perceived Risks, Perceived Benefits, Beliefs and Values, and Public Awareness.

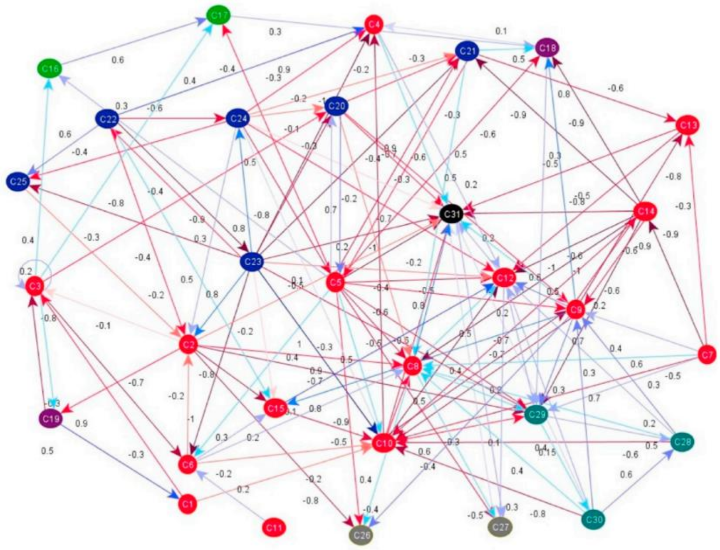

Figure 4 Fuzzy Cognitive Map (Source: (Alipour et al., 2019))

After finalizing the Fuzzy Cognitive Map through the meticulous integration of insights from public and expert surveys, which were instrumental in assigning weights to the causal relationships, the focus shifts to scenario formulation. This important phase involves formulating scenarios that stimulate the FCM, providing a platform to anticipate the potential implications of dynamic wireless charging in the Netherlands within the existing policies. To improve the study's reliability and real-world relevance, the Dutch Government's Energy Policy (Netherlands Ministry of Economic Affairs and Climate Policy (2020)) has been intricately considered into the scenario development process. By strategically aligning the scenarios with this policy framework, the study ensures a practical grounding that enriches its predictive capabilities. These scenarios have been created from the interplay between the FCM's causal relationships and Dutch government's energy policy, offer a realistic view into the dynamic landscape of dynamic wireless charging for public transportation, underscoring the study's robustness and applicability.

4 Result

This section focuses on explaining the factors and their related indicators of community acceptance in the context of dynamic wireless charging. Furthermore, this section provides the results of public and expert surveys determining the weights of relationships between the identified factors and indicators.

4.1 Community Acceptance Indicators

There is a limited number of review articles available that focus on identifying the indicators that influence community acceptance of new technologies, and consequently, the indicators for assessing social performance are not established (Hanger et al., 2016). As a result, researchers from various disciplines have used different indicators based on their specific research objectives. To find the most appropriate indicators for a particular research question, it is essential to review articles in the context of technological transition and community acceptance. Consequently, in this section, I conducted a literature review in the context of community acceptance and identified five reliable factors (Fig. 5) and their related indicators (Table. 3) of community acceptance for a novel development (Busse & Siebert, 2018).

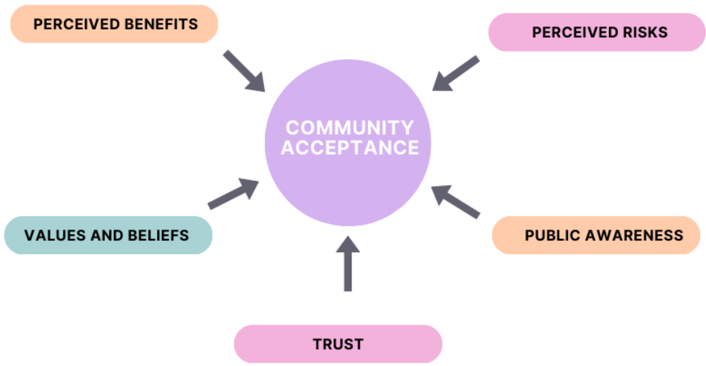

Figure 5 Community Acceptance factors

4.1.1 Perceived benefit

The first factor is perceived benefit, which is considered an indispensable part of community acceptance (Schumann, 2015; Wang & Li, 2016). Perceived benefit refers to the extent to which individuals believe that a technology or innovation will provide positive outcomes or advantages to them or society as a whole (Walter, 2014). In the context of community acceptance of dynamic wireless charging (DWC) for public transportation in the Netherlands, perceived benefit can be considered an indicator reflecting how likely individuals are to support or reject this technology. The most perceivable benefit of DWC technology, as identified in the literature review which is mostly related to the main objective of this research, is the reduction in aesthetic destruction compared to alternative existing charging infrastructure (Walter, 2014). If individuals perceive the benefits of DWC technology to outweigh the costs or potential risks, they are more likely to accept and support it. Therefore, perceived benefit is a useful indicator for assessing community acceptance of DWC technology in the Netherlands (Walter, 2014).

Dynamic wireless charging technology offers a distinct advantage by minimizing aesthetic destruction compared to alternative charging methods, such as overhead charging systems. Aesthetic destruction refers to the negative visual impact caused by charging infrastructure, which can disrupt the natural beauty of urban landscapes (Brownlee et al., 2015). Unlike traditional methods, dynamic wireless charging integrates seamlessly into the road surface, reducing visual clutter and preserving the aesthetic appeal of the environment. Community members might express a preference for wireless charging systems due to their ability to minimize visual disruption and maintain the visual quality of urban spaces (Balde & Sardar, 2019). This perceived benefit enhances the acceptance of dynamic wireless charging technology for electric buses in public transportation. Studies highlight the positive impact of lower aesthetic destruction on public perception and acceptance of new technologies (Gil & Taiber, 2014). Thus, the lower level of aesthetic destruction associated with dynamic wireless charging technology plays a pivotal role in enhancing community acceptance and supporting the implementation of electric buses in the public transportation system.

4.1.2 Perceived Risk

The second factor is perceived risk, which refers to the extent to which individuals believe that technology or innovation will result in negative outcomes or disadvantages to them or to their society as a whole (Ren et al., 2016; Specht et al., 2016). In the context of community acceptance of dynamic wireless charging (DWC) for public transportation in the Netherlands, perceived risk can be considered as an indicator reflecting how likely individuals are to reject or oppose this technology. The most important perceived risks which could be associated with DWC technology, as identified in the literature review, are construction failure, construction disturbance, waste production, health and safety concerns, and impact on property value (Linzenich et al., 2020). These factors reflect the concerns of the local community regarding the negative consequences that the implementation of the technology could bring to their neighborhood. If individuals perceive the risks associated with DWC technology to outweigh the benefits, such as a reduction in aesthetic destruction, they might be less likely to accept and support it. Therefore, perceived risk can also be a useful indicator for assessing community acceptance of DWC technology in the Netherlands.

4.1.2.1 Construction Failure

Construction failure is a significant perceived risk associated with dynamic wireless charging technology, and its potential impact on local communities can have negative implications for community acceptance. Construction failures, such as technical malfunctions, inadequate installation, or operational errors, can result in prolonged construction periods and delayed project timelines (Baur et al., 2022). These failures not only disrupt the regular flow of transportation but also inconvenience commuters and residents who rely on public transportation services. The extended construction period and delays in completing the charging infrastructure can lead to frustration and dissatisfaction among community members, fading their acceptance of the technology (Beekman & van den Hoed, 2016).

4.1.2.2 Construction disturbance

Another perceived risk associated with dynamic wireless charging technology is construction disturbance. Construction disturbance refers to the potential disruptions, permanent or temporary inconveniences experienced by the community by the implementation of new technology. This can include road closures, detours, noise, and increased traffic congestion. The literature highlights the need for effective communication, stakeholder engagement, and proactive management of construction activities to minimize the negative impacts on the community (Morfeldt et al., 2022).

4.1.2.3 Waste production

Waste production associated with dynamic wireless charging technology, from the community's perspective, poses a significant perceived risk that can negatively impact community acceptance. The introduction of dynamic wireless charging systems often requires the substitution or removal of existing electrical equipment, resulting in the generation of waste materials visible to the community. This waste production can include discarded charging infrastructure components, obsolete charging equipment, and other associated electronic waste (Suh et al., 2011). The presence of visible waste materials can raise concerns among community members regarding the environmental impact, aesthetics, and proper disposal of such waste (Schulte & Ny, 2018). Community members may express apprehension regarding the disposal practices and potential long-term consequences associated with waste generation, ultimately affecting their acceptance of the technology (Z. Wang et al., 2016).

4.1.2.4 Health and Safety concern

The level of concern regarding the health and safety implications of dynamic wireless charging technology is an important aspect of public awareness. Community members may have varying levels of understanding and knowledge about the potential risks associated with electromagnetic fields and wireless charging systems (Nkoana, 2018). Increased public awareness of the scientific research and evidence regarding the safety of dynamic wireless charging technology can help address misconceptions and alleviate concerns (Enserink et al., 2022). Providing clear and accessible information about the technology's safety features, compliance with regulatory standards, and adherence to recommended guidelines can contribute to building public trust and reducing health-related anxieties.

4.1.2.5 Negative impacts on property value

Negative impacts on property value, stemming from misconceptions and also valid concerns related to dynamic wireless charging technology, can significantly influence community acceptance. One key concern arises from the fact that wireless charging systems emit magnetic fields, which could lead to health-related anxieties among community members (Boulanger et al., 2011). Such perceived risk may result in the belief that properties located near dynamic wireless charging infrastructure could be adversely affected economically. In other words, community members might believe that prospective buyers or renters could be hesitant to reside in or invest in properties near wireless charging infrastructure. As a result, property values may be negatively impacted, affecting the economic well-being of homeowners and potentially discouraging community acceptance of the technology (Pavlowsky & Gliedt, 2021).

4.1.3 Values and Beliefs

The third factor is values and beliefs, which reveals the general perception of the target group regarding the overall idea of the novel development under study (Hemström et al., 2014). According to the theory of social adoption, humans' general perspective regarding their environment along with their living standards creates a mindset that determines people's behavior toward environmental adoption (Homer & Kahle, 1988). Gagnon Thompson & Barton (1994) further explored people's environmental attitudes, considering anthropocentrism and ecocentrism along with environmental sympathy as the main attributes of humans toward environmental preservation. Anthropocentrism views nature as deserving moral consideration because of how it affects humans, while ecocentrism views nature as deserving moral consideration for its intrinsic values. Social norms can be traced among the most determinators of a community approach regarding a new technology or innovation, such as DWC/ITP for electrified public transportation(Homer & Kahle, 1988). These norms are shaped by the community's shared beliefs and expectations of what is considered acceptable and appropriate behavior (Schumann, 2015). Therefore, understanding the social norms of the local community in this study could be considered as one of the indicators predicting how the local community would react to the introduction of DWC/ITP, as this technology could have some lasting effects on their immediate environment (Gagnon Thompson & Barton, 1994).

4.1.3.1 Demographic Characteristics

Demographic characteristics, as per Jaeger's (2015) argument, are crucial indicator of values and beliefs within a community evaluating the level of community acceptance towards the implementation of any new development. The factors such as income, gender, and other socioeconomic and socio-demographic factors play crucial roles in people’s values and beliefs regarding projects in their neighbourhood (Mouta et al., 2016). As a result, the successful implementation of a project is not simply transferable to other characteristics which implies the significance of demographic factors (Yang et al., 2016).

4.1.3.2 Geographical Characteristics

Another important indicator that could affect values and beliefs of communities is their living location. This indicator shapes the overall recognition of the local community regarding the energy transition and affects the level of community acceptance or rejection regarding the technologies which could be considered as one way of energy transition (Yuan et al., 2015). The emotional cohesion, feeling, and knowledge of the local community regarding their surrounding environment directly affect their level of acceptance towards changes in their immediate environment which is called place attachment (Menezes et al., 2017). The “NIMBY” (not in my backyard) term is in fact one of the features of place attachment expressing that people support technological transition as long as there are not being implemented in their neighborhood (Sun et al., 2016). Consequently, place attachment is one of the important indicator which should be considered to understand the extent to which people oppose or support the DWC/ITP.

4.1.4 Trust

The fourth factor is trust, which is an indispensable part of acceptance and can significantly influence the success of new development. Trust is defined as the belief and confidence that community members have in the technology, the organizations involved, and the intentions behind its implementation (Wolsink, 2012). Olsen & Shindler, (2010) emphasized the crucial role of trust in the successful implementation of innovative developments, stating that there is no alternative, such as incentives or any other motivators, to trust. The reputation and trustworthiness of the organization implementing the dynamic wireless charging and the reliability of the technology are two main factors that are relevant to the level of trust of the local community towards the introduction of DWC/ITP systems (Enserink et al., 2022).

4.1.4.1 Reputation and Credibility of the implementers

Community members tend to associate trustable implementers with a commitment to safety and reliability (Enserink et al., 2022). Reputable implementers are often known for their adherence to quality standards, rigorous testing procedures, and robust safety protocols. The involvement of such implementers can foster a sense of confidence in the safety and reliability of the dynamic wireless charging systems (Enserink et al., 2022). Community members are more likely to trust that the implementers have taken appropriate measures to ensure that the technology operates consistently and without adverse effects. Moreover, community members may perceive the involvement of trustable implementers as an indication of the technology's viability, efficacy, and positive impact on the environment and transportation sector (Olivari & Pasquali, 2022). Generally, by engaging trustable implementers, who are recognized for their credibility, expertise, commitment to safety, and successful track record, the community's optimism and trust in the profitability, safety, and overall positivity of dynamic wireless charging technology can be enhanced (Coosemans et al., 2012).

4.1.4.2 Reliability

Trust in the reliability of dynamic wireless charging technology is critical for community acceptance (Olsen & Shindler, 2010). Demonstrating the reliability of the technology through rigorous testing, quality control measures, and adherence to industry standards can help establish trust (Dumbrell et al., 2022). Implementing regular maintenance protocols, monitoring systems, and addressing any operational issues promptly and effectively can also contribute to building trust in the reliability of dynamic wireless charging systems (Enserink et al., 2022)

4.1.5 Public awareness

The fifth factor, as mentioned in various social literature, is the knowledge level of target groups regarding the function of a specific technology and its implementation. This factor can have a direct impact on the level of acceptance among the target group towards the new technology (Rogers, 2023). A higher level of awareness about DWC/ITP technology among the public can lead to greater acceptance and at the same time the further development of DWPT (Hemström et al., 2014). Public awareness can help to dispel misconceptions and myths about the technology, which could otherwise hinder acceptance. Furthermore, raising awareness through communication among community groups could significantly increase the rate of development and diffusion of novel development (Rogers, 2003).

4.1.5.1 Transparency and accountability

Transparency and accountability are another crucial indicator in fostering public awareness. The transparency of information sharing, decision-making processes, and project implementation instills confidence in the community. Openly communicating the benefits, potential impacts, and considerations associated with dynamic wireless charging technology enables community members to make informed judgments (Jakovljevic et al., 2021). Accountability ensures that the implementers and stakeholders responsible for the deployment and operation of dynamic wireless charging systems are held responsible for their actions and commitments (Skiniti et al., 2022).

Table 3 Community Acceptance factors

	Factors	Description	Indicator(s)
1	Perceived Benefit	Reflecting individuals' likelihood to support dynamic wireless charging technology in the Netherlands based on its positive outcomes.	Aesthetic Integrity
2	Perceived Risks	Perceived risk reflects individuals' likelihood to reject dynamic wireless charging technology based on potential negative outcomes and concerns	Construction Failure Construction Disturbance Waste production Health and safety concern Property Value reduction
3	Values and beliefs	Values and beliefs indicate the general perception and behavior of the community towards dynamic wireless charging technology, influenced by their culture and attitudes.	Demographic Characteristics Geographical Characteristics
4	Trust	Trust is influenced by community members' belief and confidence in the technology.	Implementers reputation Technological reliability
5	Public awareness	The knowledge level of the target group regarding a specific technology and its implementation.	Transparency & accountability

4.2 Public Survey

In the public survey, demographic information is collected through questions 2-5, which inquire about the participant's neighborhood, age, and gender and also about how frequently they use public transportation. This data is essential for understanding the diversity of perspectives within the community. To gauge the level of public awareness, question number 6 focuses on whether participants were aware of the dynamic wireless charging technology. This question assists the study in identifying the extent to which the general public is knowledgeable about this specific prototype technology in Den Bosch.

The most crucial question in this study is aimed at gathering the participants' opinions on the weights assigned to the key factors with direct connection to community acceptance (Table. 4). The questionnaire, provided in the appendix, concludes with an open-ended question. This question encourages participants to provide any additional factors or indicators that they deem important and that may have been overlooked in the literature review. By including this open question, the study aims to ensure that a comprehensive range of factors is considered, incorporating the valuable insights and perspectives of the participants.

Table 4 Weight assigned for community acceptance

	Indicator	Weight/Importance Score for CA
1	Health & Safety Concern	0.88
2	Construction disturbance	0.76
3	Transparency & Accountability	0.66
4	Aesthetic destruction	0.82
5	Waste production	0.79
6	Property value reduction	0.56
7	Implementers reputation	0.67

4.3 Expert Survey

In this survey, the experts are asked to assign a score indicating the extent to which they believe there is a correlation between two indicators specified in Table. 5 and Table. 6. The result of the expert survey indicates that there is a strong relationship between Transparency and Accountability (C7) and Media (C13. Strong correlation between Engaging Trusted Implementers (C14) and Trust & Credibility was another impressive result of expert survey. It is worth mentioning that all the results from the expert and public survey have been reported in table 6. The scoring mechanism allows experts to provide nuanced insights into the strength and significance of the relationships within the FCM. By administering this survey to experts in the field, the study obtains a comprehensive understanding of the interrelationships between the concepts, contributing to the determination of weights within the FCM. Table 5 defines all the concepts that were queried by experts, while Table 6 displays the survey results, showing the mean values of weights derived from the expert survey.

Table 5 Concepts within the expert survey

Concept	Name
C1	Community acceptance
C2	Trust and credibility
C3	Health & safety concern
C4	Waste production
C5	Research & Development
C6	Negative Impact on Property Value
C7	Transparency and Accountability
C8	Public Awareness
C9	Construction Failure
C10	Reliability
C11	Aesthetic Destruction
C12	Construction Disturbance
C13	Media
C14	Engaging Trusted Implementers

Table 6 Weights for the causal relationship determined by the experts

C3,C6	0.44	C7,C2	0.7	C9,C4	0.72	C13,C5	0.76
C3,C5	0.67	C7,C13	0.74	C5,C10	0.7		
C3,C13	0.78	C14,C10	0.87	C5,C12	0.45		
C12,C3	0.6	C14,C7	0.87	C5,C4	0.64		
C8,C3	0.85	C14,C2	0.73	C5,C9	0.7		
C8,C11	0.85	C11,C3	0.25	C13,C7	0.8		
C7,C8	0.8	C11,C6	0.75	C13,C7	0.95		
C7,C3	0.4	C9,C3	0.56	C13,C14	0.34		

4.3.1 Demographics

The First demographic question asked the respondents' gender and this question is followed by asking the respondents' age. All age groups (older than 18) were welcomed to participate and the result shows that most of the respondents were in the age group of 18-30 age. This could be related to the fact that the respondents to be involved in English speaking

Moreover, the survey findings revealed that about 8% of respondents reported frequent usage of public transportation, while an additional 14% indicated occasional usage and others rarely use buses. These percentages collectively account for 21% of the participants who utilize buses as a primary mode of transportation (Fig. 6 and 7) . This significant number highlights the substantial reliance on public transportation among the surveyed population and underscores the potential impact that improving community acceptance can have on improving public support for dynamic wireless charging technology. By focusing on increasing their awareness and understanding of dynamic wireless charging, their support and advocacy for the technology can be bolstered.

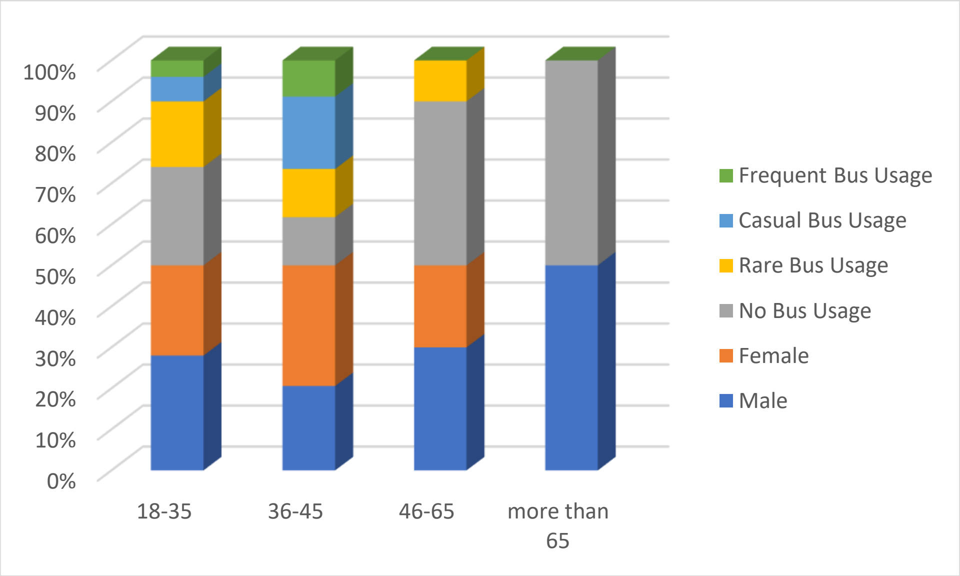

Figure 6 Demographic information

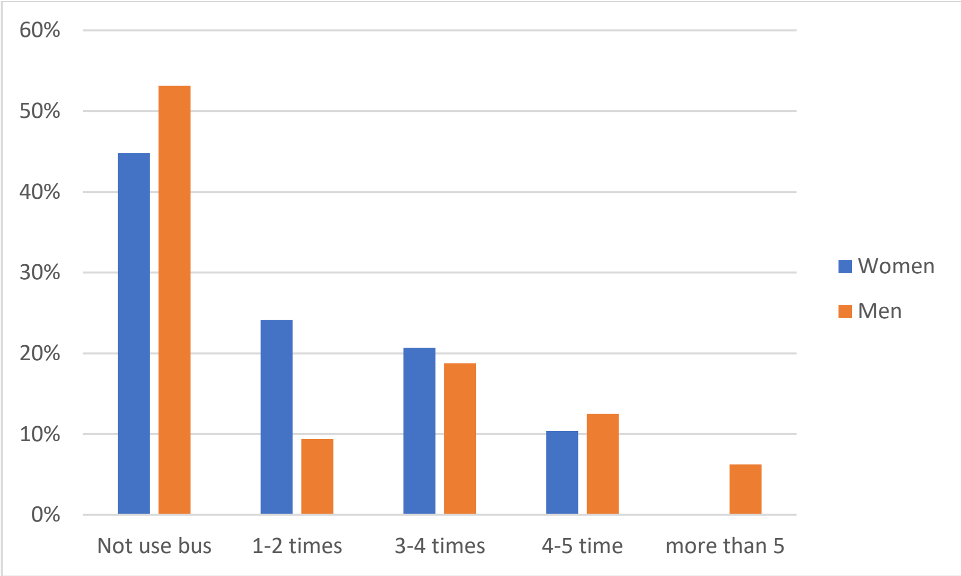

Figure 7 Bus usage by gender

4.3.2 Residents prior knowledge

The findings from the survey indicate a considerable lack of awareness among the general public regarding Dynamic Wireless Power Transfer (DWPT) in Den Bosch city. Specifically, 85% of the respondents were not aware of this technology. This result highlights a significant gap in knowledge and understanding of DWPT among the surveyed population.

One of the primary reasons for the lack of awareness regarding dynamic wireless charging in public transportation systems could be attributed to the novelty of the technology itself. Dynamic wireless charging is a relatively recent concept, and it may not have centered significant attention or publicity in its implementation (Sundelin et al., 2016). While conducting research on the topic, I discovered a scarcity of information, and it was only after stumbling upon a company that had implemented the prototype of this project in Den Bosch that I could gather some relevant information. This indicates a lack of widely available information for the general public. As a consequence, the general population may not have had sufficient exposure to relevant information or educational initiatives that could aid their understanding of the dynamic wireless charging concept and its associated advantages. The lack of awareness stems from limited access to resources that could effectively disseminate knowledge about this technology.

4.3.3 Reduction in the Property Value

The survey results illuminate an average unfavorable perception among community members, particularly in the age group of 36-45 or older, regarding the perceived decrease in property value acting as a hindrance to the adoption of dynamic wireless charging technology. The fact that in general, most of the respondents somehow expressed concerns about the impact on property values (Fig. 8) underscores the perspective that the implementation of this technology would lead to adverse effects on real estate prices and it could be considered as an important factor that should be addressed if the high support of the technology is aimed.

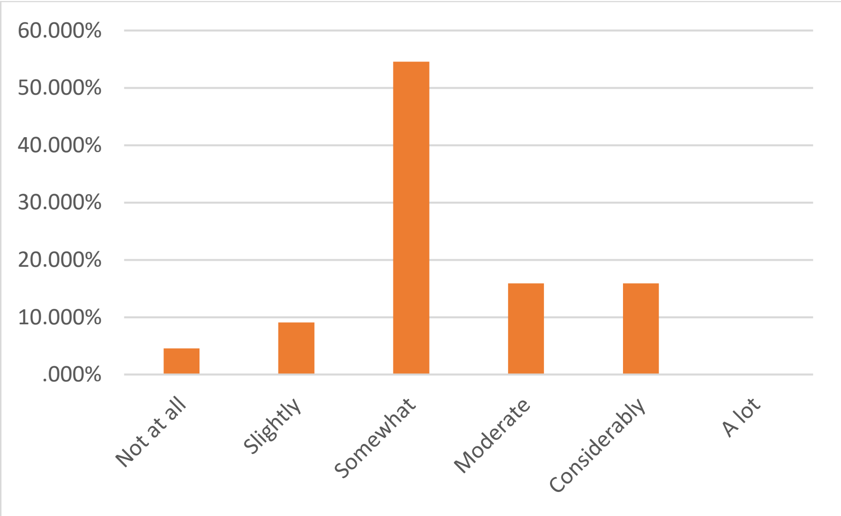

Figure 8 Reduction in Property Value

4.3.4 Aesthetic Destruction

The survey results indicate a strong negative perception among respondents regarding the aesthetic destruction of charging infrastructure (Fig. 9). The significance of aesthetic destruction increases as depicted with higher age groups. This perception suggests that respondents believe that technology has a detrimental effect on the aesthetic nature of the neighborhood which may also impact on property value.

One possible reason for this perception is that respondents may have general preconceived notions about the negative aesthetic effects associated with charging infrastructure. However, it is important to highlight that dynamic wireless charging systems are designed to minimize aesthetic destruction in comparison to traditional charging methods. Unlike bulky charging stations and overhead wires, dynamic wireless charging infrastructure is embedded into the road, blending seamlessly with the surroundings. This design approach ensures a more harmonious integration of the technology, reducing visual pollution and preserving the aesthetic appeal of the neighborhood (Gil & Taiber, 2014).

Moreover, alternative charging methods that require overhead power lines or extensive construction can introduce disruptions and visual disturbances during installation. These modifications may compromise the overall aesthetic of the community and raise safety concerns. In contrast, dynamic wireless charging technology takes advantage of the existing road infrastructure for charging purposes, eliminating the need for significant construction or modifications (Sundelin et al., 2016). This approach not only reduces visual disruptions but also contributes to a more favorable perception of the technology's impact on the community's aesthetic.

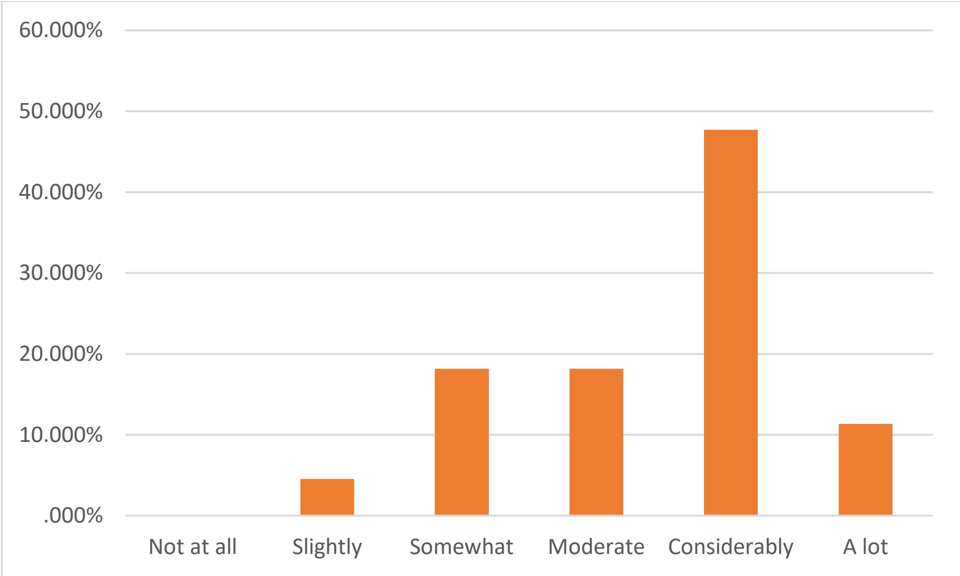

Figure 9 Aesthetic Destruction

4.3.5 Safety Concern

The survey results indicate that safety concerns have a strong influence on community acceptance of dynamic wireless charging technology considering this factor a main contributors for their attitude towards the technology in their neighborhood. This suggests that respondents perceive safety as a critical factor affecting their acceptance of the technology. Safety concerns can encompass a range of aspects, such as the risk of electrical hazards, potential accidents during charging, or concerns about the overall reliability and robustness of the charging infrastructure (Nkoana, 2018).

One particular area of concern regarding the safety of dynamic wireless charging technology revolves around the magnetic field generated by the charging infrastructure. The magnetic field is a fundamental component of this technology, as it enables the transfer of power from the charging infrastructure to the electric bus without the need for physical connections (Sundelin et al., 2016). However, the presence of strong magnetic fields raises concerns among the local community about potential health risks and electromagnetic interference with other electronic devices. Addressing the concerns requires comprehensive studies to assess the potential health effects of long-term exposure to the magnetic fields generated by dynamic wireless charging systems. These studies should involve rigorous testing and evaluation, considering various factors such as field strength, exposure duration, and the distance between the magnetic field source and humans (Jung et al., 2021).

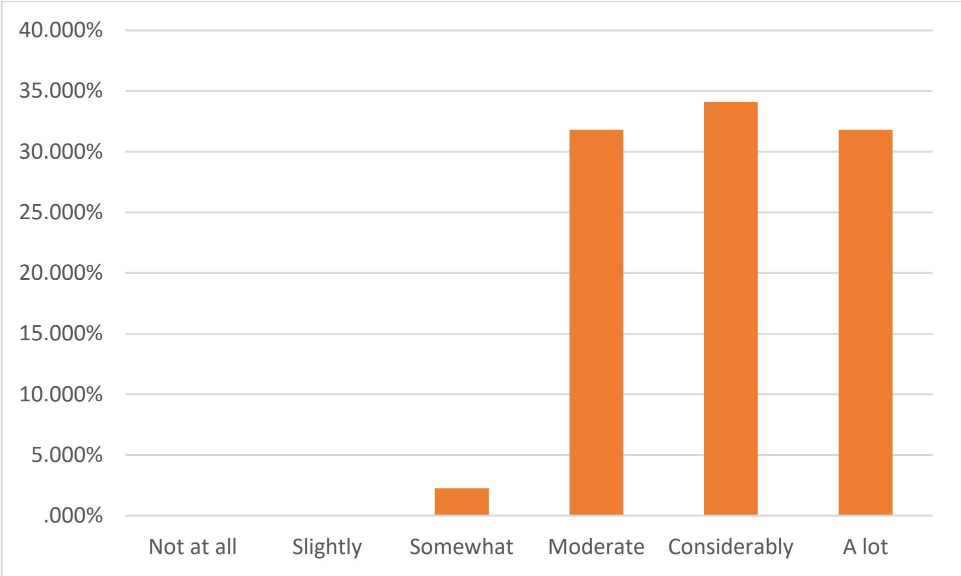

Figure 10 Safety and Health Concern

4.3.6 Construction Disturbance

The survey results reveal that construction disturbance has a negative influence on community acceptance of dynamic wireless charging technology, with a high weight (Fig. 11). This suggests that, on average, respondents have high concerns about the disruptive effects of construction activities associated with implementing the technology. The score implies that these construction-related disturbances are perceived as one of the barriers to accepting dynamic wireless charging technology.

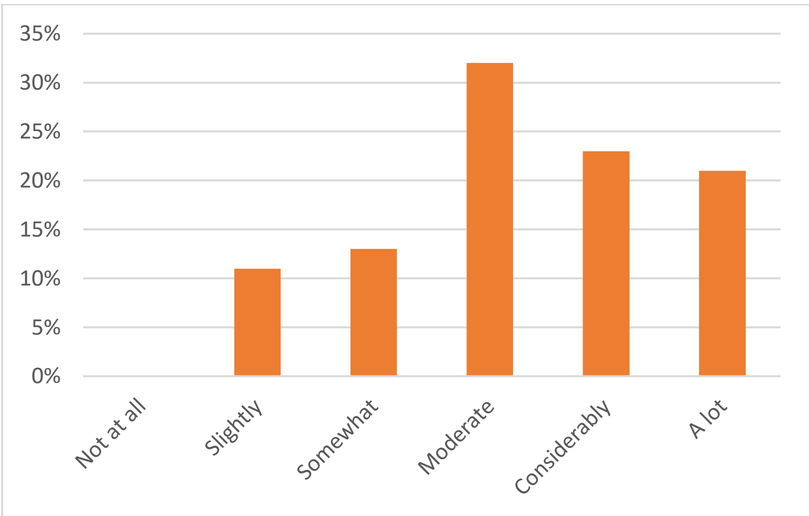

Figure 11 Construction Disturbance

4.3.7 Waste Production

The survey results reveal that most of the respondents view the waste products of the project to have a moderate to high effect on their perspective regarding technology in their neighborhood (Fig. 12).

Waste production in this context may refer to materials used in the construction and operation of dynamic wireless charging systems, such as packaging waste, discarded equipment, or waste generated during maintenance activities waste (Suh et al., 2011). The negative mean score suggests that, on average, respondents view waste production as a factor that hinders their acceptance of dynamic wireless charging technology. However, dynamic wireless charging has the capability to highly adopt with the existing equipment of the charging infrastructure and also it has no wearing part compared to its alternatives and as a result it generally produces less waste(Sundelin et al., 2016). This again emphasizes the fact that low public awareness regarding the advantages of this technology is one of the main challenges which should be addressed.

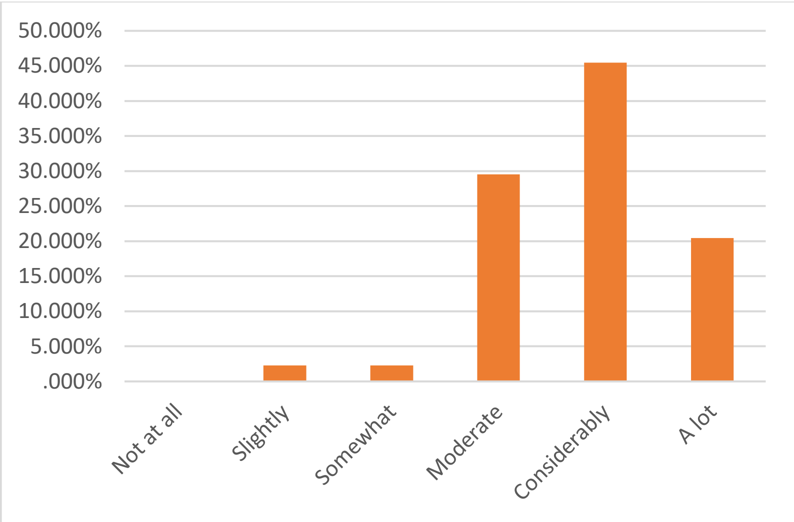

Figure 12 Waste Production

4.3.8 Engaging reputed implementer

According to the survey findings, it is evident that involving highly reputable and trustworthy implementers can significantly impact the community's acceptance of dynamic wireless charging technology. The finding reveals that engaging reputable implementers is moderately important (Fig. 13). This suggests that respondents view the involvement of reputable entities in implementing the technology as a generally important factor that enhances their acceptance. Reputed implementers could refer to well-known companies or organizations with a track record of successful project implementation and a reputation for delivering quality and reliable solutions. The positive mean score indicates that, on average, respondents perceive the involvement of such reputable implementers as an indication of the technology's credibility and reliability, thus positively influencing their acceptance.

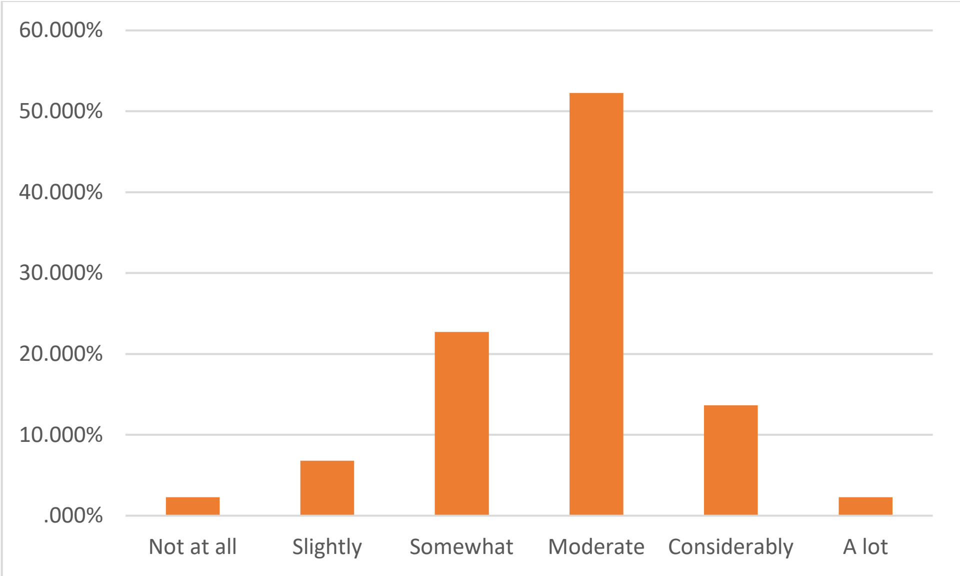

Figure 13 Engaging Reputable Implementers

4.3.9 Public Survey summary

The survey findings, depicted in Figure 14 indicate that the primary perceived risk associated with this technology is safety, as it relies on the creation of a magnetic field. To foster community acceptance and alleviate this concern, it is crucial to conduct further research and development on Dynamic wireless charging, specifically focusing on safety considerations and potential adverse consequences for the residents. By addressing this problem, it is possible to positively impact public perception and mitigate any negative effects on property prices in the vicinity of the technology's implementation.

The second and third most significant concerns expressed by residents regarding the implementation of Dynamic wireless charging pertain to aesthetic destruction and waste production, respectively which could eventually lead to reduction in property value and deteriorate the situation. However, it is important to highlight one of the technology's key advantages, which is its relatively lower aesthetic impact compared to other charging infrastructure options. Similarly, Dynamic wireless charging results in reduced waste generation since it is more compatible with existing charging infrastructure and requires fewer additional components and maintenance due to its lack of wearing parts, unlike alternative solutions (Sundelin et al., 2016). These benefits should be effectively communicated to the public to enhance awareness and enable residents to fully appreciate them, thus fostering greater support for the technology within the community. Lastly, construction disturbance is another concern expressed by residents, as they fear that the installation of dynamic wireless charging could disrupt their daily lives.

The residents' concern regarding construction disturbance stemming from the installation of dynamic wireless charging is a valid issue that needs to be addressed. To mitigate this challenge and minimize disruption to the local community, a solution that emphasizes transparency and the availability of information should be implemented. To address this concern, ensuring that information regarding the project, such as its purpose, timeline, and potential impact on daily life, is readily available to residents through multiple channels can help alleviate their concerns (Skiniti et al., 2022). By fostering transparency and making information easily accessible, the local community can stay informed and feel more involved in the installation process of dynamic wireless charging, ultimately reducing anxiety and garnering support for the initiative (Netherlands Ministry of Economic Affairs and Climate Policy (2020))

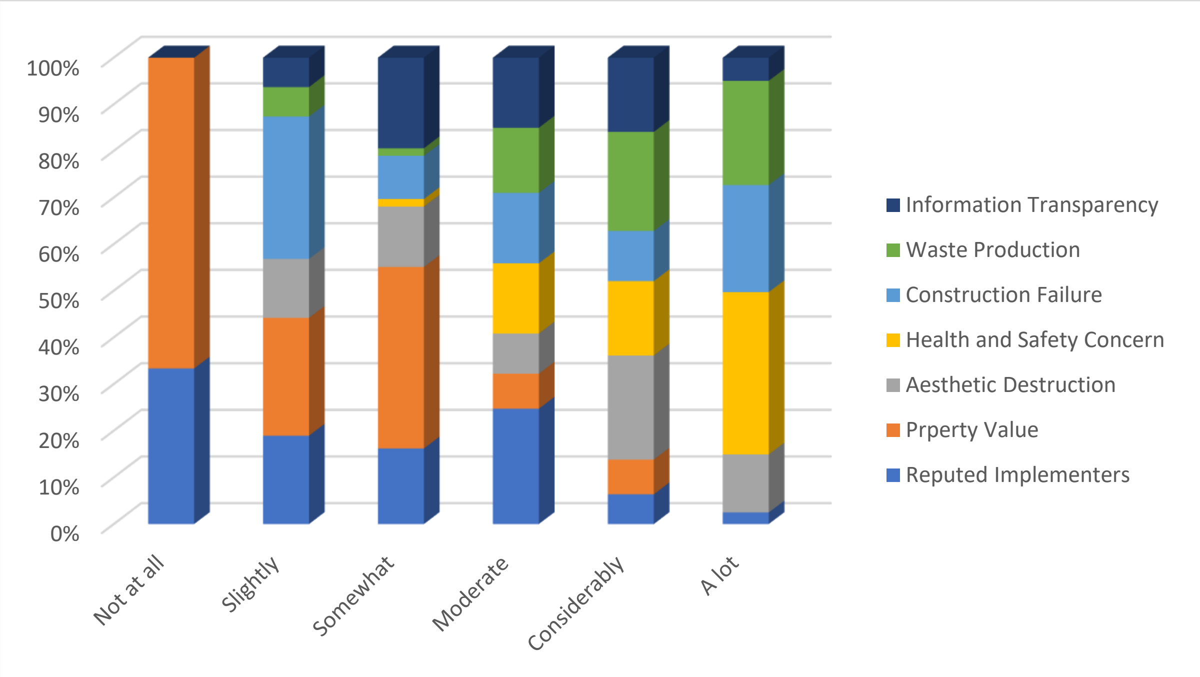

Figure 14 Overall View of Respondents

4.4 Casual relationships in the FCM

After collecting data from respondents in the public and expert surveys, the level of interrelations between each pair of connected concepts in the Fuzzy Cognitive Map (FCM) has been calculated and summarized in Table 7 and depicted in Fig. 15. The indices of "i" and "j" are introduced to represent the concept numbers and reflect how different concepts correlate to others (table. 8). To illustrate this, let's consider "C1, C2" as an example. The value associated with this entry represents the weight applied to the arrow that connects concept C1 to concept C2 in the FCM.

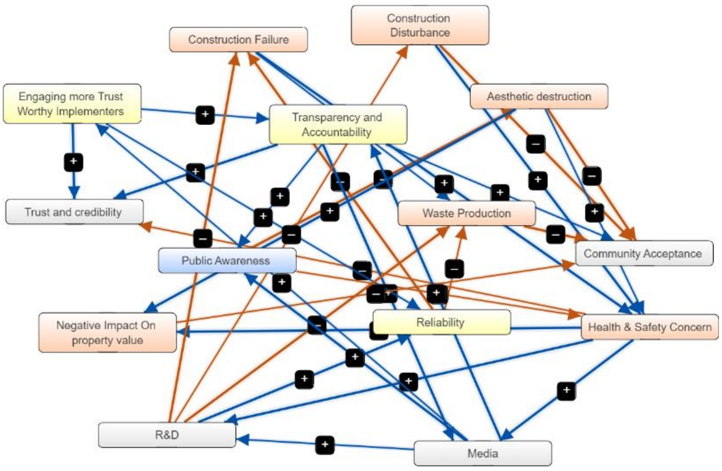

Figure .15 Fuzzy Cognitive Map of the present study

Table 7 Concepts and Metrics

Concept	Name	In-degree	Out-degree	Centrality	Type
C1	Community acceptance	3.05	0	3.05	Receiver
C2	Trust and credibility	2	0.25	2.25	Ordinary
C3	Health & safety concern	1.6	1.8	3.4	Ordinary
C4	Waste production	1.4	0.65	2.05	Ordinary
C5	Research & Development	1.4	2.05	3.45	Ordinary
C6	Negative Impact on Property Value	1.35	1	2.35	Ordinary
C7	Transparency and Accountability	1.3	1.55	2.85	Ordinary
C8	Public Awareness	1.05	1.92	2.97	Ordinary
C9	Construction Failure	1	0.9	1.9	Ordinary
C10	Reliability	0.8	0.7	1.5	Ordinary
C11	Aesthetic Destruction	0.77	1.8	2.57	Ordinary
C12	Construction Disturbance	0.7	0.8	1.5	Ordinary
C13	Public-Private Partnership for Pilot Projects	0.6	3	3.6	Ordinary
C14	Engaging Trusted Implementers	0.5	1.1	1.6	Ordinary

Table 8 FCM Casual Relationships (Ci,Cj)

C3,C6	0.44	C7,C2	0.7	C9,C4	0.72	C13,C5	0.76
C3,C5	0.67	C7,C13	0.74	C5,C10	0.7	C3,C1	0.88
C3,C13	0.78	C14,C10	0.87	C5,C12	0.45	C12,C1	0.76
C12,C3	0.6	C14,C7	0.87	C5,C4	0.64	C7,C1	0.66
C8,C3	0.85	C14,C2	0.73	C5,C9	0.7	C11,C1	0.82
C8,C11	0.85	C11,C3	0.25	C13,C7	0.8	C4,C1	0.79
C7,C8	0.8	C11,C6	0.75	C13,C7	0.95	C6,C1	0.56
C7,C3	0.4	C9,C3	0.56	C13,C14	0.34	C14,C1	0.67

The central concept in this mind-map is community acceptance, which serves as the primary receiver within the Fuzzy Cognitive Map (FCM) (Fig. 15). It is directly influenced by key components, making it a crucial aspect of the analysis. These aspects, while falling outside the scope of this study, highlight the broader implications of community acceptance on the successful implementation of dynamic wireless charging.

Research & Development (R&D) is a concept that holds both a high outdegree and centrality within the fuzzy cognitive map. Its inclusion in the map was based on a careful examination of the Netherlands' energy policies and its potential to accelerate the adoption of dynamic wireless charging.

The high outdegree of R&D indicates its extensive influence on other concepts in the fuzzy cognitive map. It is connected to concepts such as reliability, construction disturbance, construction failure, and waste production. These connections suggest that R&D has a significant impact on these aspects of implementing dynamic wireless charging. Through research and development activities, advancements can be made in improving the reliability of the technology, minimizing construction disturbances and failures, and reducing waste production associated with the implementation process. Moreover, R&D has a central position within the fuzzy cognitive map, implying that it is a key driver and influencer of other concepts. Health and safety concerns, as well as media communication of the technology, are the drivers connected to R&D through its indegree. This indicates that R&D plays a vital role in addressing health and safety concerns related to dynamic wireless charging, as well as in effectively communicating and promoting the technology through media channels. These connections highlight the central role of R&D in shaping the development, implementation, and acceptance of dynamic wireless charging in the Netherlands. The general statistical information of this study's FCM is represented in Table. 9.

Table 9 FCM Statistics

Total components	14
Total connection	31
Density	0.17
Connection per component	2.28
Number of driver components	0
Number of receiver components	2
Number of ordinary components	12

5 Scenario Analysis

The FCM may be generated and used for a number of decision-making objectives, the most common of which is scenario analysis. A scenario is an assumed circumstance in which the FCM is designed to provide the outputs before the circumstance actually occurs. Since there is no restriction on the number of WHAT-IF situations, this research concentrates on different chosen ones to offer a notion of how the system will respond differently when the conditions switch from the current situation to a preferred state with the defined scenario based on the Netherlands' energy policy. The scenario component of this thesis serves to navigate through the complex casualty in the mind-map in such a way as to reach the most efficient approach for accelerating the energy transition by improving the community acceptance of DWPT.

In this chapter, we delved into the scenario analysis of the fuzzy cognitive map (FCM). The FCM consists of factors identified from conducting a literature review on articles discussing similar concepts to this thesis and then the pubic survey responses, along with the expert survey were conducted to fully depict the mind-map and determine the weight of casual relationships between different concepts. These factors are crucial in understanding the comprehensive dynamics and interrelationships among various elements influencing community acceptance of dynamic wireless charging technology. The purpose of this chapter is to recognize the dynamics of the FCM consisting of different factors with a complex interrelationship and acquire a cognition of how these causal relationships influence the final impact of each factor on decision-making regarding community acceptance.

After finalizing the fuzzy cognitive map, it revealed that there are seven indicators including, aesthetic destruction, construction disturbance, transparency, construction failure, waste production, reputed implementers and negative impact on property value which directly affect the people's level of support or rejection for the dynamic wireless charging project. Moreover, in total, 31 links connect the 14 concepts of the FCM, which gives 2.28 connections per component on average. It needs to be mentioned that in a fully connected system composed of 14 concepts, the highest number of interrelations equals 180; however, the map of this research has only 31 of them, and this results in a low value of density in the statistics. FCM with higher density displays a greater degree of complexity in the relationships and thus offers a greater number of options (Gray et al., 2014).

As discussed earlier, seven key concepts are considered crucial in determining the level of community acceptance. In order to identify scenarios that can positively influence the casual relationships within the fuzzy cognitive map, it is necessary to target concepts that can be directly affected. Among all the concepts in the mind-map, three have been identified as having the potential for improvement: public awareness, transparency and accountability, and R&D. These concepts play a significant role in shaping public perception and acceptance. Therefore, leveraging the current energy policies (Netherlands Ministry of Economic Affairs and Climate Policy (2020)) in the Netherlands, this study has devised realistic strategies to accelerate the implementation of dynamic wireless charging.

5.1 Scenario formulation

For scenario number one, in line with the Dutch government's energy policy, which aims to assist local governments in developing the necessary capacities for implementing energy strategies, there is a significant opportunity to leverage these measures to increase public awareness of dynamic wireless charging technology. By incorporating public awareness campaigns as part of the Regional Energy Strategies (Netherlands Ministry of Economic Affairs and Climate Policy (2020)), the government can effectively promote awareness about the technology. This could include organizing community events, workshops, and educational programs that highlight the benefits and functionality of dynamic wireless charging. By actively engaging the public in these events, local governments can effectively communicate the advantages and dispel any misconceptions surrounding the technology (Marra & Colantonio, 2022).

Additionally, the energy policy's emphasis on knowledge exchange presents an opportunity for collaboration between local governments, technology providers, and other relevant stakeholders. Through partnerships and sharing of best practices, local governments can access valuable insights and strategies for effective public awareness campaigns (Netherlands Ministry of Economic Affairs and Climate Policy (2020)). By integrating these measures into the Regional Energy Strategies, the Dutch government can effectively harness the energy policy's support to increase public awareness of dynamic wireless charging technology. This proactive approach will contribute to higher acceptance of this innovative technology among the public. Thus, scenario one focuses on the collaborative potential enabled by the energy policy's emphasis on knowledge exchange, highlighting how local governments and stakeholders can work together to enhance public awareness campaigns and drive greater acceptance of dynamic wireless charging technology through integrated Regional Energy Strategies.

In scenario number two which focus on improving transparency and raising public awareness, the energy policies in the Netherlands emphasizes the importance of digitalization in energy transitions. The Dutch government recognizes that the deployment of digital technologies and solutions is crucial, particularly in the transport, buildings, and electricity sectors (Netherlands Ministry of Economic Affairs and Climate Policy (2020)). These policies aim to support the development of a clear approach to energy sector data, including ownership and access. By promoting the use of digital tools and technologies, the government seeks to enhance transparency in the energy sector. In other words, by aligning with the energy policies in the Netherlands, one of the scenarios focused on improving transparency aligned with the Dutch Energy Policy. Collaborative efforts and support from local governments are essential in overcoming barriers and successfully executing strategies that promote transparency in the energy sector. In summary, scenario two's emphasis on transparency aligns with Dutch energy policies, highlighting digitalization's importance in energy transitions and underscoring the need for collaborative efforts to overcome barriers and enhance sector transparency.

In scenario number three aligns with the Dutch government emphasizes on the importance of research and development in the successful and smooth transition leading to Climate Act targets. The Climate Act outlines a clear objective to reduce greenhouse gas emissions by 49% by 2030 and 95% by 2050 compared to 1990 levels and the Dutch government has defined various plans to ensure meeting the targets in time (Netherlands Ministry of Economic Affairs and Climate Policy (2020)). One of the government plan to support achieving these ambitious targets is through implementing the Integral Knowledge and Innovation Agenda (IKIA), which includes the Multiannual Mission Driven Innovation Programmes (MMIPs). MMIP 9, in particular, focuses on innovation in electric vehicles (EVs) and aligns closely with our R&D scenario for dynamic wireless charging technology. The strategic alignment between our R&D scenario and MMIP 9 underscores the Dutch government's commitment to advancing sustainable transportation solutions and reducing emissions. By investing in R&D for dynamic wireless charging, the government can drive innovation in the transportation sector, with a focus on reducing waste production and increasing reliability, R&D efforts can contribute to further enhancing the technology's efficiency and effectiveness. Additionally, the development of energy distribution systems for electric buses can further enhance the transition to zero-emission mobility of people and goods by 2050. This policy landscape provides a strong foundation for funding and supporting R&D efforts in dynamic wireless charging. In summary, the alignment of my R&D scenario with MMIP 9 underscores the Dutch government's dedication to sustainable transport solutions and signifies the potential of dynamic wireless charging to drive EV innovation, efficiency, and emissions reduction.

5.1.1 Scenario one

The initial findings indicate that dynamic wireless charging technology has a low awareness level among the general public in the Netherlands. Despite this lack of awareness, it is known that this technology has the advantage of causing lower destruction to the aesthetic integrity of the local community compared to traditional charging infrastructure and also implementing this technology could cause lower waste production compared to the existing alternatives. Recognizing the importance of increasing public awareness towards the perceived benefits of the project, scenario one aims to evaluate the potential impact of enhancing public knowledge and perception of dynamic wireless charging. By increasing public awareness and addressing concerns related to aesthetic destruction and waste production, it is hypothesized that the community's acceptance of dynamic wireless charging technology will improve .

This immediate conclusion is derived from the understanding that increased public awareness can lead to a better perception of the technology, thereby positively influencing community acceptance. However, it is important to recognize that the fuzzy cognitive map comprises 14 interconnected components with 31 connections. Therefore, scenario one serves as a comprehensive investigation to assess the overall effect of raising public awareness regarding the positive aspects of dynamic wireless charging on the entire fuzzy cognitive map and its implications for other concepts within the map. This approach allows for a holistic understanding of the system’s dynamic and aids in identifying the indirect consequence of raising public awareness and then determine the most effective and sustainable strategies to accelerate the adoption of dynamic wireless charging technology in the Netherlands.

In scenario one, the "what if" analysis focuses on the potential outcomes of a sharp increase in public awareness regarding dynamic wireless charging and its benefits. An increased acceptance is expected when the community could have the opportunity to acquire a better understanding of the benefits that the technology could bring to the neighborhood and this would eliminate the existing misconceptions. Although in an immediate glance, raising public awareness might seem a very positive change that could significantly increase public acceptance, it is important to consider the unintended consequences of this scenario.

The reduced media focus on technology due to community peace of mind may result in decreased funding for research and development (R&D) by (-52%). This, in turn, can have adverse effects on the technology's reliability, potentially leading to construction failures (+48%) and increased waste production (+78%). Furthermore, the public's peace of mind and the consequent decline in media attention towards the technology would lead to reduced transparency (-67%) and limited involvement of reputable implementers (-25%). A decrease in transparency may also cause increased construction disruptions (+23%) and reduced the public's trust and confidence (-34%) in the technology's profitability (Fig. 16). While it is vital to raise public awareness as a pivotal step in accelerating the adoption of dynamic wireless charging, it is equally important to explore alternative approaches or complement this scenario with measures that address other challenges associated with the technology.

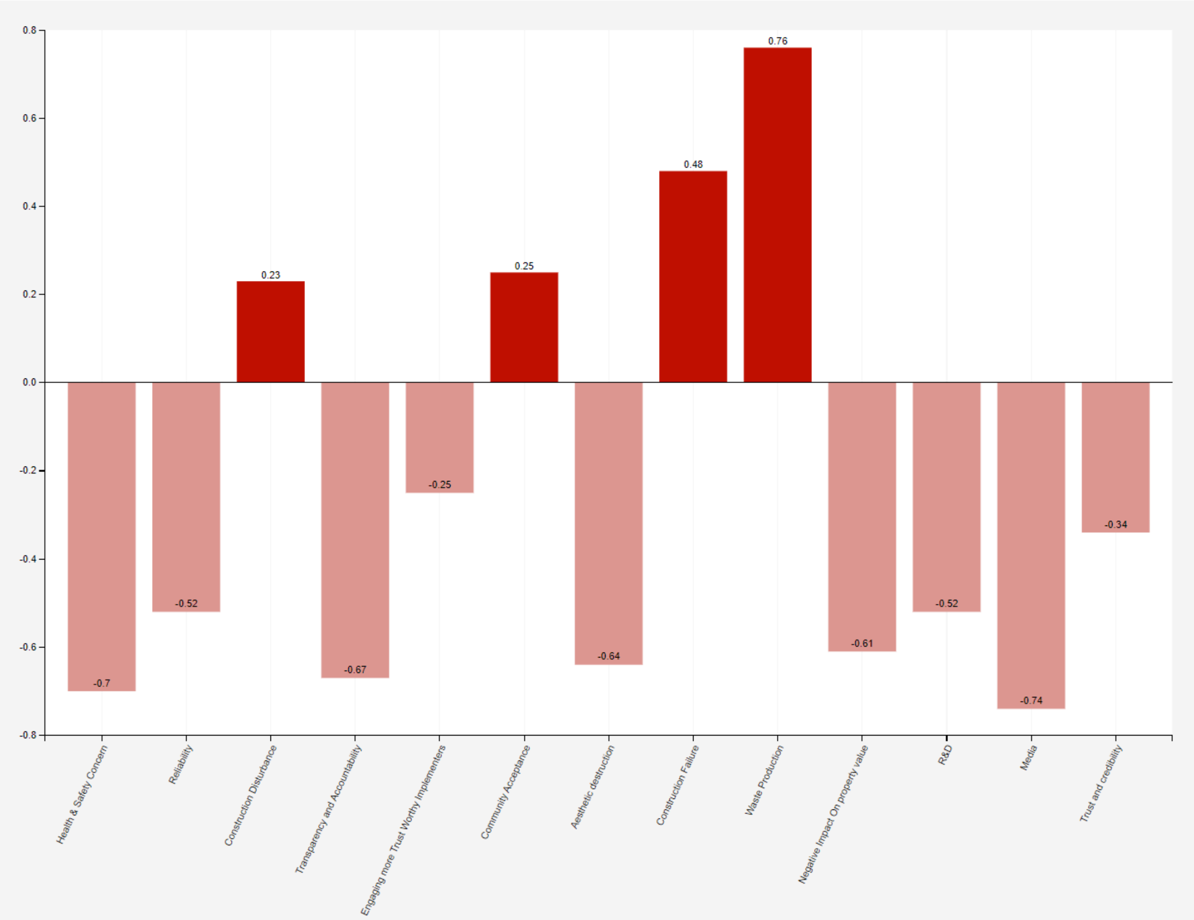

Figure 16 Scenario one

5.1.2 Scenario two

Scenario two explores the potential outcomes of significantly enhancing transparency and accountability regarding dynamic wireless charging information. The main objective of this scenario is to enhance public awareness by providing reliable and impartial information to the media. By ensuring transparency, the community gains access to a well-rounded perspective on the advantages and disadvantages of adopting this new technology. The crucial difference between scenario one and scenario two lies in the trustworthiness of information and how increased awareness through transparent information can bolster the community's confidence and trust in the profitability of the technology. When information is transparent and delivered in a responsible manner, the media can become a reliable source of unbiased information for the community. Additionally, through the implementation of the digitalization plan outlined in the Dutch energy policy, transparent information can help minimize construction disturbances by informing the local community about the construction plan and any potential.

The improved transparency of information creates an environment of trust (+78%), bolstering the credibility of projects in the eyes of the community and enhancing their confidence in the perceived benefits of the technology. Furthermore, addressing concerns and misconceptions related to the technology's aesthetic impact (-56%) can mitigate any potential reduction in property value (-59%), leading to increased acceptance within the community (+66%). However, it is important to note that the increased trust and credibility may inadvertently reduce attention and funding towards research and development (R&D) (-17%), resulting in increased waste production (16%) and construction failures (+8%), as well as a potential neglect of health and safety concerns (-43%) raised by the local community (Fig. 17).

In scenario two, the balanced and informed awareness generated within the community through increased transparency and accountability justifies the allocation of funding for research and development (R&D) efforts aimed at addressing the challenges associated with dynamic wireless charging (Fig. 17). For this reason the third scenario is introduced as a combination of second scenario with increased a fund on R&D.

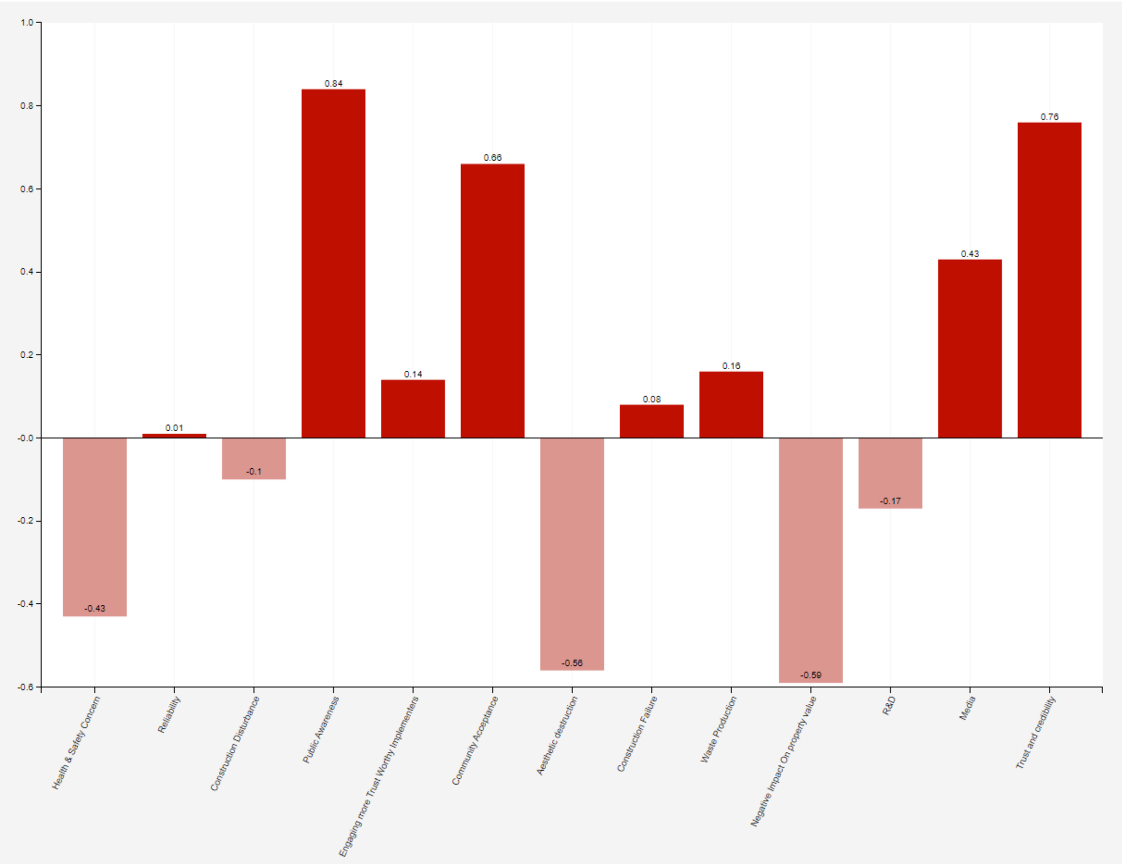

Figure 17 Scenario two

5.1.3 Scenario three

In the final scenario, we explore the combined effect of a sharp increase in R&D and implementing a sharp increase in transparency and accountability (Fig. 18). This scenario leverages the benefits of both previous scenarios to foster an environment of continuous improvement and informed decision-making.

With a sharp increase in R&D investment, there is a greater focus on addressing the challenges and optimizing the dynamic wireless charging technology. This additional funding enables researchers and innovators to develop novel solutions and enhance the overall reliability, and safety of the technology (+65%). Simultaneously, the sharp increase in transparency and accountability ensures that the information reaching the community is unbiased, reliable, and balanced. The public gains access to comprehensive knowledge about the technology, including its benefits, drawbacks, and ongoing R&D efforts. This transparent flow of information helps to build trust and confidence (+79%) in the community, fostering their acceptance and support for dynamic wireless charging.

By combining a sharp increase in R&D with a sharp increase in transparency, this scenario maximizes the potential for positive outcomes. It establishes a feedback loop where R&D advancements drive improved technology, while transparent information dissemination nurtures a well-informed and supportive community. This synergy between research, transparency, and community involvement paves the way for accelerated adoption, increased public awareness, and the continuous refinement and optimization of dynamic wireless charging technology.

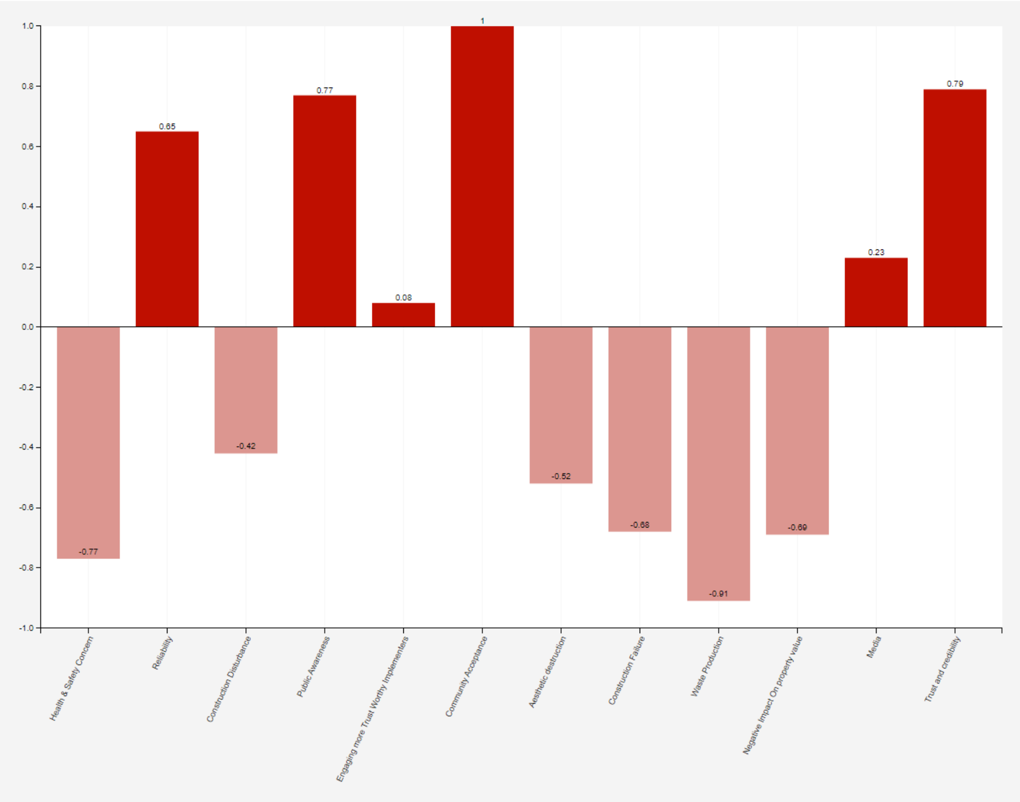

Figure 18 Scenario three

6 Conclusion

This thesis has addressed the crucial issue of community acceptance regarding the implementation of dynamic wireless charging (DWC) technology in the context of public transportation in the Netherlands. The aim of this study was to evaluate the community's response to DWC and understand the factors that influence their acceptance or rejection of this innovative charging method. By investigating the perceptions of local residents and analyzing the interconnections between various influencing factors using fuzzy cognitive mapping, valuable insights have been gained. Answering the first question of this study, the findings shed light on the key considerations that communities take into account when assessing the feasibility and desirability of DWC, with factors such as health and safety concerns, aesthetic impact, and waste production emerging as significant contributors to the acceptance or rejection of this technology in their neighborhoods.

Regarding the second question of the study which was to recognize the current level of acceptance of the technology, findings indicate that dynamic wireless charging technology has a low awareness level among the general public in Den Bosch city as the case study in the Netherlands. Recognizing the importance of increasing public awareness, the study aims to evaluate the potential impact of enhancing public knowledge and perception of the advantages of dynamic wireless charging. Based on the third sub-question, this study evaluate different scenarios which could help decision makers to accelerate the adoption of dynamic wireless charging in the Netherlands. The results of scenario one revealed that it is true that raising public awareness could increase the overall community acceptance though it comes with reduced attention of the media towards the technology, resulting from the community's peace of mind, based on the results acquired by imposing scenario one to the FCM, may lead to lower funding allocation for research and development (R&D). This, in turn, can negatively impact the reliability of the technology, potentially leading to construction failures and increased waste production.

Building upon these findings, the study introduced a second scenario that focused on increasing transparency and providing the public with a realistic view of the implementation of dynamic wireless charging. This scenario yielded more successful results, as it not only raised public awareness but also address the construction disturbance and enhanced trust and credibility within the community. By presenting both positive and negative aspects of the technology, this scenario fostered informed decision-making and allowed the community to have a more comprehensive understanding of the benefits and potential drawbacks.

To further improve the implementation of dynamic wireless charging in the Netherlands, the study proposed a third scenario that combined increased transparency with higher investment in research and development. This scenario anticipated a significant improvement in community acceptance, as it addressed health and safety concerns while also fostering technological advancements. By allocating resources to both enhancing public understanding and driving further innovation, the implementation of dynamic wireless charging can be moved forward, ensuring a sustainable and efficient public transportation system for the future. In other words, this scenario harnesses the benefits of both previous scenarios, fostering an environment of continuous improvement and informed decision-making. The increased R&D investment enables a greater focus on addressing challenges and optimizing dynamic wireless charging technology, driving advancements in reliability, efficiency, and safety. Simultaneously, the enhanced transparency ensures unbiased and reliable information reaches the community, building trust and confidence. By combining R&D advancements with transparency, this scenario maximizes positive outcomes, paving the way for accelerated adoption, increased awareness, and continuous refinement of dynamic wireless charging technology.

Policymakers and urban planners can leverage the insights gained from this study to inform their decision-making processes and develop strategies that prioritize community acceptance. Transportation authorities can use the identified factors influencing acceptance to design effective communication and engagement campaigns that address public concerns and promote the benefits of dynamic wireless charging. By considering the practical implications of this research, stakeholders can work towards creating an environment that fosters positive community acceptance and accelerates the integration of dynamic wireless charging into the public transportation infrastructure.

This study utilized the fuzzy cognitive map to capture the complexity of casual relationship between 14 concepts with 31 connection. However, a fully connected system composed of 14 concepts, the highest number of interrelations equals 180. Aside from exceeding the scope of this research, at least one question per connection would have to be there in the survey, which would make the survey too time-consuming. This study also had a limitation in terms of its sample size and involving aging groups as it only included 50 respondents for the public survey. This limitation came from the practical constraints of the study for gathering information from the Den Bosch city. The low participation of older age group in the present study root to the reluctancy of the older generation specifically women over 70 to answer Dutch culture issues in English. Finally, it is worth considering that there may be other factors and indicators that could have been included in the present study.

The importance of considering these aspects, and how this consideration would lead to a more comprehensive understanding of the dynamics surrounding the implementation of dynamic wireless charging technology could be discussed in a continuation of this study. Moreover, this study focused on improving the community acceptance of dynamic wireless charging while a consequential study could work on the effects of the community acceptance improvement on the adaptation of the technology. For instance, positive community acceptance can influence government policies and regulations, leading to the development of supportive frameworks for implementing dynamic wireless charging. Furthermore, it can attract funding and investment opportunities, foster collaboration among stakeholders, and shape public perception and awareness of the technology's benefits (Knauf & le Maitre, 2023)

In conclusion, this thesis has made significant contributions to improving community acceptance and accelerating the implementation of dynamic wireless charging for public transportation in the Netherlands. By investigating the factors that influence community acceptance and exploring different scenarios, valuable insights have been gained. The research emphasizes the importance of enhancing public awareness, increasing transparency, and investing in research and development to address concerns and foster technological advancements.

7 Reference

Bakhtavar, E., Valipour, M., Yousefi, S., Sadiq, R., & Hewage, K. (2021). Fuzzy cognitive maps in systems risk analysis: a comprehensive review. *Complex & Intelligent Systems*, *7*(2), 621–637. https://doi.org/10.1007/s40747-020-00228-2

Balde, B. J., & Sardar, A. (2019). Electric Road system With Dynamic Wireless charging of Electric buses. *2019 IEEE Transportation Electrification Conference (ITEC-India)*, 1–4. https://doi.org/10.1109/ITEC-India48457.2019.ITECINDIA2019-251

Baur, D., Emmerich, P., Baumann, M. J., & Weil, M. (2022). Assessing the social acceptance of key technologies for the German energy transition. *Energy, Sustainability and Society*, *12*(1), 4. https://doi.org/10.1186/s13705-021-00329-x

Beekman, R., & van den Hoed, R. (2016). Operational demands as determining factor for electric bus charging infrastructure. *6th Hybrid and Electric Vehicles Conference (HEVC 2016)*, 3 (6 .)-3 (6 .). https://doi.org/10.1049/cp.2016.0963

Boulanger, A. G., Chu, A. C., Maxx, S., & Waltz, D. L. (2011). Vehicle Electrification: Status and Issues. *Proceedings of the IEEE*, *99*(6), 1116–1138. https://doi.org/10.1109/JPROC.2011.2112750

Brownlee, M. T. J., Hallo, J. C., Jodice, L. W., Moore, D. D., Powell, R. B., & Wright, B. A. (2015). Place Attachment and Marine Recreationists' Attitudes toward Offshore Wind Energy Development. *Journal of Leisure Research*, *47*(2), 263–284. https://doi.org/10.1080/00222216.2015.11950360

Busse, M., & Siebert, R. (2018). Acceptance studies in the field of land use—A critical and systematic review to advance the conceptualization of acceptance and acceptability. *Land Use Policy*, *76*, 235–245. https://doi.org/10.1016/j.landusepol.2018.05.016

Climate change: what the EU is doing - Consilium. (n.d.). Retrieved March 28, 2023, from https://www.consilium.europa.eu/en/policies/climate-change/

Climate policy | Climate change | Government.nl. (n.d.). Retrieved March 28, 2023, from https://www.government.nl/topics/climate-change/climate-policy

Coosemans, T., Lebeau, K., Macharis, C., Lievens, B., & Van Mierlo, J. (2012). Living Labs for Electric Vehicles in Flandres. *World Electric Vehicle Journal*, *5*(4), 1005–1010. https://doi.org/10.3390/wevj5041005

Corbet, S., Larkin, C., & McCluskey, J. (2023). The influence of inclement weather on electric bus efficiency: Evidence from a developed European network. *Case Studies on Transport Policy*, *12*, 100971. https://doi.org/10.1016/J.CSTP.2023.100971

Deveci, M., & Torkayesh, A. E. (2022). Charging Type Selection for Electric Buses Using Interval-Valued Neutrosophic Decision Support Model. *IEEE Transactions on Engineering Management*, 1–14. https://doi.org/10.1109/TEM.2021.3108062

Devine-Wright, P., Batel, S., Aas, O., Sovacool, B., LaBelle, M. C., & Ruud, A. (2017). A conceptual framework for understanding the social acceptance of energy infrastructure: Insights from energy storage. *Energy Policy*, *107*, 27–31. https://doi.org/10.1016/J.ENPOL.2017.04.020

Dumbrell, N. P., Wheeler, S. A., Zuo, A., & Adamson, D. (2022). Public willingness to make trade-offs in the development of a hydrogen industry in Australia. *Energy Policy*, *165*, 112987. https://doi.org/10.1016/j.enpol.2022.112987

Dutch goals within the EU | Climate change | Government.nl. (n.d.). Retrieved March 28, 2023, from https://www.government.nl/topics/climate-change/eu-policy

Dutch vision on global climate action | Climate change | Government.nl. (n.d.). Retrieved March 28, 2023, from https://www.government.nl/topics/climate-change/dutch-vision-on-global-climate-action

E-Moss testing “completely climate-neutral” wireless charging bus in Netherlands - Autoblog. (n.d.-a). Retrieved April 16, 2023, from https://www.autoblog.com/2012/10/16/e-moss-testing-completely-climate-neutral-wireless-charging-bu/?guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAA9faFtxaJExtKDnneptR57HkfIuCJCk-Dfo5OXtI-MDZhKEXmlj57K1xISjrxgxy_-A8MPMpd_cn3OCUJUAjgZCHDk9hQ6WjLtjrV2M4L5ePQpXImQb6KelA2b5WVPy-xvbY8c5emhfVrg2tcembNhY0JWPZj3gEtxvgrkPjMZG&guccounter=2

E-Moss testing “completely climate-neutral” wireless charging bus in Netherlands - Autoblog. (n.d.-b). Retrieved April 21, 2023, from https://www.autoblog.com/2012/10/16/e-moss-testing-completely-climate-neutral-wireless-charging-bu/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAA9faFtxaJExtKDnneptR57HkfIuCJCk-Dfo5OXtI-MDZhKEXmlj57K1xISjrxgxy_-A8MPMpd_cn3OCUJUAjgZCHDk9hQ6WjLtjrV2M4L5ePQpXImQb6KelA2b5WVPy-xvbY8c5emhfVrg2tcembNhY0JWPZj3gEtxvgrkPjMZG

Enserink, M., Van Etteger, R., Van den Brink, A., & Stremke, S. (2022). To support or oppose renewable energy projects? A systematic literature review on the factors influencing landscape design and social acceptance. *Energy Research & Social Science*, *91*, 102740. https://doi.org/10.1016/j.erss.2022.102740

Gadgil, S., Ekambaram, K., Davies, H., Jones, A., & Birrell, S. (2022). Determining the Social, Economic, Political and Technical Factors Significant to the Success of Dynamic Wireless Charging Systems through a Process of Stakeholder Engagement. *Energies*, *15*(3), 930. https://doi.org/10.3390/en15030930

Gagnon Thompson, S. C., & Barton, M. A. (1994). Ecocentric and anthropocentric attitudes toward the environment. *Journal of Environmental Psychology*, *14*(2), 149–157. https://doi.org/10.1016/S0272-4944(05)80168-9

Gil, A., & Taiber, J. (2014). *A Literature Review in Dynamic Wireless Power Transfer for Electric Vehicles: Technology and Infrastructure Integration Challenges* (pp. 289–298). https://doi.org/10.1007/978-3-319-01884-3_30

Hanger, S., Komendantova, N., Schinke, B., Zejli, D., Ihlal, A., & Patt, A. (2016). Community acceptance of large-scale solar energy installations in developing countries: Evidence from Morocco. *Energy Research & Social Science*, *14*, 80–89. https://doi.org/10.1016/j.erss.2016.01.010

Hemström, K., Mahapatra, K., & Gustavsson, L. (2014). Public Perceptions and Acceptance of Intensive Forestry in Sweden. *AMBIO*, *43*(2), 196–206. https://doi.org/10.1007/s13280-013-0411-9

Hoen, B., Firestone, J., Rand, J., Elliot, D., Hübner, G., Pohl, J., Wiser, R., Lantz, E., Haac, T. R., & Kaliski, K. (2019). Attitudes of U.S. Wind Turbine Neighbors: Analysis of a Nationwide Survey. *Energy Policy*, *134*, 110981. https://doi.org/10.1016/j.enpol.2019.110981

Homer, P. M., & Kahle, L. R. (1988). A structural equation test of the value-attitude-behavior hierarchy. *Journal of Personality and Social Psychology*, *54*(4), 638–646. https://doi.org/10.1037/0022-3514.54.4.638

Jaeger, H., Knorr, D., Szabó, E., Hámori, J., & Bánáti, D. (2015). Impact of terminology on consumer acceptance of emerging technologies through the example of PEF technology. *Innovative Food Science & Emerging Technologies*, *29*, 87–93. https://doi.org/10.1016/j.ifset.2014.12.004

Jang, Y. J. (2018). Survey of the operation and system study on wireless charging electric vehicle systems. *Transportation Research Part C: Emerging Technologies*, *95*, 844–866. https://doi.org/10.1016/j.trc.2018.04.006

Jung, G., Hosani, K. Al, Song, B., Seo, D., Kim, J., & Cho, D. (2021). Semi-Dynamic Wireless Power Charging System for Autonomous Electric Vehicle. *2021 IEEE Wireless Power Transfer Conference (WPTC)*, 1–4. https://doi.org/10.1109/WPTC51349.2021.9458092

Kalantari, F., & Akhyani, N. (2021). Community acceptance studies in the field of vertical farming—A critical and systematic analysis to advance the conceptualisation of community acceptance in Kuala Lumpur. *International Journal of Urban Sustainable Development*, *13*(3), 569–584. https://doi.org/10.1080/19463138.2021.2013849

Kaldellis, J. K., & Boulogiorgou, D. (2022). Social Acceptability of Wind Power Projects. In *Comprehensive Renewable Energy* (pp. 628–643). Elsevier. https://doi.org/10.1016/B978-0-12-819727-1.00159-X

Kawashima, T. (2012). Basic Research on an Electric Bus System Charged Quickly at Every Bus Stop Using Green Energy (Demonstration Experiment Using EV Converted Minivan). *Volume 3: Renewable Energy Systems; Robotics; Robust Control; Single Track Vehicle Dynamics and Control; Stochastic Models, Control and Algorithms in Robotics; Structure Dynamics and Smart Structures;*, 583–590. https://doi.org/10.1115/DSCC2012-MOVIC2012-8666

Knauf, J., & le Maitre, J. (2023). A matter of acceptability? Understanding citizen investment schemes in the context of onshore wind farm development. *Renewable and Sustainable Energy Reviews*, *175*, 113158. https://doi.org/10.1016/j.rser.2023.113158

Kosko, B. (1986). Fuzzy cognitive maps. *International Journal of Man-Machine Studies*, *24*(1), 65–75. https://doi.org/10.1016/S0020-7373(86)80040-2

Kumar, A., Sah, B., Singh, A. R., Deng, Y., He, X., Kumar, P., & Bansal, R. C. (2017). A review of multi criteria decision making (MCDM) towards sustainable renewable energy development. *Renewable and Sustainable Energy Reviews*, *69*, 596–609. https://doi.org/10.1016/J.RSER.2016.11.191

Linzenich, A., Zaunbrecher, B. S., & Ziefle, M. (2020). “Risky transitions?” Risk perceptions, public concerns, and energy infrastructure in Germany. *Energy Research & Social Science*, *68*, 101554. https://doi.org/10.1016/j.erss.2020.101554

Liu, Z., & Song, Z. (2017). Robust planning of dynamic wireless charging infrastructure for battery electric buses. *Transportation Research Part C: Emerging Technologies*, *83*, 77–103. https://doi.org/10.1016/J.TRC.2017.07.013

Long, R., Zhang, L., & Chen, Q. (2018). Soft switching strategy of dynamic wireless charging system for electric vehicles. *2018 33rd Youth Academic Annual Conference of Chinese Association of Automation (YAC)*, 738–742. https://doi.org/10.1109/YAC.2018.8406469

Marra, A., & Colantonio, E. (2022). The institutional and socio-technical determinants of renewable energy production in the EU: implications for policy. *Journal of Industrial and Business Economics*, *49*(2), 267–299. https://doi.org/10.1007/s40812-022-00212-6

McKenna, R., Ostman v.d. Leye, P., & Fichtner, W. (2016). Key challenges and prospects for large wind turbines. *Renewable and Sustainable Energy Reviews*, *53*, 1212–1221. https://doi.org/10.1016/j.rser.2015.09.080

Menezes, M. C., Costa, B. V. L., Oliveira, C. D. L., & Lopes, A. C. S. (2017). Local food environment and fruit and vegetable consumption: An ecological study. *Preventive Medicine Reports*, *5*, 13–20. https://doi.org/10.1016/j.pmedr.2016.10.015

Miklautsch, P., & Woschank, M. (2022). A framework of measures to mitigate greenhouse gas emissions in freight transport: Systematic literature review from a Manufacturer’s perspective. *Journal of Cleaner Production*, *366*, 132883. https://doi.org/10.1016/J.JCLEPRO.2022.132883

Miles, J., & Potter, S. (2014). Developing a viable electric bus service: The Milton Keynes demonstration project. *Research in Transportation Economics*, *48*, 357–363. https://doi.org/10.1016/j.retrec.2014.09.063

Morfeldt, J., Shoman, W., Johansson, D. J. A., Yeh, S., & Karlsson, S. (2022). If Electric Cars Are Good for Reducing Emissions, They Could Be Even Better with Electric Roads. *Environmental Science & Technology*, *56*(13), 9593–9603. https://doi.org/10.1021/acs.est.2c00018

Mouta, J. S., de Sá, N. C., Menezes, E., & Melo, L. (2016). Effect of institutional sensory test location and consumer attitudes on acceptance of foods and beverages having different levels of processing. *Food Quality and Preference*, *48*, 262–267. https://doi.org/10.1016/j.foodqual.2015.10.002

Nationally Determined Contributions (NDCs) | UNFCCC. (n.d.). Retrieved April 12, 2023, from https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs

Nations, U. (n.d.). *All About the NDCs | United Nations*. Retrieved March 28, 2023, from https://www.un.org/en/climatechange/all-about-ndcs

Netherlands leads the way on new electric buses - analysis. (n.d.). Retrieved April 10, 2023, from https://www.transportenvironment.org/discover/netherlands-leads-the-way-on-new-electric-buses-analysis/

Nkoana, E. M. (2018). Community acceptance challenges of renewable energy transitions: A tale of two solar parks in Limpopo, South Africa. *Journal of Energy in Southern Africa*, *29*(1), 34–40. https://doi.org/10.17159/2413-3051/2018/v29i1a2540

Olivari, C., & Pasquali, M. (2022). *(Un)earth Vulnerable Chile* (pp. 173–181). https://doi.org/10.1007/978-3-031-06825-6_17

Olsen, C. S., & Shindler, B. A. (2010). Trust, acceptance, and citizen - agency interactions after large fires: influences on planning processes. *International Journal of Wildland Fire*, *19*(1), 137. https://doi.org/10.1071/WF08168

Özesmi, U., & Özesmi, S. L. (2004). Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. *Ecological Modelling*, *176*(1–2), 43–64. https://doi.org/10.1016/J.ECOLMODEL.2003.10.027

Pavlowsky, C. E., & Gliedt, T. (2021). Individual and local scale interactions and adaptations to wind energy development: A case study of Oklahoma, USA. *Geography and Sustainability*, *2*(3), 175–181. https://doi.org/10.1016/j.geosus.2021.08.003

Policies to promote electric vehicle deployment – Global EV Outlook 2021 – Analysis - IEA. (n.d.). Retrieved April 10, 2023, from https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment

Ren, X., Che, Y., Yang, K., & Tao, Y. (2016). Risk perception and public acceptance toward a highly protested Waste-to-Energy facility. *Waste Management*, *48*, 528–539. https://doi.org/10.1016/j.wasman.2015.10.036

8 Appendix

8.1 Public Survey

Dynamisch Draadloos Opladen

Start of Block: Default Question Block

Dynamisch Draadloos Opladen: Dynamisch draadloos opladen is een innovatieve technologie die elektrische bussen in staat stelt om hun batterijen draadloos op te laden tijdens het rijden via een inductief oplaadsysteem dat onder het wegdek is geïnstalleerd. Deze technologie maakt het mogelijk dat elektrische bussen langer kunnen rijden zonder te hoeven stoppen voor een langdurig oplaadproces. Echter, de acceptatie door de gemeenschap speelt een belangrijke rol bij de succesvolle implementatie van deze technologie. De acceptatie door de gemeenschap bepaalt of een nieuwe technologie succesvol zal worden geïmplementeerd of niet, omdat dit van invloed is op het niveau van steun en bereidheid van lokale bewoners om de technologie te omarmen. Bijvoorbeeld, de bouw van infrastructuur voor dynamisch draadloos opladen kan bepaalde moeilijkheden opleveren voor nabijgelegen bewoners, waaronder problemen zoals geluidsoverlast en verkeersopstoppingen. Daarom speelt de houding van de lokale bevolking ten opzichte van de potentiële voordelen van deze technologie een cruciale rol bij het bepalen van hun steun of afwijzing ervan. Uiteindelijk kan hun acceptatie of afwijzing een aanzienlijke invloed hebben op het succes van de technologie. Het doel van deze enquête is om de acceptatie door de gemeenschap van deze technologie te onderzoeken, wat vereist dat de attitudes, overtuigingen en meningen van mensen in uw gemeenschap of buurt ten opzichte van deze technologie worden begrepen, en eventuele mogelijke zorgen of belemmeringen worden geïdentificeerd die de adoptie ervan kunnen belemmeren.

Wees gerust dat alle gegevens die in deze enquête worden verzameld strikt vertrouwelijk worden behandeld. Uw antwoorden zullen geanonimiseerd en samengevoegd worden voor analytische doeleinden. Alle identificeerbare informatie zal worden verwijderd en gewist uit de dataset na afronding van het onderzoek. De verzamelde gegevens zullen uitsluitend worden gebruikt voor academisch onderzoek en zullen niet worden gedeeld met derden. Bedankt voor uw waardevolle bijdrage aan dit onderzoek! Doel van de studie: Deze studie heeft tot doel het niveau van acceptatie van dynamisch draadloos opladen in de Nederlandse gemeenschap te onderzoeken en dienovereenkomstig enkele aanbevelingen te doen ter verbetering.

Q1 Zou u bereid zijn om deel te nemen aan dit onderzoek?

○ Ja (1)

○ Nee (2)

Q2 Woont u in Den Bosch of in de omgeving ervan?

○ Ja (1)

○ Nee (2)

Q3 Met welk geslacht identificeert u zich?

- Man (1)
- Vrouw (2)
- Non-binair/derde geslacht (3)
- Geef liever geen antwoord (4)

Q4 Hoe oud bent u?

- 18-30 (1)
- 31-45 (2)
- 46-65 (3)
- meer dan 65 (4)

Q5 Hoe vaak maakt u gebruik van openbare bussen voor vervoersdoeleinden?

- Niet Vaak (1)
- 1-2 keer per week (2)
- 2-3 keer per week (3)
- 4-5 keer per week (4)
- meer dan 5 (5)

Q6 Heeft u ooit gehoord van dynamische draadloze oplaadtechnologie die wordt toegepast in uw lokale omgeving, waar elektrische voertuigen kunnen worden opgeladen tijdens het

- ○ Ja (1)
- ○ Nee (2)

Q7 Beoordeel alstublieft het niveau van invloed dat de volgende factoren hebben op uw perceptie op een schaal van 0 (geen invloed) tot 5 (sterke invloed).

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Hoe beïnvloedt de vermindering van de waarde van het onroerend goed in het naburige gebied uw beslissing om het project af te wijzen? (1)	○	○	○	○	○	○
Hoe beïnvloedt de bouwoverlast, zoals verkeersopstoppingen of mogelijke geluidsoverlast, uw beslissing om het project af te wijzen? (2)	○	○	○	○	○	○
Hoe beïnvloedt de reputatie van de projectontwikkelaar uw beslissing om het project te ondersteunen? (3)	○	○	○	○	○	○
Hoe beïnvloedt de openheid en duidelijkheid van de projectontwikkelaar uw beslissing om het project te ondersteunen? (4)	○	○	○	○	○	○
Hoe beïnvloedt visuele vervuiling uw beslissing om een project te steunen of af te wijzen? (5)	○	○	○	○	○	○
Hoe beïnvloedt de veiligheid en beveiliging van de technologie uw beslissing om het project te steunen of af te wijzen? (6)	○	○	○	○	○	○
Hoe beïnvloedt de productie van afval uw beslissing om het project te steunen of af te wijzen? (7)	○	○	○	○	○	○

Q11 Welke andere zaken zou u in overweging moeten nemen bij het vormen van uw mening over het ondersteunen van dynamische draadloze oplaadtechnologie voor openbaar vervoer in Nederland? Op een schaal van 1-5, hoe belangrijk acht u deze factoren?

____

End of Block: Default Question Block

8.2 Expert Survey

Start of Block: Default Question Block

Q1 Dynamic Wireless Charging:

This survey aims to delve deeper into the factors influencing the successful deployment of dynamic wireless charging technology for electric buses in the Netherlands, with a specific focus on improving community acceptance which is an approach to determines whether a new technology will be successfully implemented or not, as it affects the level of support and willingness of local residents to embrace the technology. This innovative technology allows electric buses to charge their batteries wirelessly while in motion through an inductive charging system installed beneath the road surface. In other words, this technology provides the electric buses with the high capacity to be charged without making any interruption in their ability to provide continues service to passengers. However, the successful implementation of this technology is directly related to the level of acceptance and support of the local community.. To evaluate the level of acceptance within a community towards a technology which in my study is dynamic wireless charging, various factors such as construction disturbance should be considered. Therefore, it is essential to understand the attitudes, beliefs, and opinions of the community towards this technology to identify any potential concerns or barriers that may hinder its adoption. This survey is the continuation of a public survey which targeted the factors which could directly affect the people acceptance towards the technology. In the previous public survey I identified seven direct causal relationships between specific components and community acceptance. Now, I seek your expertise to determine the causal relationships between the other components. In this survey, we are using a tool called Fuzzy Cognitive Maps (FCM) to understand how different factors influence community acceptance of dynamic wireless charging technology for electric buses. FCM helps us visualize and analyse the relationships between these factors. Achieving an accurate result from the FCM necessitate defining accurate values for the weights of the casual relationships for each and every connection and this is where this study seek your expert opinion. Think of the weight as the strength of the casual relationship between components. For example, let's say there is a causal relationship between Factor A and Factor B. We want to understand what is the strength of this relationship or in other words in what extend they are related and could affect each other. We can calculate this strength or correlation by giving it a weight. Finally, A higher weight means a stronger influence, while a lower weight means a weaker influence Your expert opinion in this domain will play a crucial role in providing accurate assessments and insights. Your valuable input will help inform policy decisions, technological advancements, and strategies aimed at accelerating the adoption of dynamic wireless charging for electric buses in the Netherlands.

Should you have any questions throughout the survey process or even after its completion, please feel free to contact me at any time.

Phone number: 0645525495
Email Address: ashkan.chavoushi@gmail.com

Q2 Consent Form:

Participation in this questionnaire is entirely voluntary, and you are free to discontinue at any point by simply closing your browser. Should you have any questions or concerns regarding the questionnaire, please feel free to reach out to me via email at a.chavoushiforooshani@student.utwente.nl. Rest assured, your privacy is of utmost importance. This questionnaire guarantees anonymity, ensuring that no personally identifiable information such as your name, email address, or phone number will be collected. Furthermore, individual responses will not be shared with peers or professors; only aggregated summaries and analyses will be utilized. Any published materials will also only consist of these summaries and analyses. Once the research is concluded, all individual data will be promptly deleted.

Q1 Are you willing to participate in this survey

- ○ Yes (1)
- ○ No (2)

Q2 What is your professional background/expertise

- ◯ Transportation/Urban Planning (1)
- ◯ Energy Management/Engineering (2)
- ◯ Environmental Sciences (3)
- ◯ Policy/Regulatory Affairs (4)
- ◯ Social Sciences/Humanities (5)
- ◯ Automation (6)
- ◯ Electric Vehicles (7)
- ◯ Energy Transition (8)
- ◯ Others (9)

Q3 What is your expert opinion regarding the impact of allocating increased funding to research and development of dynamic wireless charging, with the goal of enhancing its performance, minimizing its environmental impact, and promoting widespread adoption in the Netherlands? How do you believe this would affect the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
The level of seamless and trustworthy functioning that the technology can achieve (1)	○	○	○	○	○	○
The potential waste generated by replacing the necessary equipment for implementing dynamic wireless charging with the existing equipment of the current technology, such as overhead charging. (2)	○	○	○	○	○	○
Construction failure (Defects, faults, or malfunctions during construction that can compromise the timing of the project completion) (3)	○	○	○	○	○	○
The disruptions experienced by the local community as a result of construction activities (traffic congestion, noise pollution,...) (4)	○	○	○	○	○	○

Page Break

Q4 What is your expert opinion on the potential impact of media sources providing trustworthy information on the implementation of dynamic wireless charging? How do you think it could influence the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Increased allocation of funding towards research and development (1)	○	○	○	○	○	○
Enhancing the clarity, trustworthiness, and accessibility of information (2)	○	○	○	○	○	○
Involving reputable and well-known implementers who are trusted by the local community (3)	○	○	○	○	○	○
Increasing public awareness and promoting better understanding of the positive impacts of dynamic wireless charging in comparison to other alternatives (4)	○	○	○	○	○	○

Q5 What is your expert opinion on the potential impact of involving reputable implementers who are well-known within the community? How do you think it could influence the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (7)
Trust and credibility of the local community towards the potential benefits of implementing the project in their neighborhood (1)	○	○	○	○	○	○
Enhancing the clarity, trustworthiness, and accessibility of information (3)	○	○	○	○	○	○
The level of seamless and reliable functioning that the technology can achieve (4)	○	○	○	○	○	○

Q6 In your expert opinion, how do you perceive the influence of health and safety concerns of the local community regarding the installation and performance of the technology in their neighborhood on the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
The degree to which media provides balanced coverage of dynamic wireless charging information, presenting both positive and negative aspects in an equitable manner (1)	○	○	○	○	○	○
Increased allocation of funding towards research and development (2)	○	○	○	○	○	○
Decrease in property prices in the vicinity of the installed dynamic wireless charging (3)	○	○	○	○	○	○
Trust and credibility of the local community towards the potential benefits of implementing the project in their neighborhood (4)	○	○	○	○	○	○

Q7 What is your expert opinion on the potential influence of the reliable and trustworthy functioning of dynamic wireless charging technology on the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Construction failure (Defects, faults, or malfunctions during construction that can compromise the timing of the project completion) (1)	○	○	○	○	○	○
Waste production (2)	○	○	○	○	○	○

Q8 In your expert opinion, how do you perceive the influence of construction failure on the following factors

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Waste production (1)	○	○	○	○	○	○
Health and safety concerns of the local community (2)	○	○	○	○	○	○

Q9 In your expert opinion, how do you perceive the influence of the clarity, trustworthiness, and accessibility of information on the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Increasing public awareness and promoting better understanding of the positive impacts of dynamic wireless charging in comparison to other alternatives (1)	o	o	o	o	o	o
Trust and credibility of the public regarding the beneficiary of the project in their neighborhood (2)	o	o	o	o	o	o
The degree to which media provides balanced coverage of dynamic wireless charging information, presenting both positive and negative aspects in an equitable manner (3)	o	o	o	o	o	o

Q10 In your expert opinion, how do you perceive the impact of Involving reputable and well-known implementers who are trusted by the local community, on the following factors?

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
The clarity, trustworthiness, and accessibility of information (1)	○	○	○	○	○	○
Trust and credibility of the local community towards the potential benefits of implementing the project in their neighborhood (2)	○	○	○	○	○	○
The level of seamless and reliable functioning that the technology can achieve (3)	○	○	○	○	○	○

Q11 In your expert opinion, how do you perceive the impact of trust and credibility of the local community towards the potential benefits of implementing the project in their neighborhood on the following factor:

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
the concern that people would have about the safety of technology (1)	○	○	○	○	○	○

Q12 In your expert opinion, how do you perceive the influence of public awareness on the following factors

Note: Respondents may have preconceived notions about the negative aesthetic effects associated with charging infrastructure. However, it is important to highlight that dynamic wireless charging systems are designed to minimize aesthetic destruction in comparison to traditional charging methods. Unlike bulky charging stations and overhead wires, dynamic wireless charging infrastructure is embedded into the road, blending seamlessly with the surroundings. This design approach ensures a more harmonious integration of the technology, reducing visual clutter and preserving the aesthetic appeal of the neighbourhood

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)
Correcting the misconceptions of the local community regarding the charging infrastructure and addressing concerns about potential visual pollution they may perceive. (1)	○	○	○	○	○	○
Concerns expressed by the local community regarding the safety of the projects (2)	○	○	○	○	○	○

Q17 "Based on your expertise, are there any additional factors or variables that you consider important and that have been overlooked in the survey? Please provide details regarding these factors and their potential causal relationships with the existing concepts in the fuzzy cognitive map."