

A cleaner public space through robots

An exploratory research into points of attention for the successful introduction of a cleaning robot in the Amsterdam Schoon department

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A CLEANER PUBLIC SPACE THROUGH ROBOTS

AN EXPLORATORY RESEARCH INTO THE INTRODUCTION OF A CLEANING ROBOT IN THE
AMSTERDAM SCHOON DEPARTMENT

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PREFACE

Dear reader,

This report is the final result of the MSc program Metropolitan, Analysis, Design and Engineering. The writing of this report was an interesting, engaging and fun process that widened my view and taught me a lot. I enjoyed the 5 months that I worked on this thesis. This thesis is however not the result of solely individual work by myself. Many people contributed in many ways to the end result.

Firstly, I want to thank my supervisors, Jered Vroon and Marco Rozendaal from respectively the Sustainable Design Engineering department and the Human Centred Design department of the Industrial Design faculty of the TU Delft. Their insights, feedback and interesting ideas have taken the research to a higher level. The many weekly meetings were useful and provided me with constructive feedback to improve my research.

Involving the department Schoon employees would not be possible without the help of representatives from the Amsterdam municipality. I would like to thank Abdel Setta and Mario Weij for their help in finding the right contacts within the Schoon department and for providing me with internal documents and guidelines.

The meetings with the research collective of the TU Delft, AMS Institute and the Municipality of Amsterdam provided me with useful insights, interesting starting points for this research and critical reflections on the preliminary results. I want to thank Thijs Turèl from the AMS Institute and Mario Weij, Antina Snijder, Theo Veltman and Leo Huizinga of the Municipality of Amsterdam and the Schoon department for their input during these meetings.

I want to especially thank Ruben van Thal, my contact at the Schoon department Centrum yard. As a team manager, Ruben arranged everything needed for me to join the Schoon employees during the walk-along days. He also provided me with very practical information about the organisation and the activities conducted by the department. He put me in touch with the right persons during my walk-along days and arranged all materials I needed to get out on the street.

I also want to thank the many Schoon department employees that I spoke to. They provided me with insights, gave me useful tips and provided me with feedback on preliminary results. The way how I was greeted when I entered the yard during the mornings made me feel like a full-fledged colleague. I had many inspiring conversations with very diverse persons that made me enjoy every day at the Schoon department.

I was however not the only student during the walk-along days. Together with Claire Schuurman, I joined numerous shifts. We discussed the outcomes of the interviews, critically analysed the observations and discussed the general topics of robot introduction. Sharing literature and findings, Claire contributed to improving the quality of this research.

Last but not least, I want to thank my family for supporting me in my search for a research topic and for their support during the final research. They kept me motivated and provided me with insights that helped me in continuously improving my work.

SUMMARY

The Dutch metropolis of Amsterdam deals with a waste problem. Both the inhabitants and tourists in Amsterdam experience nuisance from litter. The future growth of Amsterdam will only amplify this problem. To address this, the municipality needs to increase the productivity of the Schoon department, the department tasked with keeping the public space of Amsterdam clean. Therefore, the responsible and effective introduction of a cleaning robot is researched. During a series of walk-along days, interviews, experiments and observations, I identified multiple themes, important for the job satisfaction of the Schoon employees. This knowledge, combined with observed knowledge on practical challenges caused by the design of the Amsterdam public space on the cleaning activities, translates into a number of design qualities for a future cleaning robot. The results of this research seem to indicate that this cleaning robot could best be deployed during the shifts tasked with brooming the streets and emptying the trash bins, the Veegshift and Vuilnisbakkenshift respectively. During those shifts it can potentially assist in cleaning the street using the RAVO mechanical streetsweeper and emptying trash bins respectively. Assisting during those two tasks frees up manpower that can be utilized to increase the productivity of those shifts. The findings further highlight that this future robot should not compromise the freedom experienced by the Schoon employees in how they carry out their work. Nor should this robot replace the Schoon employees, as this would remove the human interaction with bystanders, an aspect of the work greatly appreciated by the employees. The loss of human interaction might also lead to a more monotonous situation, which is the opposite of the variety enjoyed by the Schoon employees during their work. The future robot should also be user friendly, allowing everyone in the department to operate the robot. Furthermore, the robot must be able to communicate its status, intentions and possible help requests and offers to its Schoon colleagues. Overall, the introduction of a cleaning robot can improve the cleanliness of the city of Amsterdam when the design incorporates the themes important for the job satisfaction of the Schoon employees, aims at an efficient human-robot collaboration through clear communication and combines the right type of autonomy with the challenging Amsterdam environment.

Amsterdam – Public Space – Waste – Human Robot Interaction

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1. INTRODUCTION

Amsterdam: the bustling capital of the Netherlands. With hundreds of thousands of inhabitants and millions of tourists using its public spaces, the city faces a huge challenge. How is the city kept clean and liveable?

Despite the efforts of more than 500 employees of the Schoon department that go out daily to keep the streets, parks, bridges and canals clean, the city is not as clean as its inhabitants would like it to be. Research from the CBS (2020) on littering shows that 88.5% of the inhabitants of the municipality of Amsterdam experiences littering in its neighbourhood. As many as 30.4% consider litter as a huge inconvenience.

This has led the municipality to consider; could robots help make the city cleaner more efficiently? Developments in robotics and automatization allow dangerous, dull, and delicate tasks to shift from man to machine. The question is however, can the introduction of a robot in the Schoon department of Amsterdam offer a solution for the challenge of keeping Amsterdam clean?

In the cleaning industry, indoor cleaning robots have already been deployed for years. Exploratory research by Prassler et al. (2000) already yielded a list of 30 different robots tasked with cleaning that were operating more than 20 years ago. These robots differed from being tasked with cleaning pools and vacuum cleaning houses to industrial robots cleaning factories. These indoor cleaning robots evolved to ingenious robots filled with sensors which can even change shape when needed (Prabakaran et al., 2018). This shows that indoor cleaning robots turned into advanced machines.

Outdoor cleaning robots are however not as smart and efficient as their indoor counterparts. Many providers of cleaning robots offer their indoor robots also to work fully autonomous. This is however not the case for robots that have to operate in an outdoor environment. Where indoor robots are already for purchase for the last 20 years, outdoor robots are still in their infancy. This is caused by the nature of working outdoors: such robots should be robust, should be able to operate in less controlled environments and should be able to deal with different types of weather conditions. An indoor robot does not have to deal with such challenges.

The municipality of Amsterdam is tasked with keeping the outdoor public spaces clean. This task is the responsibility of the Schoon department of the municipality. To increase the efficiency of the Schoon department, the municipality wants to explore how outdoor cleaning robots could assist the Schoon department employees in their work. There are however many challenges connected to robot deployment in public spaces: how should a robot behave in a public space filled with humans that exhibit unexpected behaviour, what tasks should and could it conduct, how robust or resilient should it be and how should it be operated? Due to the wide variety of types of robots that are available, the many challenges of robot deployment in public spaces and the many different human co-workers the robots will work alongside, an exploratory research approach is needed into the wishes and needs of the cleaning department of the municipality.

The introduction of robots could contribute to an improvement of the circularity of Amsterdam's waste streams. Increased garbage collection by the Schoon department means less litter to roam the streets. An increased productivity of the Schoon department means that trash is being collected more often and in higher volumes for further processing. An important question that has to be researched is: how to responsibly introduce such a robot into the Schoon department and the Amsterdam public space?

Thus, before cleaning robots can be introduced into the "Schoon" department of the municipality of Amsterdam, more knowledge should be collected on the challenges of operating a robot in a complex and unpredictable outdoor environment where it works alongside humans.

Earlier research by the municipality on the feasibility of building an autonomous cleaning robot focussed primarily on the technical feasibility. The challenge of incorporating a robot into teams of human cleaners has not been researched yet. For the efficiency of the Schoon department to increase, it is important that the efficiency of the human cleaners does not decrease. It is therefore important to take into account the views and opinions of the people that will have to work alongside those robots. In order to provide the municipality with insights into the above mentioned challenges, I will conduct exploratory research to provide the municipality with some of the conditions and boundaries needed for a successful employment of a robot for cleaning tasks.

Making use of the operationalization of job satisfaction, the Human-Agent Collaboration framework by Cila (2022) and an operationalization of challenges for robot deployment in public spaces, the goal of this exploratory research is to provide the municipality with a set of points of attention related to the efficient introduction of a cleaning robot in the Schoon department. This goal is translated to the following main research question:

- *What are the requirements placed on a cleaning robot by its embedding in the Amsterdam Schoon department?*

To answer this main research question, I divided the research further into sub research questions. Those three sub research questions follow three research directions.

The three different research directions follow from the three different relations influenced by the introduction of a cleaning robot, namely:

1. The relation between the Schoon employee and the Schoon department activities
2. The new relation between the Schoon employee and the robot
3. The relation between the Robot and the Schoon department activities

The first research direction aims at identifying factors influencing the job satisfaction of the Schoon employees. The first sub research question is therefore:

- *What are aspects of the activities conducted by the Schoon Department that contribute to the job satisfaction of the Schoon employees?*

The second research direction aims at identifying effective ways of human-robot collaboration. The second sub research question is therefore:

- *How should the collaboration between the Schoon department employee and the cleaning robot be shaped?*

The last research direction is a more practical direction aimed at identifying actual tasks for a cleaning robot in the Schoon department. This direction follows from the practical challenges connected to robot deployment in public spaces. The last sub research question is:

- *During which task(s) executed by the Schoon department employees can a cleaning robot support the employees?*

In Table 1, an overview of the research is provided which shows the outcomes per chapter.

Research direction and sub research question	Theoretical Background	Context	Results
Job Satisfaction <i>What are aspects of the activities conducted by the Schoon Department that contribute to the job satisfaction of the Schoon employees?</i>	Job Satisfaction		Job Satisfaction Core Themes
Collaboration <i>How should the collaboration between the Schoon department employee and the cleaning robot be shaped?</i>	Human-Robot Collaboration		Collaboration Methods
Tasks <i>During which task(s) executed by the Schoon department employees can a cleaning robot support the employees?</i>	Challenges for robots in Public Spaces	Schoon Department methods	Practicalities

Table 1 Research overview with outcomes per chapter

For the future human-robot collaboration, I will first introduce job satisfaction, design considerations for human-robot collaboration and challenges for robot deployment in public spaces in Chapter 2. In the next chapter, Chapter 3, I link the theoretical background to the Amsterdam context. Here, the methods of the Schoon department and the municipality are introduced. In Chapter 4, I introduce the methods used during this research. In Chapter 5, named Results, I introduce the core themes, ways of collaboration and the practicalities connected to robot deployment. These all follow from interview questions, observations and experiments based on the context and theoretical framework. I then link the outcomes of the walk-along days to the design considerations from the framework discussed in the Theoretical Background in Chapter 6, leading to a number of points of attention important for designing the future cleaning robot. In the same chapter, the operationalisation of the design considerations is visualised through a series of fictionalized stories. In Chapter 7, Discussion, I critically assess the research I conducted on applicability and reliability. In the final chapter, Chapter 8, I list the requirements of a cleaning robot for it to be efficiently introduced into the Schoon department.

2. THEORETICAL BACKGROUND

The aim of the introduction of a robot in the Schoon department is to improve the cleanliness of Amsterdam. A robot will contribute to this by improving the productivity of the Schoon department. It is therefore important to know what factors should be taken into account when designing a future cleaning robot. For this reason, in this chapter I will first discuss the general topics of job satisfaction, human-robot collaboration and challenges of robot usage in public spaces before diving deeper into the Amsterdam case.

Such knowledge would ground the further research, and enable me to give more directly relevant and applicable advice about the introduction of cleaning robots in the Schoon department. This research is structured around three main directions, namely job satisfaction, the interaction between the robot and the humans around it and the potential tasks during which a cleaning robot can assist the employees.

The potential tasks that a robot should execute follow from research on the city guidelines, general challenges of introducing robots in public spaces and the view of the municipality on the department Schoon activities. Job satisfaction should also be taken into account when making recommendations for future tasks for a cleaning robot as it influences the acceptance and thus the efficiency of a future robot.

Job satisfaction is however a very broad and subjective term that needs to be operationalized. How to exactly define job satisfaction? Besides operationalizing job satisfaction, human-robot collaboration should also be operationalized. Because the goal of this research is to provide the municipality with the qualities for a cleaning robot that collaborates with the Schoon department, this operationalization should be focussed on human-robot collaboration design. Last but not least, general challenges for the introduction of robots in public spaces are introduced which offer practical boundaries for this research.

By analysing existing literature on the topics of job satisfaction, robot deployment in public spaces, productivity and human-robot collaboration, the above mentioned three directions are operationalized.

Currently, there are no robots employed by the Schoon department. This causes that research can not be conducted on the human-robot collaboration in the Amsterdam case. There are however many extensive studies on human-robot collaboration elsewhere. Literature on human-robot collaboration will therefore be used to conduct research about the future human-robot collaboration. Besides literature on human-robot collaboration, literature on job satisfaction will also be used to create a more objective framework in which the subjective topic of job satisfaction will be operationalised.

2.1 JOB HAPPINESS, JOB SATISFACTION, AND PSYCHOLOGICAL WELL-BEING

Due to the fact that the city of Amsterdam is growing and experiences budget cuts on the Schoon department, it is hardly possible for the Schoon department to keep the city as clean as prescribed in the policy dictated by the Municipality. This causes complaints and nuisance by waste in public spaces in Amsterdam. One of the reasons of introducing a robot into the Schoon department is to increase the overall productivity of the department. By introducing a robot, manpower can be freed from certain tasks and be used elsewhere, increasing the overall productivity.

The introduction of a cleaning robot will only improve the overall productivity when its introduction does not lower the productivity of the humans it will complement. This means that to achieve an increase in productivity, the productivity of the human colleagues of the robot should not decrease.

For this research, it is important to operationalize how introducing a robot can influence productivity. As research by Böckerman & Ilmakunnas (2012) showed, increasing job satisfaction can lead to an increase of productivity. Not only job satisfaction influences productivity, also general psychological well-being. As stated by Wright & Cropanzan (2000), “happy workers often have higher performance but that “happiness” should be operationalized as psychological well-being”(P.91).

For the Amsterdam case, this thus means that introducing a robot should not decrease the job satisfaction of the Schoon department employees and should not negatively influence their psychological well-being.

Locke (1969), in his research on job satisfaction, explained that job satisfaction consists of the following three aspects: one’s perception of an aspect of a job, one’s value standard and one’s judgement on the relationship between these perceptions and values. This means that job satisfaction is the result of an interaction between one’s perception of its tasks, one’s expectations about that task and the difference between those two.

Besides job satisfaction, the psychological well-being of the workers also influence the productivity. When one is not only satisfied by the work he or she executes but also happy in doing so, this influences the productivity in a positive way (Wright & Cropanzano, 2000).

Research by Meissner et al. (2020) showed that when assembly workers were interviewed about the possible introduction of robots at their workplace, many workers expressed fear of being replaced by a robot. Another fear expressed by these workers was an increased monotony of their job due to the robot taking over a number of tasks reducing the tasks available to the workers. Those two fears led to an increased feeling of anxiety. This increase of anxiety influences the psychological well-being which can lead to a decrease in job satisfaction and productivity. This same feeling of anxiety could be felt by the employees of the Schoon department when their highly rated tasks are taken over by a robot. The introduction of a robot that should increase the overall productivity should thus not negatively influence the well-being of the Schoon department employees.

Besides the fear of being replaced and an increase of monotony during their work, robots can also decrease the self-determination of workers (Mock et al., 2019). When robots assist humans in certain tasks, this can lead to the feeling that he or she is subject to the robot. This can lead to lower acceptance and even inattention.

This means that attention should be paid to what factors of their job satisfy the employees and what gives them a good feeling. Knowledge should be gathered on what aspects of their tasks and the organisation itself positively influence their well-being.

2.2 HUMAN-ROBOT COLLABORATION

For every application a robot is designed for, the robot itself and the interaction with humans will be unique due to the environment it will be active in and the humans it will encounter.

This interaction between humans and robots can be divided into three different types: human-robot coexistence, human-robot cooperation and human-robot collaboration. Human-robot coexistence is defined as a situation where humans and robots work in the same location at the same time (Schmidtler et al., 2015). Human-robot cooperation can be described as a human and a robot working at the same place during the same time with the same goal. Human-robot collaboration means that the human and the robot work at the same place at the same time in order to achieve their common goal and are in physical contact with each other. In the Amsterdam case, the robot will physically support the Schoon employee in its activities, thus working towards the same common goal in the same place at the same time. This makes that for the Amsterdam case, human and robots will cooperate.

In her research on human-agent collaboration, Cila (2022) analyses qualities of human-agent collaboration that are useful for designers that want to create pleasant human-agent collaboration. The framework by Cila (2022) is based on the Shared Cooperative Activity framework by Bratman (1992). Bratman divides a shared cooperative activity into three feature characteristics, namely mutual responsiveness, commitment to the joint activity and commitment to mutual support. In the framework by Cila, the three feature characteristics by Bratman are split into 7 collaboration qualities. These 7 collaboration qualities are then further specified for human-agent collaboration leading to 11 design considerations which are shown in Figure 1.

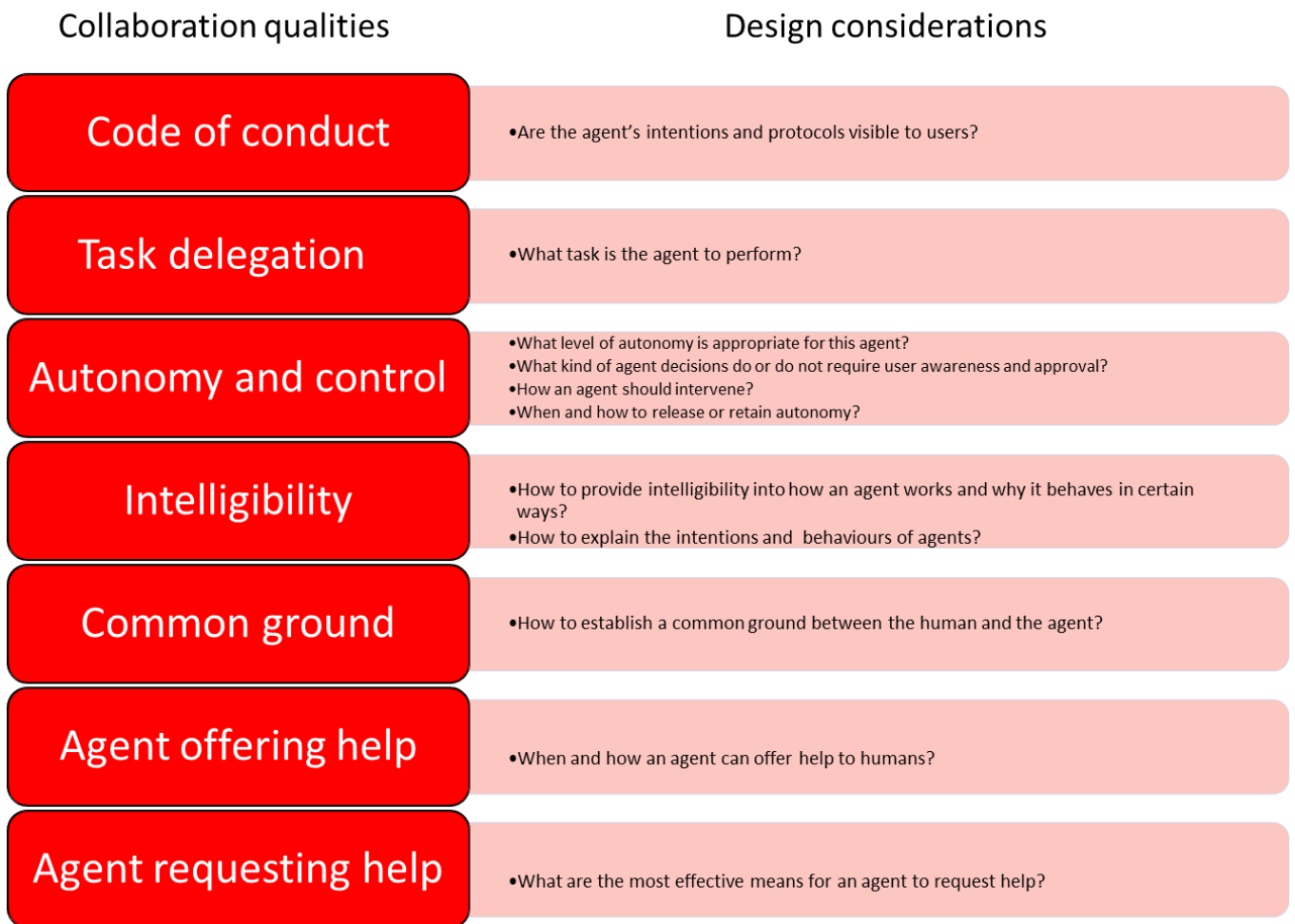


Figure 1 Human-Agent collaboration design considerations and collaboration qualities (Adapted from Cila, 2022)

In order to design the collaboration and interaction between humans and a robot, it is important to define what task the robot has to execute. Therefore, the first design consideration that was used is: *What task is the agent to perform?* Answering this question provides the municipality with knowledge on the potential tasks a robot can perform. It also sheds a light on the future employment of the robots: as a supporting robot during certain tasks or as a substitution of an employee with a very specific task.

After having defined what tasks a robot can execute, it is important to determine whether the robot does this fully autonomous or with heavy influence of humans. Answering this second question helps the municipality and the Schoon department employees in defining how a robot should perform its tasks. In the paper by Beer (2014) on robot autonomy during human-robot interaction, she clearly shows that a robot's autonomy is based on whether the planning, acting, and sensing is executed by the robot itself or by its human operator. Applying the design consideration *What level of autonomy is appropriate for this agent?* in the Amsterdam case will lead to insights into what specific parts of a task the municipality and the department Schoon employees want a robot to conduct on its own, and what parts of the task the human operator should conduct.

This division in autonomy is however not fixed. Robots and their behaviour can be designed to operate fully or partly autonomous and offer the operator the ability to change the level of autonomy. The users in the vicinity of the robot can also be provided with the ability to override the autonomous decisions made by the robot (Cila, 2022). The third design consideration I analysed for the Amsterdam case aimed at providing insights on how different forms of autonomy could be controlled during the operation of a robot. This design consideration is formulated as: *When or how to release or retain autonomy?*

It is important for the efficiency of both the robot and the cleaner that they know the task division of each other and can react on each other. In the Amsterdam case, the robot will cooperate with the Schoon department employees to keep the city clean. This means that the robot might operate next to those employees. The collaboration should be based on a situation in which the human and the robot can clearly sense each other's intentions. This is in line with the fourth design consideration of Cila (2022): *How to establish a common ground between the human and the agent?*

Of great importance in collaboration and interaction between robots and humans is the way they support each other. It is important to obtain knowledge on how humans should interact with robots and how the robots should interact with the humans they work with. In this case, interaction also deals with offering help and requesting help. Cila (2022) translated this challenge into two design considerations. The first one, *When and how an agent can offer help to humans?*, focusses on how the robot can express his willingness to help the human and how the robot can sense that a human needs help. The second design consideration related to this challenge is: *What are the most effective means for an agent to request help?* This second question deals with the challenge of the robot interacting with the humans in its vicinity when it needs assistance.

The Code of Conduct and Intelligibility collaboration qualities from the framework by Cila (2022) are the last two collaboration qualities. These qualities deal with more in-depth questions about moral responsibilities and transparency into algorithms and data. In this exploratory phase of the research into a future cleaning robot, such challenges are less relevant. Therefore, those two collaboration qualities with the associated design considerations are not accounted for during this research. The six design considerations that are utilized in this research are:

- What task is the agent to perform?
- What level of autonomy is appropriate for this agent?
- When or how to release or retain autonomy?
- How to establish a common ground between the human and the agent?
- When and how an agent can offer help to humans?
- What are the most effective means for an agent to request help?

2.3 CHALLENGES FOR ROBOTS IN PUBLIC SPACES

Due to the unpredictability of human behaviour and the variability in possible situations, there will still be situations in which a robot in a public space does not behave optimally due to the shortcomings in the programming. This is a common flaw for robots in general, which is mitigated by employing robots in controlled environments where the most likely events that the robot can encounter are known. In public spaces however, this is not the case.

Public spaces are environments that are freely accessible by the public but not necessarily owned by the public (VROM, 2009). The bodies that maintain these environments are often government agencies, varying from municipalities to provinces and the state itself. In the Amsterdam case, the public space is mostly maintained by the Schoon department with only some parks being maintained by private contractors working for the Schoon department. In these public spaces, citizens and tourists can up to a certain degree freely go wherever they want causing them to portray unpredictable behaviour.

One of the challenges of deploying autonomous robots in public spaces is therefore how to react on the unpredictable behaviour of the other actors in this public space (Campbell et al., 2010). Where humans learn over the years how to act and predict behaviour of other participants in traffic and public spaces, robots mostly lack this ability. Machine learning, where the autonomous object learns how to act and react based on data, can be a solution for this challenge (Fujiyoshi et al., 2019). Using pictures, an autonomous object can learn how to react and act in certain situations. This technique could be part of the solution to the challenge of unpredictable behaviour in public spaces.

Two important topics related to the feasibility of robot deployment in public spaces are thus the complexity of the tasks conducted and the predictability of the situation in which the robot is deployed. A task is defined as complex when it requires a large number of activities to be executed before the task is completed. The more complex a task is, the more actions the robot has to execute and the more potential there is for the robot to malfunction.

The predictability of the situation is related to the expected and unexpected interactions that will happen during this situation. The predictability depends on the type of activities that have to be conducted and the amount and type of actors that influence the activities. A predictable situation is a situation in which the activities to perform are known and in which the influence of bystanders is limited.

Besides the unpredictability and complexity of the public space, robustness is also an important challenge of operating in public space. Most of the public space in Amsterdam is outdoors. This means that the robot should be able to operate in all types of weather. Depending on the task of the robot, the waste that it encounters varies between soft paper and plastic to metals, glass and even liquids. The robot should be able to process all those different types of trash. The trash it collects and the climate it operates in are not the only factors influencing the robustness of the design. Human-robot interaction can also lead to damage. Robots are innovative devices that are not widely operated in public spaces and can therefore be viewed as interesting and strange objects. Those objects can become the aim of vandalism or can be damaged when people do not treat them properly (Złotowski et al., 2015).

Challenges concerning unpredictability of public space, the state of autonomous behaviour and robustness have a big influence on the successful implementation of robots. It is therefore of great importance that during this research, I will reflect upon the possibilities and constraints connected to employing robots in public space when designing prototypes and drawing up guidelines.

2.4 SUMMARY

To successfully introduce a cleaning robot in the Schoon department, job satisfaction, human-robot collaboration design and the challenges of operating robots in public spaces should be taken into account.

To improve the productivity of the department, the introduction of a robot must not negatively influence the job satisfaction that employees experience during their work. Besides job satisfaction, the challenges of the deployment of robots in public spaces should also be taken into account. A robot must be robust to withstand external influences during work in public spaces, must be able to deal with the unpredictable events that take place in public spaces and should have the appropriate form of autonomy.

After securing the job satisfaction of the Schoon employees, the interaction between the robot and humans should be designed. This design is guided by the design considerations from the human-agent interaction by Cila (2022).

3. CONTEXT

This research does not deal with introducing a cleaning robot in a controlled environment that can be closed off when cleaning activities take place. The robot that I conduct this research for will operate in the busy public space of the city of Amsterdam where it will encounter countless types of obstacles.

The framework introduced by Cila (2022) and the operationalization of job-happiness are applicable to the introduction of robots in any workspace where it can encounter humans. The introduction of a cleaning robot in the Schoon department is however much more complicated. The Schoon department is tasked with cleaning the public space of Amsterdam, a busy and growing city with more than 900.000 citizens. The centrum area of the city, the area with most of the touristic hotspots and events, is the area that scores the lowest on the quality of the public space (Gemeente Amsterdam, 2017).

The Schoon department conduct her activities in the narrow streets and along the canals of the Amsterdam city centre among the many citizens and tourists roaming the streets. Despite the municipalities efforts to create a car free city centre, the Schoon department still has to work in the busy and unpredictable Amsterdam traffic.

Besides their daily and weekly tasks, the Schoon department is also tasked with cleaning the city during events and peak hours. This causes that the activities of the Schoon department do not always fit a daily or weekly schedule.

Thus, to get a better insight into how a cleaning robot can be introduced into the Schoon department, it is important to better understand how the Schoon department deals with the above mentioned challenges of cleaning a busy metropolis. To get more knowledge on how the Schoon department works, I studied the guidelines created by the municipality and joined the Schoon department during their work.

3.1 CLEANLINESS LEVELS

When people are asked what they define as a clean street, you will get different answers as cleanliness and beauty are both subjective terms. To make sure that the cleanliness of the public space is the same in every neighbourhood in Amsterdam, objective guidelines on how to qualify the cleanliness of a neighbourhood were created.

The litter that is found on the Amsterdam streets can be divided into three categories, namely fine litter, coarse litter and bulky waste. Fine litter is characterized by its size: larger than 1 cm but smaller than 10 cm. Coarse litter is defined as litter with a size of more than 10 cm up to trash that fits a trash bin. Bulky waste is waste that does not fit in a household trash bin or public underground waste bin (Weij, 2021).

The cleanliness goals of the municipality are based on the cleanliness levels drawn up by the CROW and Stichting Nederland Schoon. The levels, increasing from D to A+, stand respectively for very dirty to very clean. The definition of an area with the A+ label is an area of 100 square meters in which no coarse litter is found. Besides coarse litter, an A+ area also shows no fine litter in a 1 square meter area. For D labelled areas, more than 25 pieces of coarse litter are found within 100 square meters and more than 25 pieces of fine litter are found within 1 square meter (Rijkswaterstaat, 2015).

The ambition of the municipality of Amsterdam is to keep the public space of the municipality on Well Cared level. In Amsterdam policy, this means that the streets look well cared for, “Verzorgd” in dutch. This translates into level B from the CROW terminology. Level B means that there are not more than 10 pieces of coarse litter within 100 square meters and when there are no more than 10 pieces of fine litter within 1 square meter. A whole neighbourhood receives the Verzorgd title when more than 90% of the area is labelled as A+, A or B (Gemeente Amsterdam, 2017).

This same report showed that in the city centre of Amsterdam, the overall level of cleanliness is C, which means sober. The city centre is the area with the largest share of D labelled streets. Overall, the city centre is the lowest scoring area when looking at the cleanliness of the streets. This is the reason why this research focusses on the city centre area called Centrum.

Working with the cleanliness levels, formed to analyse the public space cleanliness in an objective matter, still involves the subjective view of the cleaners themselves. It is up to the Schoon employee working on his or her shift to determine whether the cleanliness levels are met. This subjectivity can pose challenges when this decision taking has to be transferred to a robot.

3.2 TASKS

To keep the city clean according to the pre described cleanliness quality levels, the Schoon department conducts a wide variety of activities. Making use of road sweepers, garbage trucks, pressure washers, leaf blowers and branch brooms, the city is kept clean.

The three most common types of shifts are the so called broom shift, the trash bin shift and the waste picker shift, respectively the “Veegshift”, “Vuilnisbakkenshift” and the “Prikshift” in Dutch. In addition to these regular shifts, there is also the so called “Tenantshift”. Below, I will provide a short summary of the activities conducted during these shifts.

Veegshift - The Veegshift, which translates into brooming shift, is tasked with cleaning the streets. At the beginning of such shift, a list of streets is handed to the foreman of the shift, as seen in Figure 2. This list contains all streets that have to be cleaned and lists which streets are priority streets. The Veegshift consists ideally of 4 to 5 people based on their availability, namely one foreman and 3 to 4 colleagues that work alongside him or her.

Woensdag Route's van XXXX.			
Prio Route vanaf 06:30 T/M 15:00 uur			
De Ruijterkade achter Centraal Station			
Stationsplein voor Centraal station, Tram Westzijde en tram Oostzijde.			
Prinse Hendrikkade tussen Damrak en Martelaarsgracht			
Prinse Hendrikkade tussen Damrak Geldersekeade.			
Koffie Pauze van 08:45 tot 09:00 uur.			
Zeedijk.	Oudezijds kolk.	Stormsteeg.	Monnikenstraat.
Nieuwmarkt .	Bloedstraat.	Barndesteeg.	
Koestraat.	Bethanienstraat.		
Bethanienwarsstraat.	Boerensteeg.		
Nieuwe Hoogstraat.			
Warmoesstraat	Oude Hoogstraat.		
Oudezijds Achterburgwal van Oude Hoogstraat tot Stormsteeg.			
Korte Niezel			
Oudezijds Achterburgwal van Spooksteeg tot Oude doelenstraat.			
Oude Doelenstraat			
Oudezijds Voorburgwal van Oude doelenstraat tot Vredenburgsteeg			
Stoofsteeg.	Oudekennissteeg	Kreupelsteeg.	
Oudezijds Voorburgwal van Vredenburgsteeg			
OZ. Achterburgwal van Grimburgwal tot Oude Hoogstraat.			
OZ. Achterburgwal van Damstraat tot Grimburgwal.			
Alle stegen tussen de OZ. Achterburgwal en OZ. Voorburgwal			
Geldersekeade van Prins Hendrikkade tot Nieuwmarkt.			
Kloveniersburgwal van Nieuwmarkt tot Oude Hoogstraat.			
Nieuwe Hoogstraat			
Oude Hoogstraat			
Oude Doelenstraat.			
Damstraat			
Eet Pauze van 11:30 tot 12:00 uur			
Hoogtekadijk			
Kruithuisstraat			
Laagtekadijk			
Entrepotdok			
Entrepotdok sluis			
Tussen Kadijken			
Kadijkplein			
Nieuwevaart			
Matrozenhof			

Figure 2 Document showing work area of a Veegshift (Thal, 2021)

During the Veegshift, the Schoon department employees sweep all the trash onto the roads where one shift member in a RAVO road sweeper collects the trash. Very dirty roads and priority roads might also be appointed a special vehicle with pressure washers to clean the streets with water, the so called “spoelwagen”. This shift focusses on all types of trash except for bulky trash.

Vuilnisbakkenshift - During the Vuilnisbakkenshift, a department Schoon employee is tasked with emptying the city’s trash bins. An employee, employed with a mini dump truck, receives a list with roads on which trash bins are located that he or she is tasked with emptying and refilling, seen in Figure 3. During this shift, the employee is also tasked with cleaning the vicinity of the trash bin. The employee is referred to as the Neighbourhood Caretaker, as it is his or her task to keep the trash bins and the vicinity of these bins clean during the whole day in his or her neighbourhood.

Wijk XXX		Afvalbakken/prikken	
Route van 09:00 tot 17:30		2021	
Marine Terrein / Marine kazern Kattenburgerstraat Wittenburgergracht Grote Wittenburgerstraat	Oostenburgergracht Czaar Peterstraat Cruquiuskade Zeeburgerstraat bij molen	Jacob Bontiusplaats Isaac Titsinghade Conradstraat Eerste Coehoornstraat Cruquiusstraat Eerste Leeghwaterstraat Tweede Leeghwaterstraat Oostenburgervoorstraat Boulevardpad Compagniestraat Admiraliteitstraat Oostenburgerpark Touwbaan Nieuwe Oostenburgerdwasstraat Nieuwe Oostenburgerstraat Touwbaanpark Kleine Wittenburgerstraat Parelstraat Waaigat Poolstraat Tweede Wittenburgerdwstraat Jacob Burggraafstraat Fortuinstraat Windroosplein Windrooskade	Lijndenstraat Frans de Wollantstraat Blankenstraat Tweede Coehoornstraat Kraijenhoffstraat Funenpark Keerwal derde Wittenburgerdwstraat Jan Witheijnstraat Bootstraat Wittenburgerkade Ravenstraat Kattenburgergracht Kattenburgerplein Nieuwe-Hoofdhof Prins Hendrikade trapjes Bijtjespad Kattenburgerkruisstraat Kattenburgerhof Marinierskade Kattenburgerkade Ravenwerf Leeuwenwerf Olifantswerf Dijkgracht
Werkzaamheden: * Afvalbakken ledigen en de omgeving ervan goed schoon houden: eventuele rommel rond de bak is jouw verantwoording! * De omgeving van (ondergrondse) glas- en papierbakken schoon houden * Ondersteuning neem open zakken en losse rommel altijd mee!			



Figure 3 Front and back side of the document listing the streets of the work area with the related map of a Vuilnisbakkenshift route (Thal, 2021)

Prikshift - During the Prikshift, employees are tasked with maintaining the streets that are already cleaned by the Veegshifts or that are not covered daily. During these shifts, Schoon employees are equipped with waste pickers and are tasked with collecting litter.

The Veegshifts are the shifts that start early in the morning. Beginning 6:30, the Veegshifts start their activities prior to the city becoming too busy to properly do their work. Another benefit of starting early in the morning is that citizens and tourists enter a clean city when they start their day. Alongside the Veegshifts, the Vuilnisbakkenshifts conduct their activities beginning at 9 am.

The Prikshifts follow the Veegshifts later on the day. They maintain the public space by collecting litter that is dumped in the public space in between the Veegshifts and operate in less busy parts of the city centre for which it is not efficient to employ a whole Veegshift crew. The Prikshift is also tasked with removing trash from places that are less accessible for the Veegshifts, namely along rail tracks, in parks and in busy streets.

Tenantshift - For keeping the high priority areas and touristic hotspots as clean as possible, the Tenantshift was created. For the final part of the day of a Schoon employee, he or she can be appointed to a tenant team. This team consists of 1 or 2 employees who are equipped with a street sweeper. This tenant shift will return during the afternoon to the high priority areas that were covered during the morning shift to remove the litter that accumulated during the day.

All of these shifts are conducted by the workforce of the Schoon department. This workforce consists of permanent employees and temporary employees deployed by an employment agency. The Schoon department employs both men and women with ages ranging up to 60 years old.

The organization of the Schoon department clearly shows the variety of activities conducted by the department. The question is therefore: which of the various activities conducted by the Schoon department is suitable for the implementation of a cleaning robot?

3.3 EQUIPMENT

During their cleaning activities, the Schoon department uses several types of machines to support the workers.

During the normal Veegshifts and Vuilnisbakkenshifts, the teams are equipped with a Mercedes Vito van with a tipping system on the back in which the garbage bags are collected. During the Veegshifts, this van is also used to ferry the people from the yard towards the starting point of their route.

During the Veegshifts, more machinery is used. Besides the vans with a tipping system, a RAVO street sweeper is used. This machine can be seen in Figure 4.



Figure 4 RAVO Mechanized street sweeper (Korte, 2015)

This machine is equipped with brushes and a large vacuum cleaner and is used to collect the pile of trash that is formed by the cleaners who brush the street by hand. This machine is capable of collecting most types of trash, from leaves to glass bottles. It however has a hard time dealing with plastic bags and cardboard boxes due to those blocking the vacuum cleaner opening. To diminish the nuisance caused by dust that is produced when the brushes clean the street, the machine sprinkles water over the brushes. This causes that the machine has to refill its water basin over time at refill points strategically located over the city.

Besides the RAVO, a so called “spoelwagen”, of the Bokimobil brand is used on certain high intensity routes, as seen in Figure 5. This is a small vehicle equipped with a large water reservoir of 2000 litres and two high pressure sprayers on the front. This vehicle is used to spray trash onto the street after which the employees who brush by hand make a pile out of it.



Figure 5 Spoelwagen used by the Schoon department equipped with high pressure sprayers

The Vuilnisbakenshift is also tasked with emptying trash bins in areas where the large Mercedes Vito can not come due to anti car obstacles. On routes like these, electric Goupil vehicles with a small tipping system are used, which can be seen in Figure 6. These vehicles are small enough to enter squares, playgrounds and other areas closed to the general traffic.



Figure 6 Goupil electric vehicle equipped with tipping system to access areas not accessible for normal vehicles

The Schoon department is thus equipped with a wide variety of machines to keep the city clean. Each of the machines is designed to complete its task while working in the complex Amsterdam city centre. The way the machines are used and designed learns us about what a future robot could look like: the design of the current machinery allows them to conduct their tasks in the complex city centre.

4. METHODOLOGY

Through a series of pre-determined routes, shifts and a classification scheme, the Schoon department executes her tasks in a professional matter. On paper, the equipment of the department, together with the classification and monitoring system of the municipality, leads to a city that is kept clean on level B. However, in practice, the city is not kept as clean as prescribed. On paper, there is no lack of equipment or monitoring of the city. There is thus a difference of what is possible in the city on paper and what happens on the streets.

After an analysis of the way how the Schoon department keeps the city clean, research is needed into how the Schoon department employees translate the policy into concrete actions. An analysis on how the employees execute their tasks provides me with more accurate knowledge on how the department functions on the streets. It also provides insights into what satisfies the employees and what they enjoy during their work.

However, this can be very challenging to analyse; with ages ranging from 20 to 60 years and many different positions within the organisation, a very diverse group of people is tasked with keeping the city clean. All those different people perceive their tasks and work differently and might have conflicting opinions and views. The analysis should account for this diversity, something that is elaborated upon in the next section.

4.1 WALK-ALONG DAYS

In order to gather insights and information about the actual cleaning process from a very diverse group of employees, I joined the employees during their work. During these walk-along days, I joined the employees on their routes to observe their activities and to interview them making use of semi-structured interviews. I also conducted experiments with the Schoon employees during the walk-along days.

The three different methods of collecting data did not equally contribute to the three different research directions. In Table 2, the main objectives and secondary objectives for every method are listed. Albeit contributing to all three research directions, every method distinguished main objectives and secondary objectives.

Data collection method	Primary Objectives	Secondary Objectives
Interviews	Job satisfaction core themes Collaboration insights	Practical challenges of robot deployment
Observations	Practical challenges of robot deployment Collaboration insights	Job satisfaction core themes
Experiments	Job satisfaction core themes Practical challenges of robot deployment	Collaboration insights

Table 2 Overview of objectives per data collection method

At the beginning of every walk-along day I would introduce myself to the employee or employees I would join. I explained that I conducted my graduation research about the possible introduction of robots in the Schoon department. To calm the minds of the employees, I immediately made clear that the goal of the research was not to replace the employees by a robot. I explained that I conduct the walk-along days to find out what task a robot could assist the employee in. I also explained that for the

questions that I ask no answer is wrong and all answers are useful. Last but not least, I explained that I did not work for the municipality but for the AMS Institute and the TU Delft and WUR universities. This way, I aimed to make clear that I was no extension of their own organisation and that my research was no job satisfaction research initiated by the municipality. All interviews and observations were made anonymous and when an interviewee wanted to withdraw from the research, they could contact me.

Over a period of 9 weeks, I joined 18 teams during their shifts. During these 18 shifts, I conducted interviews, I observed the activities conducted during the shifts and experimented with loFi prototypes. During 9 of the shifts, I conducted 12 semi-structured interviews. Besides the interviews, I joined 4 shifts where I only observe the activities conducted during those shifts. Last but not least I joined 5 shifts to experiment with robot behaviour using loFi prototyping. The division of interviews and experiments over the walk-along days are listed in Table 3 below.

Datum	Shift type	Interview	Observation	Experiment	Interviewees
5-apr	Veegshift		Yes		
13-apr	Vuilnisbakkenshift	Yes	Yes		1
19-apr	Veegshift		Yes		
20-apr	Veegshift	Yes	Yes		2
26-apr	Veegshift	Yes	Yes		1
2-mei	Vuilnisbakkenshift		Yes		
3-mei	Veegshift	Yes	Yes		2
4-mei	Vuilnisbakkenshift	Yes	Yes		1
10-mei	Vuilnisbakkenshift		Yes		
11-mei	Vuilnisbakkenshift	Yes	Yes		1
12-mei	Vuilnisbakkenshift		Yes	Yes	
17-mei	Vuilnisbakkenshift		Yes	Yes	
18-mei	Vuilnisbakkenshift	Yes	Yes		1
23-mei	Veegshift	Yes	Yes		2
24-mei	Vuilnisbakkenshift		Yes	Yes	
30-mei	Vuilnisbakkenshift		Yes	Yes	
31-mei	Vuilnisbakkenshift		Yes	Yes	
1-jun	Vuilnisbakkenshift	Yes	Yes		1

Table 3 Overview of shift type and activities during the walk-along days

Overall, I joined 6 Veegshifts and 12 Vuilnisbakkenshifts between April 5th and June 1st.

4.1.1 SEMI-STRUCTURED INTERVIEWS

To find out how the employees themselves experience their job and how the future human-robot collaboration should be designed, it is important to directly interact with the employees. I collected first hand opinions and idea's from the employees themselves by interviewing them. By using semi-structured interviews, I could question the employees about interesting things they mentioned or did during the walk-along days.

The starting questions from the semi-structured interviews were based on the framework for human-agent interaction and are related to the aspects of job-satisfaction as mentioned in the theoretical background. When interesting answers were given or when interesting things happened during the day, these were also questioned or noted down.

The first part of the interview questions consists of questions about job satisfaction and deals with favourite tasks, the employee's view on his task package and satisfaction. The second part of the

interview is based on how the employees interact with each other during their work and is based on the human-agent interaction framework design considerations.

The interview questions were formulated beforehand. It occurred that answers on the questions were not given by the persons but showed themselves during the observations, in which case the question was not explicitly asked again.

The interview questions can be found in Annex I. The interviewees were asked these questions during the walk-along days. The answers were noted down in my phone and afterwards noted down in the interview question list, which can be found in Annex II.

Conducting interviews during these walk along days meant that I could interview more people than during the breaks only. A downside of interviewing during these walk along days is the fact that sometimes questions were asked in the company of the whole shift. This could have influenced the answers that were given due to the presence of colleagues in both a positive and negative way. Interviewees can answer with restraint due to the presence of colleagues, but they could also be pointed at useful insights by their colleagues which they did not think of themselves.

Despite the fact that the teams are on paper staffed with 5 people, it often occurred that only 3 people were deployed on a shift. Out of those 3 employees, one drives the street sweeper. This caused that even though I joined a Veegshift, sometimes I was not able to interview more than 2 people. It also occurred that people agreed upon me observing during the shift but did not want to participate in the interviews. The fact that the interviews were held during the work also meant that when an area was very dirty, the work did not allow long interviews with all team members.

At the yard, the shift leader would ask the foremen of the Veegshifts whether they were willing to take me along on their route. If the foreman agreed to take me with him on his route, I would ask him and the other shift members if I was allowed to interview them. I would also ask whether I was allowed to make notes of everything I saw during the shifts. I made clear that all results were made anonymous. If people did not want to be interviewed, I asked whether I was allowed to still include them anonymously in the observation data.

I tried to join a very diverse group of employees during their shifts. In the end, I interviewed employees in their 50's and in their 20's, with and without an immigration background, foreman or not and Schoon employees and temporary workers.

4.1.2 OBSERVATIONS

While interviews provide me with interesting knowledge on the activities of the Schoon employees, interview answer do not reveal all processes and challenges that take place. When answering an interview question, the interviewee weighs up what to mention and what not to. It is thus possible that information that is relevant for me is not mentioned as the interviewee thinks it is irrelevant or sees the action as an uninteresting habit. To gather as much information as possible, which includes relevant information not mentioned during the interviews, I decided to also observe the Schoon employees during their work.

I chose to not only observe the Schoon employees, but to also actively join them during their work. This way, I literally and figuratively reduced the distance between myself and the Schoon employees.

While joining them during their shifts, I was not a student that comes to validate a top down idea, I was present as a colleague that helped the Schoon employees during their activities. By joining the employees during walk-along days, I could myself experience what the challenges of cleaning the city are, what makes people enjoy their work and what are the heaviest tasks.

During these walk-along days, I especially paid attention to the interaction between the Schoon employees and the interaction with bystanders. Besides the human interaction the Schoon employees have, I also paid attention to how the challenges of robot deployment in public spaces translates into challenges in the Amsterdam context. Interesting situations caused by the design of the public space of Amsterdam were noted down or photographed.

I noted down interesting findings on my phone during the walk-along days. Because I was viewed as a full-fledged colleague during the shifts, I was also given tasks that had to be completed in time. This meant that I had no time to write down everything in detail so the notes sometimes consisted of keywords and short sentences only. Those short keywords and sentences were elaborated during moments where the work allowed me to once again discuss the answers with the interviewee.

4.1.3 EXPERIMENTS

Besides observing unplanned events, I also experimented with so called loFi prototypes. During the loFi prototype experiments, I wanted to observe the behaviour of the Schoon employees when they are confronted with possible future robot behaviour. This robot behaviour would be based on the outcomes of the literature research, interviews and the observations. The experiments were conducted to let the employees reflect on possible outcomes of the research and how this would influence their own activities during their work

With this feedback on possible outcomes, the eventual recommendations to the municipality and the outcomes of the interviews can be improved. The experiments were namely used to validate and further investigate an outcome of the interviews.

Experimenting with loFi prototypes during this research meant the simulation of robot behaviour during walk-along days. This behaviour was based on the outcomes of the literature research, the interviews and the observations. During the experiment, I presented the Schoon employee with the rules of the prototype. I would then, during the shift, act like I am the robot supporting the Schoon employee. I chose to conduct the robot behaviour myself instead of interviewing the employees about the behaviour to observe the genuine reactions from the Schoon employees. This way of prototyping also allowed me to observe the actual actions taken by the Schoon employees when a robot interferes with their current activities. This would allow me to observe actual behaviour instead of stated behaviour.

During the experiment, I observed the actions taken by the Schoon employees that differed from their usual activities. After the experiment, I questioned the employees about their experience during the experiment. These outcomes of the experiments were recorded like the general observations. They were namely noted on my phone during the walk along day and afterwards added into the interview list found in annex II.

4.2 ANALYSIS

After each walk-along day, I noted down the interview answers, interesting observations and other relevant data in a document that listed all the collected data. This document is a list of the interview questions for every day an interview was conducted. The data I noted down in this document followed from the elaboration of the answers with the interviewees when the work was done. This list can be found in Annex II.

After a number of walk-along days, I started to notice a number of common answers given by the interviewees. I created a list of topics that were often mentioned and used those topics as the guidelines for further coding the future interviews. Those topics were:

1. Variety, everything related to variety. Either within shifts, between shifts or outside shifts but during working hours
2. Freedom, everything related to freedom. Either actual freedom of choice or the feeling of freedom
3. Interaction, everything related to interaction. Both interaction with colleagues and with bystanders
4. Outdoor work, everything related to working outdoors in the Amsterdam city centre
5. Work effort, any mention of physical or psychological effort related to the conducted activities
6. Feedback on result, everything related to receiving feedback on the result of the work, either positive or negative
7. Delivering a clean street, everything related to valuing visual or tangible result

The topics, when they were mentioned and which colour code they received can be found in Table 4.

Date	Shifttype	Interview	Observation	Experiment	Interviewees	Variety	Freedom	Interaction	Outdoor work	Work effort	Feedback on result	Delivering a clean street
5-apr	Veegshift		Yes									
13-apr	Vuilnisbakkenshift	Yes	Yes		1	x	x			x		
19-apr	Veegshift		Yes									
20-apr	Veegshift	Yes	Yes		2	x	x	x	x	x		x
26-apr	Veegshift	Yes	Yes		1	x		x		x		x
2-mei	Vuilnisbakkenshift		Yes									
3-mei	Veegshift	Yes	Yes		2			x	x	x	x	
4-mei	Vuilnisbakkenshift	Yes	Yes		1		x			x		x
10-mei	Vuilnisbakkenshift		Yes									
11-mei	Vuilnisbakkenshift	Yes	Yes		1	x	x			x	x	x
12-mei	Vuilnisbakkenshift		Yes	Yes								
17-mei	Vuilnisbakkenshift		Yes	Yes			x					
18-mei	Vuilnisbakkenshift	Yes	Yes		1			x	x	x		x
23-mei	Veegshift	Yes	Yes		2	x		x	x	x		x
24-mei	Vuilnisbakkenshift		Yes	Yes		x						
30-mei	Vuilnisbakkenshift		Yes	Yes			x					
31-mei	Vuilnisbakkenshift		Yes	Yes					x			
1-jun	Vuilnisbakkenshift	Yes	Yes		1		x	x	x			x

Table 4 Overview of shift type, data collection method, amount of interviewees and the mentioned topics per interview

5. RESULTS

In this chapter, the results of the interviews, observations and experiments are presented. I will first introduce the outcomes of the interviews held with the Schoon employees during the walk along days. Then I will introduce interesting findings that follow from the observations made during the walk-along days. Lastly, I will present the outcomes of the experiments conducted during the walk-along days.

5.1 INTERVIEWS

Below, an overview of the most interesting outcomes of the interviews are listed. Those are the most important aspects of the work conducted by the Schoon employees that make them satisfied and happy about their work.

5.1.1 FREEDOM

When asked about the aspect of their work that makes the employees choose for the Schoon department, a much heard term is freedom. The majority of the interviewees stated that the freedom that they feel while they conduct their work is an important reason for them to enjoy their work as cleaners for the city of Amsterdam.

“I love the buzz of the city and the freedom that they give me to plan my own activities during the emptying of the trash bins.”

-Interviewee June 1st

When asked about what activities people like and why they like this activity, freedom is also a much heard topic. During the Veegshifts, employees who are foreman state that they enjoy the Veegshift work because they as foreman decide how to clean a certain area. This is not regulated and is therefore open for discussion per team. It is up to the foreman to decide which streets will be cleaned first and how to proceed through the designated area. The foreman and its team have the freedom to plan their activities between the starting time and end time. It is up to the team to decide whether they start very intensive and end relaxed or work on a speed that keeps them active the whole day. This freedom follows from the fact that the team managers trust the foreman in accomplishing their tasks between the specified starting and end times.

The interviewees on the Afvalbakkenshifts also expressed that they enjoy their work due to the high degree of freedom. During the Afvalbakkenshifts, employees of the department Schoon work on their own without a foreman. The employee thus has the freedom to choose his or her own route and plan their activities on their own.

“The shift I like the most is the Afvalbakkenshift, I go out on my own, turn my music on and do not feel pressure”

- Interviewee May 4th.

What comes with this freedom is also responsibility. Without a foreman deciding whether something is clean enough to proceed, the employee should do this on his own. The employee thus has the

freedom to decide whether he or she continues their activities or should return to certain areas. They also have to decide on their own whether certain types of trash fall within their task package or not.

The employees on the Afvalbakken and Veegshifts also have the freedom to decide whether to help their colleagues in other neighbourhoods or not. On paper, every team is allocated to a neighbourhood during a certain time period. When the whole neighbourhood is clean enough before this time period is over, one can choose as a team to assist other teams that struggle to finish their work within the given time period. This is however based on personal interest. During the June 1st interview, the employee stated that he shared telephone numbers with certain colleagues with whom he gets along well. This allowed him and his colleagues to contact each other when they are finished with their own tasks and to ask or offer assistance if needed.

Summary - The many aspects of freedom, experienced in many different ways, are seen as important characteristics of the work conducted by the Schoon employees. The fact that they can and are allowed to organize their own activities within the municipal guidelines is an important characteristic of the work conducted by the Schoon department which positively contributes to the job satisfaction experienced by the employees.

5.1.2 VARIETY

When asked about the reason why he worked for the Schoon department, the person that I conducted an experiment with on May 24th told me:

Not a single day is the same, one day I sweep the street, the other day I use the spoelwagen. I am an allrounder."

- Interviewee May 24th

This person was not the only one who mentioned that the fact he conducts a wide variety of tasks during his work at the Schoon department is the reason why he works at the Schoon department. 6 of the interviewees expressed that the variation offered by this type of work was a reason for them to apply to this job or to stay at this job after being dispatched by an employment agency. During the interviews, multiple levels of variation were mentioned.

The first level is the inter-shift variation. There is a huge variation in shifts that the employees can be deployed on. This variation in shifts comes with a variation of task for every shift. One day an employee is made responsible for maintaining the trash bins in a neighbourhood, the next day he joins a Veegshift in a different neighbourhood where he maintains the trash on the streets and the following day he uses a high pressure sprayer to clean alleys. When the employee is certified to drive trucks, his activities can be expended to collecting household waste and bulky waste.

When an employee is promoted to foreman, he or she is however limited in his or her activities. When one gets promoted to foremen Veegshift, he or she will only be deployed on Veegshifts. Every day will however still be different. No one in the organisation has his or her own neighbourhood and team. Therefore, the team you work with and the location you work at will be different every day. When asked why he became a cleaner for the Schoon department, the interviewee on May 11th also mentioned the rotation of the routes:

“You get a lot of freedom and learn a lot about your city because you get different and nice routes every day”

- Interviewee May 11th

The second level of variation exists within the shifts. During every shift type, a wide variety of activities is conducted.

When working on a Veegshift, the employees can be appointed to a wide variety of tasks. One could be appointed as the driver of the road sweeper, the user of the high pressure sprayer, the driver of the high pressure sprayer car or the traditional street sweeper. These tasks also rotate during the day, making sure that no one executes the same task the whole day long.

For the Vuilnisbakkenshift, there is also a variance in activities. One is not only tasked with emptying trash bins, one should also take care of litter in the vicinity of the trash bins, in the vicinity of the underground waste containers and hindering litter on the streets.

Due to the nature of working in a busy city, not one single day is the same. This is a much heard statement from the interviewees. They also mention that this keeps the work interesting and keeps it from becoming boring.

Summary - All the above shows that variance is an important characteristic of the work conducted by the Schoon employees. This variance is found at multiple levels within the work conducted by the employees. All those different forms of variety positively contribute to the job satisfaction felt by the Schoon employees.

5.1.3 HUMAN INTERACTION

During the walk-along days, two types of interaction with humans took place. The first one is between the employee and bystanders and the second type is the interaction between the employees and their colleagues.

5.1.3.1 BYSTANDERS

When the interviewees were asked about the interaction they have with bystanders they mostly first mention the positive interaction they have. This ranges from getting a free cup of coffee every time they pass a certain store to receiving compliments. Citizens and tourists are often happy that the Schoon employees clean their direct environments and thank the employees for this fact. This positive interaction is seen as a reward for their work and as a confirmation of their work, namely a clean street.

Bystanders however do not always interact positively with the Schoon employees. Bystanders can get frustrated by a traffic jam that is caused by a road sweeper, by the nuisance a high pressure sprayer gives or by the fact that trash was not properly collected during a previous shift. The employees are trained on how to deal with such situations. Some interviewees stated that this negative interaction makes them feel that their work is unappreciated, especially when negative remarks are made about the quality of the public space after a day of hard work.

Both the positive and negative interactions contribute to the variety that the employees experience during their work. During their shifts, the employees meet and see a wide variety of people during a

day. This, in combination with the rotation of employees on shifts and neighbourhoods, makes that the employees meet and see a lot of people with whom they can interact. One of the interviewees on April 20th explained that the Veegshift is his favourite activity due to the fact that he is rotated through the centre of Amsterdam with teams that also rotate. This caused that every day, he worked with different people in different locations, something he appreciated.

5.1.3.2 COLLEAGUES

The human interaction between the employees of the Schoon department is however also very important, both for the joy the employees experience during their work and the execution of the tasks.

A key aspect of the work at the Schoon department that makes the employees enjoy their work is the interaction with colleagues. Many of the interviews indicated that they appreciated the contact they have with their colleagues during the work and during the breaks. The variation in teams in which employees work also contribute to the contacts colleagues have with each other. The rotation of team members enlarges the network of the employees. This also contributes to the productivity of the department as there are colleagues that help each other when their own work is finished despite not being tasked to. They are able to contact their colleagues through the network they built.

Besides social contact, interaction between the employees is also important for accomplishing their tasks. A foreman interacts with his or her colleagues about the division of employees over the sides of the streets, which alley has to be cleaned, what part of the neighbourhood needs extra attention and what the division of employees over the equipment is.

The users of the equipment also interact with their colleagues. When one uses a high pressure sprayer, he or she communicates through signs with his or her colleagues about the parts of the street that he or she can not reach or that need extra attention. The driver of the street sweeper also interacts with his or her colleagues. The street sweeper can not collect trash that is too big and thus this has to be removed from the pile. The driver of the street sweeper then communicates with his or her colleagues through hand signs and using the horn. The colleagues of the street sweeper driver also guide him or her through difficult traffic situations.

An incident that occurred during one of the walk along days clearly showed how both types of interaction lead to the successful accomplishment of the Schoon employees tasks. A street sweeper had to climb a hill onto a bridge. Due to rain, the concrete slabs that form the ramp to the bridge were slippery and caused the street sweeper to lose traction. The street sweeper had to reverse in order to take a new approach with more speed. This however required the drivers and cyclists behind the street sweeper to also reverse.

During this situation, the street sweeper had to gain the attention of his colleagues that had already proceeded over the bridge. Through using his horn and signing about his situation. His colleagues returned and turned to the cars and cyclists behind the street sweeper. They interacted with the people behind the machine in both Dutch and English and made clear that they had to reverse a couple of meters in order to proceed.

Summary – Above mentioned event clearly shows that interaction between the workers and with bystanders is important during this work. Without interacting with his colleagues, it would have taken longer for the driver to send the people behind him further back, climb the bridge and continue his

work. It would also have caused a longer traffic jam behind the machine. It also showed that in a metropolis as Amsterdam, speaking Dutch is not always enough to convey your message to the bystanders.

As the anecdotes and interview outcomes above show, human interaction with both the bystanders and colleagues is very important for the Schoon employees. This is not solely for the sake of having a good work atmosphere, it is also important for completing the activities the Schoon employees are tasked with. Human interaction is therefore the third important theme for the Schoon employees.

5.1.4 TASK EFFORT

In general, the Veegshift and the Vuilnisbakkenshift do not require heavy physical effort to conduct your job. It are often only the exceptions on the task package that require physical effort. These occur when heavy household waste is dumped in a trash bin in the public space. It also occurs that employees have to lift bikes and even scooters out of the way when they are parked in front of trash bins. Some interviewees indicated that the Veegshift is physically demanding because during this shift the employee walks many kilometres a day.

What was often heard during conversations with the employees and their managers was that despite driving the RAVO street sweeper might not be physically demanding, the fact that the driver has to pay constant attention to his or her environment still causes it to be viewed as a very demanding task.

A much heard remark was that the salary for the employees of the Schoon department was relatively high for the relatively light physical work they conduct. The work can be classified as heavy when compared to an office job but is relatively light when compared to road workers and construction workers.

When asked about what task is the heaviest task, 8 out of 12 interviewees mentioned collecting trash using the garbage truck. This task involves heavy physical actions over a prolonged time. For half of the interviewees, working on the garbage truck was also the least favourite task for the same reason as why it is a heavy task: it clearly requires more of the employee physically.

In general, the Veegshift and the Vuilnisbakken shift were not considered as the most heavy tasks. Only two people expressed that emptying trash bins was heavy work, of which one only indicated that this only applies to certain routes with the Mr Fill type of trash bins. There was one interviewee who found the Veegshift heavy when he was appointed to this shift type for multiple days in a row.

Summary - The fact that the Veegshift and Vuilnisbakkenshift are largely not seen as heavy tasks show that the intensity of the work is important for the Schoon employees. Their dislike of the physically heavy task illustrate that the heavier the task is, the lesser the task is liked. The relatively light intensity of the activities conducted during the Veegshift and the Vuilnisbakkenshift is therefore another key theme appreciated by the Schoon employees.

5.1.5 VALUING RESULTS

When I asked the department Schoon employees what aspects of their work made them feel satisfied, multiple answers were given. 75% of the interviewees answered that delivering a clean street or neighbourhood gave them a satisfied feeling. This satisfaction is also caused by interaction with the

inhabitants of Amsterdam whom sometimes express their gratitude towards the employees when they cleaned a street. The satisfaction is not only caused by the interaction with inhabitants, there are also interviewees who state that they feel satisfied at work because they can clean “their own city”. When asked what aspect of his work made him feel satisfied, the interviewee of June 1st answered:

“The fact that I can clean my city, I myself would also like a clean street in front of my house”

-Interviewee June 1st

Another employee answered that delivering a clean street that was previously very polluted made him feel satisfied after his work. When asked about what aspect of his work made him feel satisfied, he said:

“Delivering a clean street. When the Warmoesstraat is a big mess in the morning, it feels good when half way your shift it is clean again.”

-Interviewee April 20th

Summary - Besides a good salary, delivering a clean street as a result of their work is an important factor that makes the Schoon employees feel satisfied. Seeing the result of the work that they delivered must therefore be seen as a core value that is important to the Schoon employees. They enjoy the fact that after working hard, they see the result of their work.

5.1.6 WORKING OUTDOORS

When asked why they do this type of work, 7 workers mentioned the fact that they like to work outdoors. One of the interviewees even told about his previous job where he worked for 8 years at an office and how he now appreciates the outside work because it is much more entertaining and interesting. This appreciation of outside working can be split into two underlying reasons.

The first reason is the climate in which the work is conducted. The interviewees I spoke were often interviewed during nice, dry weather. They said the nice weather showed why this work was nice. This would probably not be the case if I interviewed them during the colder winter months. There are however some employees that enjoy working during snow when they sprinkle brine and shovel the snow in the streets of Amsterdam. The climate related enjoyment of working outside is therefore closely connected to personal preferences and differs per person.

The second reason why working outdoors is appreciated is the fact that a lot happens in a metropole like Amsterdam. Working in the public space in Amsterdam means that you work alongside thousands of inhabitants and tourists where a lot of things happen. This causes interesting interactions to happen, which contribute to the variance the cleaning work offers, and which are liked by the Schoon employees. The interviewee on the 18th of May was asked what causes him to work at the Schoon department. He answered:

“I came here through the employment agency, I like to work outside where you see a lot of things happen.”

-Interviewee May 18th

Summary - The results of working outdoors contribute to multiple other key themes introduced earlier in this chapter. Without working on the streets of Amsterdam, less variety is felt due to less interaction with tourists and inhabitants. Working outside keeps the work interesting. The fact that the Schoon employees work outdoors contributes to all the other core themes. Therefore, working outdoors itself must also be considered as an important core value contributing to the job satisfaction of the Schoon employees.

5.2 OBSERVATIONS

During the 18 days that I joined the Veegshifts and Vuilnisbakkenshifts in Amsterdam, I observed a lot of interesting and relevant situations. These findings range from practical knowledge on the deployment of machinery to the types of communication used by the Schoon employees.

5.2.1 CHALLENGING ENVIRONMENT

During Veegshifts I saw that bike racks, benches, terraces, and parked cars often hindered the workers in cleaning the streets. Those objects catch litter that is blown around by the wind. Those objects should be cleaned by hand because the RAVO can not reach close to them. This causes a delay as the RAVO has to wait for the cleaners.

Other objects placed in the public space also pose challenges for the workers of the Schoon department. Due to the vicinity of bike racks to trash bins, many trash bins are used as an extension of a filled bike rack. Often, bikes are then parked against or in front of the opening of the trash bin which require extra effort and time from the employee before he or she can empty the trash bin, as seen in Figure 7.

Besides bike related challenges, there are also streets that are narrow and do not allow someone to pass the RAVO at certain points. Some streets are closed off by moving obstacles which can not be opened by every employee and some parks are even closed off for vehicles by permanent obstacles.



Figure 7 Trash bin located near bike parking blocked by incorrectly parked bike

Summary - This all shows that the design of the public space in Amsterdam with all the street furniture which is part of this public space pose challenges for efficiently keeping the city clean. Those challenges also influence the efficiency of robot deployment. The challenging design of the public space also has an effect on the deployment of robots in this public space. All the obstacles in the Amsterdam public space pose a challenge for a predictable and non-complex deployment of a robot.

5.2.2 TRAFFIC

During the Veegshift, the RAVO street sweeper drives at low speed. This causes that bikes, motorcycles and cars try to pass by the vehicle. The RAVO however does not follow a straight line and sometimes has to swing to the left or right in order to collect piles of trash. It are during such movements that the RAVO interferes with the other traffic in the street. The drivers of machines like the RAVO street sweepers have to constantly pay attention to their environment to prevent accidents from happening and to prevent damage to their equipment.

One way to diminish the risk of damage and to prevent accidents from happening is the usage of right hand drive vehicles within the Schoon department. The majority of the vans used by the Schoon department is equipped with the steering wheel on the right side of the vehicle. This way, the drivers can drive very closely to the side of the streets. Next to this, another benefit of right hand driving in Amsterdam is the fact that most of the traffic bins are located on the right side of the vehicle. This prevents that the employee has to cross the busy streets. There are however also streets where this is not the case. When this is the case, the employee has to cross the street from behind or in front of his vehicle trough busy traffic. To make the employees visible for everyone in the Amsterdam traffic, they wear bright reflective clothes.

The traffic in Amsterdam also leads to interactions between the Schoon employees and bystanders. When people want to pass the vans or the RAVO sweepers, they often ask whether this is possible. Sometimes, the RAVO or van drivers interact with the drivers behind them to find out whether he or she has to let them pass on narrow streets. Negative interaction also takes place due to the traffic in Amsterdam. During one occasion, someone reacted angry when he had to wait for the 3rd time in a row on the same one way street. There was no space on the street where the Schoon employee could let the driver drive past him. Most interviewees stated that such negative interactions related to traffic are often seen.

Parked cars and cars loading or unloading goods also create a challenge for the employees of the Schoon department. Such vehicles block the sidewalk from the road and are thus obstacles that cause delays. The trash that is caught underneath such vehicles will not be collected and will show itself when the parked vehicles leaves. This way, a street on B quality can turn into a D quality street within minutes. The Schoon employees do not have the time to wait for every parked or unloading vehicle to depart.

Summary - All these traffic related challenges show that the Amsterdam traffic influences the work of the Schoon department employees on multiple topics. Not only the safety of the employees and human interaction are influenced by the intensity of the traffic, the intensity of the traffic also influences the productivity and speed with which the Schoon department can execute their tasks.

5.2.3 RAVO

During the Veegshift, the team uses a RAVO street sweeper to collect the pile of trash formed by the Schoon employees that brush by hand. These street sweepers are equipped with brushes and a vacuum cleaner system. The employees that brush the street by hand make a pile of trash on the street. Then the RAVO brushes this into a thin line that is directed into the opening of the vacuum cleaner system of the RAVO.



Figure 8 A RAVO street sweeper with in front of the brush the water sprayer. Interestingly, the text on this machine indicates that it belongs to Stadsdeel Zuid, a different area of the city of Amsterdam. This shows that machinery is shared between city areas

The brushes on the RAVO cause dust to form. Water is sprayed on the brush to diminish this effect. The system for water spraying is seen in Figure 8. The water used for diminishing the dust forming has to be tanked at designated water taps located all around the city. It occurs that in the middle of the shift, the RAVO has to refill its water. During these moments, the employees who clean by hand have to stop working. When the RAVO is not around to collect the trash, the trash will blow away through the street when collected on a pile. The moments when the RAVO is refilling its water serve as a break for the employees.

Working with the RAVO machine also means that at least one of the other employees on the Veegshift has to stay close to the RAVO. There are certain types of trash that can not be collected by the RAVO

or that block the vacuum cleaning system. The driver of the RAVO sweeper and the employee working close to the RAVO interact with each other through signs to make clear whether some objects in the pile have to be removed to prevent the machine from malfunctioning. Objects that can not be collected by the RAVO are put in a box on front of the machine and will be thrown away by hand when the machine returns to the yard.

When the other employees work far away from the RAVO, the pile that is formed might be affected by the wind. This means that light trash like paper and plastic might blow away from the pile and thus do not end up in the RAVO. This causes that despite the RAVO is used, litter will sometimes still be present.

Summary - The usage of the RAVO machine revealed multiple challenges. For example, attention should be paid to what is in the pile that could possibly clog the machine. One should also not proceed to far from the RAVO machine in order to keep the pile of trash compact and complete. Attention should also be paid to the refilling of the water tank, should this be done during the shift or prior to shifts? Those are all challenges connected to working with a street sweeper like the RAVO. The RAVO might speed up the process of collecting litter, it still requires a lot of extra attention from both the driver and the other shift members before it delivers a clean street.

5.2.4 TEMPORARY WORKERS

Due to a staff shortage at the Schoon department, the department makes use of an employment agency. Many of the interviewees told me that before they were contracted by the Schoon department, they worked for years at the Schoon department as a temporary worker employed by the employment agency.

The usage of temporary workers from an employment agency can influence the productivity of a shift. When an temporary worker is for the first time deployed at the Schoon department, he or she has to be trained about what to do. The new worker has to be briefed about what type of shift he is going to work on and what activities are connected to that shift.

When he or she has travelled to the neighbourhood he or she is appointed to, the foreman also has to brief the new worker on what he or she must do and what he or she should pay attention to. During the shift, the foreman has to pay extra attention to the new temporary workers as they have little experience and do not know what result is desired. They can also not operate the machines used by the Schoon department and are thus tasked with cleaning by hand.

During the walk-along days, I would also be treated as a new temporary worker. The foreman came to check my work, had to explain what side of the road I had to start working at and explained at what speed we had to conduct our activities.

The interviewees spoken to on the 20th of April explained that when they had to work with new temporary workers, it took them a lot of time to brief them about how to properly clean and what to pay attention to. They expressed that they rather not have new temporary workers in their team as this negatively influences the speed with which they execute their tasks. Sometimes, the employment agency also deploys new temporary workers that dislike the work. Those non motivated workers even further negatively influence the work delivered by a shift with temporary workers.

Summary - Due to their lack of experience, more communication is needed when new temporary workers are deployed. They are also not allowed to work on the machines as they do not all have the right papers. The foreman might also decide not to deploy new temporary workers on the machines as there are often more experienced workers that can complete their tasks more easily. This all shows that employing temporary workers without experience caused the productivity of a shift to decrease due to the increased coaching they needed and the lack of experience.

5.2.5 COMMUNICATION

Every walk-along day where I joined the Veegshift started the same. When the team arrives on location in their neighbourhood, the foreman discusses with its team who uses the high pressure sprayer if available and who cleans the street by hand. Then the foreman chooses the route that the team and the RAVO will take. He divides the team members over the sides of the road and the work starts. The foreman then directs team members to alleys or parks when these are located on the route.

When the work starts, little verbal communication is observed. Due to the high workload, the speed is high. During the work itself, the only communication that takes place is related to the work that is conducted. To guide the RAVO and the other team members, most of the foreman use signs.

When the team consists of experienced Schoon employees, even the communication through signing is limited. For example, through a series of gestures in certain directions, the foreman explains the route that is followed. Signs used by the RAVO driver is nodding to confirm or deny certain waste types in the waste pile to prevent clogging of the machine. There are streets during routes that are covered only once and there are streets that are covered twice. When a street is covered twice, the RAVO drives through the street on both sides. If the street is only covered once, the RAVO only drives on one side of the street. During such situations, nodding towards a side of the road is enough for the foreman to communicate where the RAVO must drive and where its colleagues must walk.

It once happened that sound signals were used during a shift. When the distance between the RAVO and our team got too big, the RAVO had to use its horn to get our attention and help.

Only on three occasions we helped each other during our activities. The first occasion happened when the RAVO was stuck. Through using his horn, he alerted us of his situation and we as a team directed the traffic around the RAVO and made sure he could continue its work. The second occasion also happened during a Veegshift where the foreman sent me and a colleague into an alley to help a third person already working in this alley. We had to assist the man working in the alley because otherwise the RAVO would have to wait for the man to clean the ally by himself.

The third occasion happened on May 4th during a Vuilnisbakkenshift. We received a neighbourhood that was relatively easy. After 2.5 hours, all the trash bins in our neighbourhood were emptied. The Schoon employee then decided to check on his colleague in the adjacent neighbourhood. Not being able to communicate with this person, we first had to locate this man before we could speak to him. We helped this man by emptying trash bins in and around a busy marketplace where the traffic was chaotic. Due to the fact that we were a team of two we could navigate through the parked cars and bikes, something the colleague was not able to on his own.

The Schoon employees are not equipped with work phones that allow them to call each other. The only number they can call for assistance is the number of the yard. This means that teams can not call

each other directly when they need assistance when they are in the city centre. It once happened during a walk-along day that we had to wait for 30 minutes before the RAVO showed up. Not being able to call the driver meant that we had to wait for him to show up without knowing why it took him so long.

There are however colleagues that shared their private telephone numbers with their close colleagues in order to offer and ask help. During the interview on June 1st, the Schoon employee told about the fact that the colleagues he likes have his number and could call him for assistance when he is done with his route. During this walk-along day, a colleague on a Prikshift made use of his number to contact us for a ride towards the yard.

Summary - The above mentioned situations all show that although communication might be limited during the work, it is still very important for the efficiency of the teams. The communication that takes place is however often limited to short signs and nodding when the team consists of experienced Schoon employees. When this communication is verbal, it is often during breaks or before the shift starts as it are during those moments that the Schoon employees are close to each other and are not hindered by noise from machinery. Inter-team communication is limited to the initiatives of the Schoon employees themselves.

5.2.6 CLEANING EFFECTIVENESS

During the walk-along days, the way how the cleanliness levels were used in practice became clear. Both the Veegshift and Vuilnisbakkenshift members are familiar with the grading system. The way how this system was translated to actual actions differed however. During all the Veegshifts, the fine litter was not collected by the RAVO because we did not collect it during the sweeping by hand. However, when the Veegshift was equipped with the high pressure cleaner, fine litter would be collected. There is thus a difference in quality delivered caused by the equipment deployed on a route.

The quality is however not only related to the equipment made available, it is also influenced by the workers on the shift. Where some employees reached under cars and between bikes, others would smoke in between the breaks and throw their cigarettes on the same street we just cleaned. Where one employee strived for A level quality, others feel fine by delivering B level quality.

How B quality is perceived also differs per person. Where one employee worries about cigarettes and leaves on the street, another employee might not even care about such small litter.

The activities conducted by the Schoon employees on the Vuilnisbakkenshift also differs per person. On only two occasions, the employee would also clean the inside of the trash bin, a task every employee should do in their opinion. When others were asked about this activity, they mentioned it was not their responsibility and would slow them down.

Summary - The situations described above show the subjective nature of the activities conducted by the Schoon department. Within the broad guidelines, there exists the ability to act either very precise or less strict. This translates in a difference in delivered quality based upon the preferences of the employees or foremen. When a robot is to conduct a certain task, clear and strict guidelines about its task should be formulated as a robot is not possible to subjectively assess its work and results the same way the Schoon employees do.

5.3 EXPERIMENTS

To further specify and analyse the outcomes of the interviews and observations, I conducted experiments. During these experiments, I used loFi prototypes to simulate robot behaviour. In the next section, the outcomes of two types of experiments are introduced.

5.3.1 PROTOTYPE FREEDOM

One of the key themes mentioned as an important reason why the Schoon employees chose this work and enjoyed their work was freedom. During the observations, it became clear that many employees do not work according to the list of streets supplied on their neighbourhood map but choose their own route. The first experiment was conducted to find out whether the feeling of freedom is influenced when the employees have to follow a set route.

The question during the freedom experiment was: “How does working according to a set route influence the feeling of freedom?”

At the beginning of a Vuilnisbakkenshift, the employee is given a document with a map of his neighbourhood and a list of those streets that belong to his neighbourhood. During the experiments, I would empty the bins on the route. This route was the route as it was listed on the document he received at the beginning of his shift. After joining the Vuilnisbakkenshifts that I experimented with, I questioned the employee about how this set route affected his freedom.

Working according a set route did not diminish their feeling of freedom. Some of the men expressed that it depends on their neighbourhood whether they follow the route or choose their own route. Others normally make their own route but do not feel a decrease in freedom when they have to follow a set route. They expressed that they still feel freedom because they can determine their own speed and thus still plan their activities over the day.

The reason why some of the workers choose a different route over the route on the document was for all of them an increased efficiency. In their eyes, their own route is more logical and efficient than the route given on the document.

The five experiments on May 12th, 17th, 24th, 30th and 31st showed that freedom is not necessarily based on the ability to adjust your own route but is also determined by the ability to plan your activities over the day. Freedom therefore not solely depends on the ability to decide the place where you work but also on the ability to plan at what time you conduct which aspect of your work.

5.3.2 PROTOTYPE AUTONOMY

The second experiment conducted during the same five walk-along days was aimed at the future autonomy of a possible trash bin emptying robot. During the observations, it became clear that the majority of the trash bins was either broken or blocked and could not be opened without performing additional actions. It occurred that the Schoon employee had to reach with his hand in the trash bin to open the door from within or had to support the inner mechanism with his legs to prevent it from falling to the floor.

The question that I wanted to answer during this experiment was: “How would the Schoon employee behave when the trash bins are emptied for them?”

During the walk-along days, I acted as if I was a robot emptying trash bins. The worker would either bring me to a trash bin or inform me of the nearest trash bin and I would empty it. I would only empty a trash bin when I would succeed in opening and replacing the garbage bag in one attempt. This way, I simulated a both full and semi-autonomous robot that could only empty a trash bin without having to perform difficult actions.

During these walk along days, it became clear that the majority of trash bins could not be emptied in one attempt. During one particular shift, we emptied 43 trash bins. Out of the 43 trash bins, only 16 bins were faced towards the road and could be opened without problems. In Figure 9, the division of characteristics of the trash bins are listed for one single route.

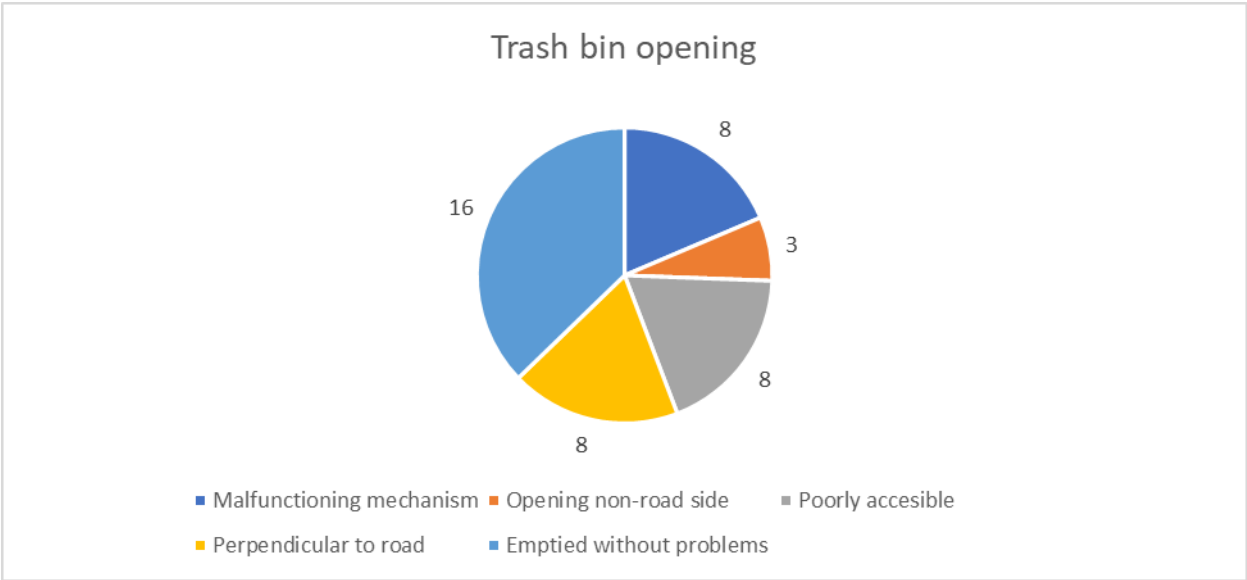


Figure 9 Division of bin opening characteristics

Figure 9 shows that for that particular route, only 37% of the trash bins allowed me as a robot to easily empty the trash bin. This is a big issue in the Amsterdam city centre. There are trash bins of which the opening mechanism is broken, trash bins with the internal mechanism broken as in Figure 10, trash bins that are blocked by garbage bags, Figure 11, trash bins with the door not aimed at the road and there are bins placed perpendicular to the road. On all these occasions, it is hard for a robot to be placed in front of the trash bin without having to perform additional actions.



Figure 10 Trash bin with broken internal mechanism



Figure 11 Trash bin blocked by household waste

During the experiment on autonomy, not only the practical challenges were observed, the behaviour of the Schoon employee was also studied. When a robot empties a trash bin, the employee is given the chance to clean the vicinity of the trash bin. During the 5 Vuilnisbakkenshifts that I joined and where I emptied the trash bins, all the employees would continue working. None of the employees waited without acting for the trash bin to be emptied. 4 out of 5 employees started cleaning the litter in the vicinity of the trash bin. One even walked to the next trash bin to continue emptying trash bins. This showed the potential gain in efficiency that a trash bin emptying robot could create.

Due to the fact that the employees would clean the vicinity of the trash bin when the robot is emptying the trash bin, there is no need for an autonomous movement from the van to the trash bin by the robot. The employee has to walk towards the trash bin and could thus take the robot with him. This would also allow him to manoeuvre through the obstacles found on the sidewalk. There is therefore little advantage to letting the robot autonomously travel to the trash bin.

5.4 CONCLUSION

During the walk-along days, the views, opinions and actions of a very diverse group of employees became clear. It became clear that the employees value the freedom the cleaning work offers. This freedom is not necessarily caused by the freedom to choose your own route, but also the freedom to plan your activities on your route. Besides freedom, the employees mentioned that variety, both in activities and interactions in the city, is a reason why they enjoy their work. The interactions that the employees have during their work are also a reason why they enjoy their work and why they are still interested in their work. They mostly view their work as relatively light and think their wages are high for the amount of physical work they do.

Besides the high wage, the majority of the Schoon department employees stated that they also feel satisfied when they delivered a clean street or completed the tasks on their route. The employees also enjoy working outside, not necessarily due to the weather, but mostly due to the interaction the employees have during their work on the streets of Amsterdam.

The work on the streets of Amsterdam is however very complicated. The employees have to work in the chaotic traffic of Amsterdam which can be dangerous and negatively influences the efficiency. The street furniture of Amsterdam also causes the cleaning work to become more complicated. Malfunctioning and blocked trash bins make emptying those bins more difficult, something encountered often during the Vuilnisbakkenshifts. The trash that is found on the streets can also be challenging. Especially for the RAVO machine as specific materials can clog the machine leading to delays.

To prevent this from happening and to guide the RAVO through the Amsterdam traffic, the employees of the Schoon department communicate clearly with each other. The more experienced the workers are, the less verbal communication is needed. This is however not the case when temporary workers are employed. This happens very often as there is a lack of personnel. Those temporary workers need to be trained, leading to a decreased efficiency.

Last but not least, due to the subjective nature of the grading system of the cleanliness of the Amsterdam public space, the quality delivered by the teams is not the same. This differs per foreman and per shift managers. As a result, every shift and every team conducts different actions within the bandwidth of the task package.

The outcomes of the walk-along days grouped per research direction can be found summarized in the research setup found in Table 5

Theoretical Background		Context	Results
Job Satisfaction			Freedom Variety Human Interaction Task Effort Valuing Results Working Outdoors
Human-Robot Collaboration			Limited Communication Experience Responsibilities
Challenges for robots in Public Spaces	Cleanliness Levels Tasks Equipment		Challenging Environment Temporary Workers Cleaning Effectiveness

Table 5 Outcomes grouped per research direction

6. POINTS OF ATTENTION FOR ROBOT DESIGN

After having investigated what must be paid attention to when introducing a robot and how the Amsterdam Schoon department cleans the city, interviews were conducted and observations were made of the activities of the department. These interviews resulted in a series of topics that are important for the Schoon department employees. The observations resulted in a series of challenges caused by working in the Amsterdam city centre.

The next step in this research is to provide the municipality with points of attention for their future robot design. These points of attention can also be divided into the three sub directions of this research, namely points related to preserving the job satisfaction experienced by the Schoon employees, points related to the collaboration between human and cleaning robot and points related to dealing with practical challenges caused by the design of the public space and the tasks.

Some of the identified points of attention are hard to grasp directly from the dry description only. For outsiders, it might also be difficult to imagine the situations which the Schoon employees find themselves in and how the points of attention will influence such situations. In order to clarify the effects of the named points of attention, I created short fictional stories in which the effects of the attention points are portrayed in the Amsterdam context. The fictional stories are based on situations that I have been through during my walk along days. To make it easier to understand the points of attention, I added visualisations of the situation to the stories.

6.1 JOB SATISFACTION POINTS OF ATTENTION

This research revealed a series of themes important for the job satisfaction of the Schoon employees. Below, points of attention during the design process are connected to those themes.

6.1.1 FREEDOM

The Schoon employees expressed that it is important that they can plan and organize their activities during the day as this contributes to the job satisfaction experienced at the Schoon department. If the job satisfaction is not to be influenced negatively, a robot should not decrease the feeling of freedom the Schoon employees experience. This could be achieved by not making the usage of the robot mandatory during the shift that it is deployed to. The employee, being on location, can better estimate whether the usage of the robot will be beneficial for his work or not. This way, the freedom to still organize and plan their own activities is maintained.

6.1.2 USER FRIENDLINESS

The Schoon employees expressed that it is the variety experienced during their work that keeps the work interesting. If the robot must lead to an increased productivity, it should not limit the variety the workers experience, otherwise the job satisfaction will be negatively influenced. This can have a negative effect on the acceptance and eventual efficiency of the robot.

To prevent the work from losing its variety, the aim should not be to train certain individuals in the operation of the robot making them the only users. When this is the case, those individuals will be limited in the activities they can conduct within the Schoon department which will negatively influence the variety they experience during their work.

A benefit of designing a robot which is easily operated and user friendly is the fact that it could be widely distributed along all employees. These include employees with little digital knowledge or with little experience at the Schoon department.

There are older employees within the Schoon department with little digital skills. When the usage is simple and requires little digital skills, it could be distributed over a wider number of employees. A simple system also contributes to a wider deployment through the ability of temporary workers to use the robot. It sometimes occur that temporary workers , who have little experience in cleaning the city, are deployed at the Schoon department. A simple system which requires little training could also be distributed to these unexperienced workers.

6.1.3 BOOTS ON THE GROUND

Another important reason why the Schoon employees feel satisfied in their work was the fact that their actions lead to a direct result. Transforming a dirty street into a clean street works satisfying due to the fact that this is achieved through physical effort. Besides delivering clean streets, the interaction with the bystanders in the city centre were also an important reason why the Schoon employees enjoyed their work. It would be beneficial for the job satisfaction of the Schoon employees and the efficiency of the robot when there are still Schoon employees deployed alongside the robot. Besides the fact that humans are needed alongside the robot for guiding it through the complex environment, it also ensures that the Schoon employees still go out into the city where they interact with the bystanders and where they deliver satisfying results.

This interaction with the bystanders, feeling the buzz of the city and delivering satisfying results are not the case when the robot is remote controlled from an office. If the desire for human interaction has to be met, the robots should not be remotely operated from the yard. A question from one of the Schoon employees was:

“A robot? Does this mean that someone at the yard operates a cleaning machine from behind a desk?”

- Bystander at the yard, April 19th

This shows what kind of automatization is not desired when one wants to adhere to the core themes valued by the Schoon employees: the operation of a robot without the assistance of humans by its side which removes any interaction within the city.

6.1.4 TASK EFFORT

Despite the fact that the Schoon employees conduct physical work, they do not view their activities during the Veegshift and the Vuilnisbakken shift as very physically demanding. This is also a reason for many to work at the Schoon department: they receive a relatively high salary for relatively light physical work.

The interviews showed that the least liked task was collecting bulky waste due to the fact that it is a very physically demanding task. This shows that the Schoon workers expect their work to be relatively light.

To make sure that the robot increases the productivity of the department it must be widely accepted and used. This might not be the case if the robot causes the work to become significantly more physically demanding than in currently is. If the Schoon employee who is equipped with the new robot has to put in a lot of extra effort, he or she might not use the robot to its full potential.

Introducing a robot that makes the work lighter might also increase the efficiency of the department. People who were previously not able to conduct the activities due to the physical demand might now be able to conduct the activities with the help of the robot.

If one values the core themes found important by the Schoon employees, the robot should thus be light and easy to move. A robot which demands more physical input might not be accepted and might lead to a lesser increase of productivity.

Pieter, 59 years old, Vuilnisbakkenshift

After the surgery on my shoulder, today was the first day I got back on the job. The team leader promised me to make my day easy, and he definitely did! I was tasked with emptying the trash bins on the Damrak. Normally, this is a route that is physically demanding due to the many MrFill trash bins located there. However, to relieve my shoulder, he equipped me with the new Vuilnisbakkenrobot.

During the day, I used the robot to empty and refill the heavy MrFill garbage bags, as seen on Figure 12 on the Dam square. In the meantime, I used the waste picker to clean the surrounding of the MrFill when the robot was conducting its job.

On forehand, I thought that using the robot would be quite complex. I am no hero with digital devices. I have to call my children to help me with apparently very easy issues on my old phone. The robot was however easy to operate. I was informed of a future lesson on operating the robot through an application. I, however, chose to initiate the emptying action on the robot itself through the control panel on the robot.

Due to the electric support motor in the robot, I did not have to pull a heavy machine around. The usage of the robot also meant that I did not have to use my shoulder. This time, I experienced the route as light as I did not have to pull the heavy MrFill trash bags out of the bins.



Figure 12 The new Vuilnisbakkenrobot emptying a heavy MrFill trash bin

6.2 COLLABORATION POINTS OF ATTENTION

After defining the job satisfaction points of attention, it is important to define the points of attention for the design of the collaboration between the Schoon employees and the robot. These points of attention link the outcomes of the walk-along days and the with the design considerations from the framework by Cila (2022). The design considerations connected to collaboration are: *How to establish a common ground between the human and the robot?*, *When and how an agent can offer help to humans?* & *What are the most effective means for an agent to request help?*.

6.2.1 HOW TO ESTABLISH A COMMON GROUND BETWEEN THE HUMAN AND THE ROBOT?

For human-robot collaboration to be efficient, it is important that the human and the robot, working in the same environment, can sense and understand each other's intentions. Due to the fact that the robots will be deployed in the public space, there are two classes of humans that interact with the robot. The first class are the Schoon employees that interact with the robot to clean the city. The second class are the bystanders that encounter the robot while moving through the city. For both classes, it is important to understand what the robot is currently working on and what it will do next.

For efficient human-robot collaboration, the intentions of the robot should be communicated to both the direct colleagues and the bystanders. This does however not mean that the bystander have to receive the same information as the Schoon employee. For the employee, knowing the status of the activity that the robot executes is useful information, for a bystander, it is not. For bystanders, it is more useful to know whether the robot will move, whether they can pass the robot and whether they have to keep a distance to the robot. These are all questions often asked to the Schoon employees when their activities interfere with the actions of bystanders.

There are different optimal methods for efficiently communicating the intentions of the robot to the bystanders and the Schoon employees. Bystanders affected by the robot are located in close vicinity of the robot. This means that the communication of the status and intentions of the robot can come from the robot itself.

For the Schoon employee, this is not always the case. When the robot can conduct its task autonomously, the Schoon employee will continue working further from the robot, sometimes even out of sight of the robot. For the Schoon employee, it would be beneficial to know when the robot is malfunctioning, can not execute the task or whether the robot is finished with its task without the need of a direct line of sight. This means that communication between the robot and the Schoon employee has to take place through other means than the communication with the bystanders. There is a potential solution for this challenge. Many of the employees own a smart phone or a smart watch. In the future, each team will also be equipped with a tablet. To communicate the status and intentions of the robot to the Schoon employees, those devices could be utilized. This way, even when there is no direct view on the robot, it can still share its status with the Schoon employee without interfering with the information stream that the robot communicates to the bystanders.

For the robot to understand the intentions of the bystanders, artificial intelligence could be used to "learn" the robot about human behaviour. Through a series of sensors and cameras, the robot learns how to react on certain behaviour and learns from the data collected by these sensors and cameras.

This however leads to ethical questions about data gathering in the public spaces of Amsterdam and privacy challenges.

To communicate the intentions of the cleaners to the robot, the same devices could be used. An automatized RAVO machine should not overtake the Schoon employees who clean by hand because otherwise the litter would not be collected. Sensors that could observe the location of phones, smart watches and tablets through an application for Schoon department employees are an example on how the robot could sense the activities and intentions of the Schoon employees.

Important for creating this so called common ground is thus the communication of the intention of the robot to the users and the other way around. For the bystanders that travel or recreate in the public space, this communication does not have to hold the same information as the communication towards the Schoon employees. During the designing of the human-robot collaboration, this difference in communication needs should be taken into account as it will probably also lead to different methods of communication.

David, 35 years old, Veegshift

Today my team was equipped with the RobotRAVO. I drove the RobotRAVO to the Warmoesstraat where I decided that we would start our route. Here I started the autonomous program. Together with my colleagues we started to sweep the sidewalks.

Due to the newly distributed work phones, RobotRAVO kept a good distance when we moved into a side alley or had to wait for an unloading truck. Due to the fact that we could regulate the speed of the RobotRAVO in the application, we were able to increase the distance between ourselves and the RobotRAVO. At one point, we were out of sight of the RobotRAVO. After a couple of minutes, I received a short notification that the RobotRAVO needed assistance. We failed to remove a cardboard box from the pile, but the RobotRAVO did notice the box. It had stopped on the street and required me to come back and retrieve the box from the pile.

Luckily, the led screen on the back of the RobotRAVO, seen in Figure 13, informed the bystanders how they could pass the stranded machine. These days, people seem to get angry fast, but during this occasion the RobotRAVO informed the bystanders of its situation which might have prevented negative encounters with bystanders. After removing the cardboard box from the pile, I switched the machine back to manual control and collected the trash until I was back at the teams position.



Figure 1310 The RobotRAVO indicating how bystanders can pass the vehicle

6.2.2 WHEN AND HOW CAN A ROBOT OFFER HELP TO HUMANS?

The goal of the robot is to support the Schoon employees in keeping the city clean. The robot should therefore be able to offer his assistance to the Schoon employees whenever this is possible. Due to the different types of activities conducted on the Veegshift and the Vuilnisbakkenshift, the assistance the robot can offer to its human colleagues will differ.

When during the Veegshift a pile of trash is formed on the street, it has to be collected quickly before the wind blows the litter away. When a robot that is tasked with collecting this litter, it could offer its help to his human colleagues by asking them through notifications whether the robots must work closer to the Schoon employees or not. The robot might sense that the pile becomes wider over time due to the wind while the human colleagues are not in the vicinity anymore. The robot can then notify the humans of this problem, letting them know that either they have to slow down or the robot needs to be allowed to increase its speed.

During the walk-along days, it became clear that not everyone knows where the trash bins are located during the Vuilnisbakkenshifts. A robot could be designed that knows what the locations of the trash bins are. The robot could then notify the Schoon employee of the location of the trash bin to prevent it from being forgotten. However, sometimes, a trash bin is skipped on purpose when it is blocked to be emptied later when it is not blocked anymore.

The above mentioned examples showed possible ways of offering help to the human colleagues. If the core theme of Freedom is to be taken into account, the help offered by the robots to the humans should be an advise and not an order. The Schoon employees are capable enough to decide for themselves how they organize their activities during their shifts. The robot should only assist in this, not lead them through. Otherwise, the important feeling of having the freedom to organize his or her own activities, expressed by the majority of the Schoon employees as being important for their job satisfaction, will be restricted.

The way the Schoon employees are notified of the help offer deals with the same challenges introduced in the sub-chapter on common ground creation (Section 6.2.1). The Schoon employees work in an environment where a lot of noise is created and are not always in the close vicinity of the robot. Designing the way a help offer is communicated to the Schoon employees should take these challenges into account. Textual notifications might be more efficient in situations where a lot of noise is produced during work. This way, the Schoon employee receives the help offer without having to directly see the robot or hear the robot. Another benefit of receiving a textual message is the fact that the bystanders are not bothered by the notification, which will be the case when the help is offered verbally or through a textual message on the robot itself.

These examples show how the challenging environment of the Amsterdam city centre sometimes requires the help of robots, but at the same time also makes the communication of these help offers more difficult. When designing how to communicate help offers from a robot to the Schoon employees, the same challenges of designing the communication of the robot's intentions should be taken into account.

6.2.3 WHAT ARE THE MOST EFFECTIVE MEANS FOR A ROBOT TO REQUEST HELP?

The complex and unpredictable nature of the environment in which a Schoon department robot should operate and interact with cause that the robot might need the help of humans in some occasions.

When a robot is deployed, the Schoon employee does not necessarily have to be in the direct vicinity of the robot. This leads to the same situation as described at the design consideration that dealt with the common ground (Section 6.2.1). The robot might have to communicate that it needs help from a Schoon worker that might have no visual of the robot. In the busy city centre, communicating verbally showed to be not effective as the Schoon employees do not work near each other. The same challenges as in the previous sections should be tackled. This means that for communicating its need for help, the robot could make use of the digital assets used by the Schoon employees.

Communicating a help request to the Schoon employees could be achieved through making use of smart watches, phones and tablets. When the robot needs assistance from the employee, it could notify the employee through a sound signal from the device he or she is carrying. This sound signal could be combined with vibrations, making it easier for the employee to notice the robot's need for assistance, even when he or she is working next to machinery or traffic that produces a lot of noise.

The design consideration that deals with the most effective means for an agent to request help differs little from the previous design considerations about offering help and communicating intentions for the formation of a common ground. They all deal with the way how certain behaviour should be communicated to the bystanders and the human colleagues of the robot. The exact ways of communication should be refined based upon the exact reasons why the communication takes place.

6.3 PRACTICAL POINTS OF ATTENTION

Besides points of attention about the preservation of job satisfaction and human robot collaborations, there are also points of attention related to practical design choices. The practical points of attention follow from the outcomes of the interviews, observations, experiments and 3 of the design considerations from the framework by Cila (2022), namely *What task is the agent to perform?*, *What level of autonomy is appropriate for this agent?* & *When or how to release or retain autonomy?*

6.3.1 WHAT TASK IS THE ROBOT TO PERFORM?

The first practical design consideration deals with the question about what task the agent is to perform. When looking at the Amsterdam case, narrowing down to the shifts that are tasked with removing litter, four shifts can be determined. Namely the Tenantshift, the Prikshift, the Veegshift and the Vuilnisbakkenshift.

Complexity and predictability are unevenly distributed over the different shift types. In Figure 14, an overview is given of the four shift types related to litter collection and how they are related to the themes of predictability and complexity.

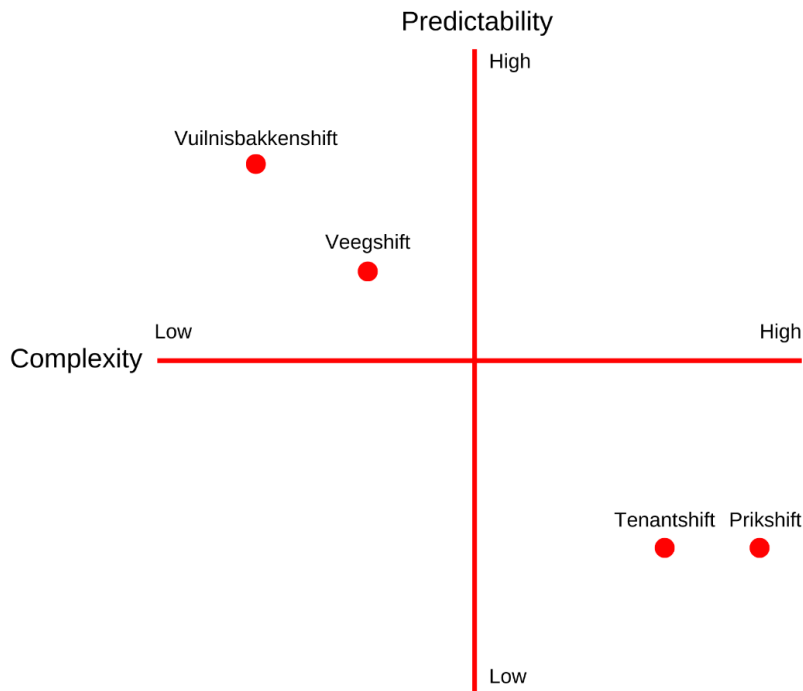


Figure 1411 Overview of the shift types and their relation to complexity and predictability

Shifts with relatively high predictability are the Veegshift and the Vuilnisbakken shift. During those shifts, the teams are deployed to set neighbourhoods with a set series of streets. The Vuilnisbakkenshift is even more predictable than the Veegshift; where during Veegshifts, litter can be located everywhere in the neighbourhood, during the Vuilnisbakkenshift the litter is located near trash bins with set locations. Those trash bins also contribute to a higher predictability as there is only a limited number of trash bin types in Amsterdam.

During the Tenantshift and the Prikshift, less predictable work is conducted. The locations where the teams are sent to can differ per day depending on the behaviour of the people in the public space that cause the pollution to happen. These shifts also work in locations where the normal shifts can not efficiently conduct their activities or work in locations where there are a lot of users of the public space. The complexity in both of these situations is higher than during the normal Veegshift and Vuilnisbakkenshifts.

This leaves the Veegshift and the Vuilnisbakkenshift as the two suitable shifts for possible robot introduction.

For the Veegshift, robot introduction is possible but challenging. During Veegshifts, The usage of the Spoelwagen and cleaning the streets by hand are two tasks that are very complex and unpredictable. Those task take place on the sidewalks filled with pedestrians and cyclists behaving unpredictable. Those same sidewalks are filled with street furniture, parked cars and loading and unloading trucks. Due to this, the environment is very complex, even for humans. Robot deployment for those tasks will not increase the efficiency of the Schoon department as robots have a harder time dealing with complex and unpredictable situations than humans do.

A possible task where robots could support the Veegshift is the usage of the RAVO. Despite the fact that the RAVO driver has to deal with the challenging traffic in Amsterdam, its task is quite simple. The other shift members create a line of trash on the street that the RAVO follows and collects. If, through the use of sensors and cameras, the RAVO could be made semi-autonomous, it could assist the cleaners in collecting the trash pile. A robot will not get exhausted due to the fact that it has to pay constant attention to the environment. Systems developed by producers of private vehicles are already able to manoeuvre a car through moving traffic without the interference of the driver. Despite the traffic looking chaotic, there are still a set of rules and regulations in place that decrease the randomness. When trash detection systems like the one used in the research by Kulshreshtha et al. (2021) can be optimized to detect trash that will clog the RAVO machine, such systems can be used to warn the Schoon employees in the vicinity of the RAVO machine that they have to remove such trash.

During the Vuilnisbakkenshift, two actions are conducted: emptying the trash bin and collecting the litter in the vicinity of the trash bin. Collecting litter in the vicinity of the trash bin is as complex and unpredictable as the hand cleaning of streets during the Veegshift, it requires ingenuity and the ability to anticipate on the other users of the public space. Humans are better capable of handling situations in which those characteristics are needed. Introducing robots for this task is therefore not desirable.

The emptying of trash bins is however a task that is up to a certain height suitable for robot introduction. There is little variance in the type of trash bins used and only two internal mechanisms exist. The action of opening, emptying and refilling the trash bin with a new garbage bag is therefore not very complicated action that does not differ much per trash bin.

Support by a robot in emptying the MrFill trash bins is especially desirable. These trash bins have an internal mechanism that differs from all other trash bins. This internal mechanism causes that the employee has to lift a potentially filled and heavy garbage bag above one's head. Due to the fact that a press system is located in the MrFill containers, it also occurs that the garbage bag is vacuumed in the container. This causes that emptying a MrFill is a physically demanding action.

Emptying a trash bin by a robot also allows the Schoon employee to focus more on cleaning the vicinity of the trash bin. This can lead to an increased productivity of the employee. He or she can conduct the cleaning activity at the same time as the trash bin is being emptied. This causes that time is saved and he or she has time to collect more litter through his or her neighbourhood.

This all is however only the case when the robot does not malfunction. This can however happen very easily. During Veegshifts, garbage not suitable for the RAVO can still end up in the pile hidden underneath garbage that looks suitable. During the Afvalbakkenshifts, it often occurs that trash bins are blocked or have malfunctioning internal and external mechanisms prohibiting it from being emptied without the interference of a human. This brings me to the following design consideration focussed on autonomy.

6.3.2 WHAT LEVEL OF AUTONOMY IS APPROPRIATE FOR THIS ROBOT?

The second design consideration deals with the question about how much autonomy and control should be given to the robot.

An aspect affected by the level of autonomy is safety. The more autonomous the robot behaves, the less human interference from an operator will take place. While working in the public space,

bystanders can get hurt when the robot malfunctions without interference from a Schoon employee. Safety measures should be built-in in the design when the robot is not operated by a Schoon employee. Further research should determine how accidents could be prevented through the design of the eventual robot and how this is regulated legally.

When looking at the environment in which a cleaning robot will conduct its work, designing a fully autonomously working robot will be challenging. Due to the unpredictable nature of the city and the obstacles encountered during the activities it will conduct, a fully autonomous robot is probably not able to operate efficiently without the interference of a human operator.

When one looks at the amount of exceptions that the Schoon employees have to make from their route and activities, it is hard to program an autonomous robot to anticipate and interact at a same level as humans are able to. The cleaners have to wait for traffic, have to work around parked cars on sidewalks and have to clear trash bins from obstacles blocking them.

It is therefore more appropriate to design a robot that is semi-autonomous. When looking at the Veegshift, the RAVO machine only starts its activities in its designated neighbourhood. Only in this neighbourhood, it slows down, uses the vacuum system and brushes. Getting to the neighbourhood means that the machine has to travel through the city towards the starting point of its shift. It would be beneficial for the efficiency that travelling towards the neighbourhood and traveling towards the refill points would still be conducted by a human as this involves participation in medium to high speed traffic.

During the Vuilnisbakkenshift, having a fully autonomous robots tasked with emptying trash bins requires complex programming. The orientation of the trash bins can differ per street just like the obstacles the robot will encounter on its way to the trash bins. This makes that navigating itself towards the trash bins a complex task which a human can do quicker. The question is therefore, is it worth the time and money to design a fully autonomous robot over a partially autonomous robot when the probable increase in efficiency is very low? It might be more desirable that a human brings the robot towards the trash bin, from where the robot will take over the action of emptying the trash bin. This means that it should be able to execute a certain activity autonomously when brought to the activity by a human. This still frees up manpower which could be used at other activities.

A fully autonomous robot that exits the yard in the morning and works all day by itself might be desirable but requires complex programming during a long design process. This robot has to manoeuvre through a complex environment and encounters many exceptions during the activities it has to conduct. Operating such a fully autonomous robot would also still require a human operator when the robot is stuck, is damaged or causes damage. Designing and deploying a robot with so called medium autonomy means that humans from the Schoon department are still around as the control of the robot is shared between the Schoon employee and the robot itself (Tiddi et al., 2020). A medium autonomy robot makes it possible to anticipate on the exceptions and obstacles found in the complex public space of Amsterdam.

6.3.3 WHEN SHOULD A ROBOTS AUTONOMOUS ACTIONS BE OVERRIDDEN?

Due to the many exceptions on the normal situation on the roads and sidewalks, there will be situations in which it is more appropriate to let the human instead of the robot conduct the task that the robot is intended to execute. This applies to tasks the human is better able to execute or because the robot can not execute the task at all.

It can occur that an employee of the Schoon department is better able to manoeuvre through a narrow street filled with cyclists and pedestrians than an AI guided robot street sweeper during a Veegshift. Such situations, which occur often in Amsterdam, ask for flexibility in the deployment of robots. It is therefore desirable that the employees can interfere with the robots actions and override its behaviour. It is therefore also not desirable that the robots work according to a set route. When the Schoon employee can deviate from the route it means that he or she is able to handle exceptions more effectively: he or she can skip a blocked street or a clean street.

During the emptying of trash bins, flexibility in the level of autonomy is also desirable. When a robot finds itself stuck at the trash bin due to damage to the bin, the employee should be able to overwrite the actions of the robot and to manually guide the internal mechanism back in.

Max, 32 years old, Vuilnisbakkenshift

This Tuesday, I was deployed on a Vuilnisbakkenshift. During this shift, I was equipped with the new Vuilnisbakkenrobot.

I tried to empty a damaged trash bin using the robot. This trash bin had a broken internal mechanism which turned out to be too challenging for the robot. I had to switch the robot to manual control and had to guide the mechanism with my hand. One of the trash bins I had to empty did not allow the usage of a robot due to the street being under construction, seen in Figure 15. On these occasions, I would not even try to attach the robot to the trash bin.

Despite the huge potential that the robot has when emptying trash bins, this does not apply to my route with many broken or blocked trash bins. I hope that next time, I get another route where I can have the pleasure of using the robot at its full potential.



Figure 15 A trash bin not able to be emptied by the robot due to the door being blocked by a street under construction

The possibility to interfere with the robot’s actions and to take over control should however not be available to anyone in the vicinity of the robot. When a robot is working, the Schoon department employees are not necessarily working near the robot. There is thus not always direct supervision on the whole robot. This means that bystanders, either motivated by interest or bad will, can approach the robot and interact with it. It is not desirable that every person can change the autonomy of the robot and take over manual control. It is however very desirable that every bystander is capable of stopping the robot in case of emergency.

The unpredictability and complexity of the environments in which the robot will conduct its activities sometimes cause that a human is better able to conduct a certain aspect of a task. It is therefore desirable that the co-worker of the robot is able to overwrite the semi-autonomous task that a robot is conducting to prevent damage and delays and to increase the productivity.

6.4 SUMMARY

In Table 6, the points of attention for the robot design are listed. The table shows, for every research direction, what the topics are that were discussed.

Theoretical Background	Context	Results	Points of Attention for Robot Design
Job Satisfaction		Freedom Variety Human Interaction Task Effort Valuing Results Working Outdoors	Freedom User Friendliness Boots on the Ground Work Effort
Human-Robot Collaboration		Limited Communication Experience Responsibilities	Common Ground Help requests Help Offers
Challenges for robots in Public Spaces	Cleanliness Levels Tasks Equipment	Challenging Environment Temporary Workers Cleaning Effectiveness	Veeg- and Vuilnisbakkenshift Semi-Autonomous Override Autonomy

Table 6 Overview of the content of the Results and Points of Attention for Robot Design chapters per research direction

7. GENERAL DISCUSSION

To find out what qualities are important for a future cleaning robot tasked with keeping the Amsterdam public space clean, an exploratory qualitative research was conducted. Every choice about the methodology influences the outcomes of this research in either a positive or negative way. Such choices related to the methodology are made based on reliability, validity and practicalities.

During this research, I strived for the most reliable and valid data to be collected. However, due to practical limitations, this was not always possible. There were however measures taken to still produce a report based on the most reliable and valid data possible within the practical boundaries. In this chapter, I critically reflect on the chosen methods and the outcomes.

7.1 SIMILARITY IN CHALLENGES

This research revealed an interesting similarity in the way the challenges of robot deployment in public spaces have the same effects on non-robot cleaning of the public spaces. During the observations it became clear that complexity and predictability of the public space not only influence the future robot design, it also influences the current activities. Unpredictability and complexity lead to lower cleanliness levels as they influence the ability of the Schoon employees to execute their activities to their full extent. There are therefore many similarities between the challenges for robot usage in public space and non-robot machinery in public space.

7.2 INCREASED INTEREST

An interesting finding related to the methodology of this research is how walk-along days and involving the end users increase their interest in the research. At the beginning of the research, most Schoon employees would express the fear of being replaced by the robot. During the walk-along days, it became clear to me that full replacement by robots was not desirable and practically not feasible. The colleagues during the walk-along days saw this. Knowing that I knew that replacement was not possible made them change their attitude towards a more helpful attitude. Knowing they would not be replaced, they started hinting at interesting possibilities and gave feedback concerning supportive activities for a robot. The walk-along days thus caused that the employees started to trust me which in the end caused useful feedback to be provided to me.

7.3 METHOD

During this research, I actively joined the Schoon employees during their activities in the Amsterdam city centre. This has several effects on the data gathering.

One of the benefits of actively joining the Schoon employees was the fact that I personally experienced the challenges of keeping Amsterdam clean. Another benefit was the fact that I was not seen as an outsider that came only for interviews, but as a helpful colleague. This caused that people were more willing to talk to me about their experiences.

A downside of the chosen method was the limited time I had to note down my findings. Due to the active involvement during the activities, I was not able to fully write down the interviews. I had to make short notes that I elaborated upon later together with the interviewee when the work allowed me to. It was not possible to record my interviews as they were conducted while actively working.

A follow up research might make use of bodycams to capture full interviews while moving and working in the public space. This way, work can continue while full interviews are captured. This might lead to more interesting findings to be collected, as the chosen method comes with the risk of losing small parts of information through only noting down keywords and short sentences.

7.4 RESPONDENTS

Another practicality that influenced the outcomes of this research is the number of employees the Schoon department deploys. In total, over 500 employees work for the Schoon department in the whole city of Amsterdam. Of the more than 100 employees working in the Centrum area of the city, I conducted 12 semi-structured interviews. It was practically not possible for me to interview every single one of the employees.

This was caused by the fact that the team managers would find employees willing to participate in my research. I therefore only spoke to people who were willing to participate in a graduation research of an external student. On multiple occasions, shift members of the shift that I joined did not want to participate in my research, either due to disinterest or mistrust. This caused that only a relatively small number of employees were extensively spoken to on the record.

To increase this number, future research initiated from within the Schoon department itself could be combined with this research. Some of the potential interviewees were reluctant to join the research because it was a research conducted by an external party not leading to any changes. By initiating a research from within the organisation, more trust might be created, leading to more participants.

To still create valid and reliable data, many observations were made. There were no shift members that were reluctant on taking me along on their route due to the research I was conducting. They agreed with me taking observations. Their actions concerning collaboration and human interaction were also revealed during the walk-along days. Observations thus made up for a lower amount of interviewees. These observations also had another benefit: they validated the stated preferences given during the interviews.

7.5 APPLICABILITY

The outcomes of the 12 interviews and the observations during all shifts are not equally accurate for each city area where the Schoon department works. The observations and interviews were conducted in the Centre area of the city, which is very different from the southern suburbs and the more rural neighbourhoods in the Noord city area.

The core themes found during the interviews and observations mostly apply to the Centrum area. This can cause that Schoon employees working outside the city centre experience other core themes. The conclusions in this report are best applicable to the busier parts of the city and especially the city centre. For other, less busy areas, additional research is needed.

This is however not necessarily the case for the practical observations. Problems like wrongly parked cars and loading trucks are a challenge for cleaning the streets everywhere in the city. The factors influencing the complexity and predictability of the activities differ per neighbourhood. When outcomes of this research are used for other city parts than the city centre, attention should be paid at how this influences the described challenges.

The city centre is however the most complex and unpredictable area of the city. When a robot can conduct its activities in the city centre, it would also be able to do so in less complex and more predictable areas of the city. The fact that equipment is shared between city parts also requires a robot to be able to deal with the situations in the different city parts.

8. CONCLUSIONS

The goal of this research is to provide the municipality of Amsterdam, specifically the Schoon department, with a set of points of attention that a future cleaning robot should encompass. These attention points depend on the tasks during which the future robot will provide support and on how the collaboration between the Schoon employee and the robot is designed.

8.1 JOB SATISFACTION

Firstly, it is important that the robot introduction does not negatively influence the job satisfaction of the Schoon employees. Core themes contributing to the job satisfaction of the employees are Freedom, Variety, Human Interaction, and the combination of relatively light work conducted outdoors.

Negatively influencing job satisfaction would therefore be a robot introduction that restricts the ability of the Schoon employees to plan their own activities.

The operation of the robot should not require designated operators, as this decreases the variety in activities experienced by these persons. It would also limit the impact of the robot when only a select number of people would be able to operate the devices. A benefit of designing a robot which is easily operated is the fact that it could be widely distributed along all employees. These include employees with little digital knowledge or with little experience at the Schoon department.

Introduction of the robot should not replace the Schoon employees. Working outdoors in the city centre contributes to the human interaction and variety employees experience. Deploying humans alongside the robots contribute to the job satisfaction of the employees and might even increase the efficiency of the robot.

Last but not least, the relatively light physical work is another aspect that the employees value about their work. Introduction of a heavy robot which requires more heavy physical effort will therefore negatively influence the job satisfaction of the employees.

8.2 COLLABORATION

Important for the efficient operation of a robot is the fact that its intentions are clear to the bystanders and users. This way, the human bystanders and operators can more easily anticipate and interact with the robot. The other way around, the robot must be able to sense the intentions and actions of its users and bystanders.

Situations will occur where the robot might need help from a human. The robot could also be used to offer help and assistance to the operator when not conducting an activity.

The above mentioned situations all require efficient communication. Users and bystanders however require different types of information. Those different types of information also require different forms of communication. In the noisy city centre of Amsterdam, choices must be made about what is desirable and what are effective communication forms.

8.3 PRACTICALITIES

The tasks that allow a robot to support the Schoon employees can be found during the Veegshift and the Vuilnisbakkenshift, as they are the least complex and most predictable shift types of the Schoon department. From all tasks conducted during those two shift types, emptying trash bins and collecting trash with the RAVO street sweeper are relatively predictable tasks which are suited for the introduction of robotization.

The higher the complexity and the lower the predictability is, the harder it is for an autonomous robot to perform its activities. Semi-autonomous robots, assisted by humans, thrive better in such situations with high complexity and low predictability due to the ability of the human to interfere. Deployment of semi-autonomous robots is therefore more efficient in the complex and unpredictable Amsterdam city centre than deploying fully autonomous robots.

The many exceptions from the regular task package pose a challenge to the optimal operation of a robot. Humans are better able to anticipate and interact on such exceptions. The human operators should therefore be given the ability to interfere with the actions the robot is conducting in order to take over control of the activity when needed.

8.4 REQUIREMENTS

This research produced multiple main points of attention. The first main point of attention shows that robot introduction should not negatively influence the job satisfaction experienced by the Schoon employees through not detracting the core themes of Freedom, Variety, Human Interaction, Working Outdoors, Light Work Effort and Valuing Results. The second point of attention related to the collaboration between robot and human shows that the robot should be able to clearly communicate its intentions, help offers and requests to the users and bystanders. Lastly, the research showed that the Veeg- and Vuilnisbakkenshifts are the shifts that offer the biggest potential for semi-autonomous robot deployment. Adhering to those points of attention, a cleaning robot would not only be able to keep the current city clean, it would also be able to keep Amsterdam clean in the future.

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Satisfaction

1. Hoe lang werkt u al bij de afdeling Schoon?
2. Wat is de reden dat u stadsreiniger bent geworden?
3. Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?
4. Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?
5. Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?
6. Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?
7. Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?
8. Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?
9. Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?
10. Aan welke van uw taken zou er meer aandacht besteed mogen worden?

Samenwerking

1. Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?
2. Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?
3. Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?
4. Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?
5. Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?
6. Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?
7. Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

The answers given during the interviews were noted down on my phone. They were then noted down in this interviews list. When an observation showed the same outcomes as during other walk-along days, this is noted.

Text in italic is observed behaviour.

13 April interview Bakkenroute

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

26 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Eerst voor het loon, daarna interesse: interesse in schoonhouden van een stad zoals Amsterdam. Je verdient goed tussen licht en zwaar werk. Was multifunctioneel en kon daardoor makkelijk aan de slag

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Altijd all-rounder geweest, variatie is een van de redenen waardoor ik dit werk blijf doen. Ene keer spoelen, dan vegen, dan vuilniswagen.

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

WAP (toiletten en stegen spoelen) en SIA klachten. Vrij in je werk, alleen aan het werk, geen voorman die je op de hielen zit. De hele stad is je wijk, je hebt de vrijheid dat je je wijk uit mag.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Tennant dienst, weggeplukt bij je ploeg om met 1 ander de prio route na te lopen. Je wordt weggetrokken bij je ploeg en moet extra werk gaan verrichten.

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Prullenbakken legen. Inhoud van de zakken kan zwaar zijn, de omgeving van de vuilnisbak kan zwaar zijn, extra zakken in de omgeving is extra werk.

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Tennant, het is een vaste werkzaamheid geworden maar is niet zo gepland.

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

SIA klachten, een extra WAP voertuig om de SIA breder inzetbaar te maken.

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Als je weet dat er een ploeg achteraan komt kan je iets laten, stel je zit in rustige wijken waar niet iedere dag men langs komt neem ik meer mee.

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

Alle taken tegelijkertijd aanpakken in een wijk met vaste ploeg.

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Blij met een schoon straatje, uitzicht weer mooi, winkeliers ook blij met een mooi uitzicht-> complimentjes en praatjes
Chagrijnige mensen, boze mensen -> negatief praatje
Verkeer in de weg

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

Tijdens vegen, help je elkaar niet, iedereen veegt alleen
Tennant dienst is ook samenwerking, je helpt een andere ploeg

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Tussen ploegen, ligt aan de collega's, kleine klusjes zoals vuilniszakje meenemen of schep lenen. Veegkipper vol, kan collega ff zakje meenemen?

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Door ervaring weet je hoe je collega's werken. Voorman geeft ook seinen.

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

De voorman stuurt je, wijst aan waar je heen moet als je begint. Op den duur weet je wat je moet doen en werk je lossen van de voorman.
Communicatie met collega's, taken samen verdelen

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

Communicatie is key, stuur je vegers

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Komen wel eens langs met de vraag of ik wat mee mag nemen, mag weigeren, neem het wel eens mee als het past. Mijn aanwezigheid en hun overschot aan afval maakt deze interactie. Klachten over de kwaliteit, burgers zeggen dat ik voor hun werk want mijn loon is hun belasting geld.

Overige

Tourist stapt eerder naar stadsreiniger dan naar agent of boa

Overgrote deel zal niet samenwerken met een machine, niet meegaan met de tijd, tijd niet rijp, veel oudere mensen.

20 april Veegshift 3 man, 2 interviewees

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

9 jaar en 6 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Via het uitzend bureau hier gekomen, **gebleven want het werk in het centrum is leuk, je ziet veel. Je doet veel verschillend werk in de buitenlucht met over het algemeen gezellige collega's.** (beide)

Je krijgt ook de vrijheid om de werkzaamheden op je eigen manier aan te pakken. (beide)

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Het opleveren van een schone straat. Wanneer de Warmoesstraat 's ochtends een puinhoop is en deze halverwege je shift mooi is voelt dat goed. Ook is er in het centrum geen dag hetzelfde, de ene dag kom je familie tegen, de dag erop een bn'er. Je hebt veel contact in het centrum.

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Vegen, grote variatie in werkzaamheden. Voorman vegen geworden want tijdens het veegwerk doe je veel verschillende dingen.

Vegen, je werkt in een team en hebt telkens een ander gebied van de stad waar je je werkzaamheden verricht.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Vuilnis halen met de vrachtwagen, zakken gooien is zwaar (Beide)

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Vuilnis halen met de vrachtwagen, het gooien van de afvalzakken is zwaar en houd je niet vol tot je pensioen. Veegwagens rijden is ook zwaar, je moet constant opletten op het verkeer en je omgeving. (Beide)

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Wanneer er geen grof zwerfafval meer ligt, een peuk is niet erg, een flesje wel

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

Geen

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Mensen vervuilen de straat waar je bij staat, gooien afvalzakken naar beneden als het vuilnis opgehaald wordt. Je spreekt ook veel inwoners en toeristen tijdens je werk. Het verkeer is ook gevaarlijk en beïnvloedt ons werk; je moet altijd op je hoede zijn. Er wordt erg op ons gelet, we zijn het uithangbord van de gemeente en moeten ons dus gedragen.

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

Ik als voorman stuur het team, ik wijs aan wie waar werkt en wat de veegmachine moet doen. *Voorman geeft ook tips, bepaalt de route en oordeelt over de kwaliteit.*

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee, niet tijdens de veegwerkzaamheden.

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren om de vegers terug naar de RAVO te roepen, kartonnen pizzadoos lag in de hoop en moest eruit, door te claxonneren en te gebaren wordt duidelijk gemaakt wat het probleem is en wie het oplost.

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, geen officieel contact met andere teams, er zijn geen werktelefoons verspreid onder de teams om elkaar te bereiken.

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

Ik stuur de mannen naar de juiste plekken door middel van gebaren en bevelen.

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Inwoners reageren soms positief op onze komst als het een bende is. Soms ook negatief als we verkeer ophouden, fietsers in de weg lopen of volgens inwoners niet vaak genoeg komen.

Overige

Centrum is zo druk dat niet iedereen daar de veegmachine kan rijden

Veel uitzendkrachten, inwerken kost telkens veel tijd, sommigen zijn niet geïnteresseerd in het werk

Niet te ver vooruit werken, wind blaast alles weg waardoor de RAVO niet zijn werk kan doen

26 april Veegshift 3 man, 1 interviewee

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

11 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Via het uitzend bureau hier gekomen, licht werk dat goed betaald wordt, gebleven vanwege de gezellige sfeer

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Het salaris, je hebt een gezin te voeden. Ook de gezelligheid maakt mijn dag goed. Het achterlaten van een schone straat voelt ook erg goed.

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Voor de spoelwagen lopen met de hoge druk spuit, je ziet direct het resultaat van je werk.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Op de veegwagen rijden, heb ik 4 jaar bijna non-stop gedaan en doe ik nu liever niet meer, wil verschillende andere dingen doen nu.

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Grof afval ophalen, zwaar en veel tillen

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Wanneer het meeste afval weg is, dus de B kwaliteit zoals voorgeschreven wordt.

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Mensen vragen of ik extra afval wil meenemen, soms huisafval. *Omstanders veroorzaken files en blokkeren stukken van de route die dan niet gedaan kunnen worden, denk aan laden en lossende vrachtwagens maar ook klusbedrijven op stoepen.*

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

Als ik voorman ben stuur ik aan, als ik veger ben volg ik de voorman. Ik sein naar de veegmachine om aan te geven hoe we een straat aan gaan pakken. Ook sein ik hem over bijzonder afval.

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

x

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

We maken afspraken vooraf of we straten van 2 kanten aanpakken of van 1 kant.
Communicatie met RAVO door gebaren en deels ervaring, ze zijn op elkaar ingewerkt en begrijpen elkaars tempo

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

Vooraf bespreken we of we een straat aan beide zijdes met de veegmachine doorlopen of maar 1 maal, dan verdeel ik de vegers over de straat.

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Groeten, geven blijk van waardering

Houden je erg nauw in de gaten als je pauze houdt

Kwamen toeristen langs die zeiden respect te hebben voor onze werkzaamheden

Overige

Leidsche plein en andere prio routes meermaals geveegd per dag, 1 normale shift, 1 tenant shift

3 mei 4 man, 2 interviewees

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

Voorman 18 jaar, collega 12

Wat is de reden dat u stadsreiniger bent geworden?

Via het uitzend bureau gekomen, **gebleven vanwege de gezellige collega's.** (beide)

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Door blije omstanders, wanneer deze blij zijn met het geleverde werk

Het loon, hoog loon voor dit soort werk

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Vegen, ik ben voorman en doe niet anders meer

Vegen, doordat je niet alleen werkt is het gezellig werken in de buitenlucht.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Duivenpoep verwijderen, is smerig en gevaarlijk werk

Grof afval ophalen, zeer gehaast werken

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Duivenpoep verwijderen, is smerig en gevaarlijk werk

Grof afval, zwaar tillen

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Duivenpoep verwijderen. (beide)

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Als de ruimte die vaak gebruikt wordt er op het eerste gezicht schoon uit ziet (beide)

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Mensen blokkeren je doorgang met hun auto's, rijden kort achter de RAVO en blokkeren daardoor het achteruit rijden van de ravo

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

Ik stuur mijn collega's op pad en geef aan welke straten we als eerste gaan doen.

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Ben voorman dus loop altijd.

De voorman stuurt in eerste instantie. De voormannen zijn meewerkende voormannen en dus soms verder op in de straat, dan communiceer je met je andere collega's als je vragen hebt.

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Ben voorman, communiceer door middel van gebaren of roep de persoon op de veegwagen naar mij toe.

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

Ik bepaal de route die we lopen. Ik verdeel de mannen over de straten die de RAVO achter ons aan gaat doen. *Voorman vertelt welke stegen wie doet en stuurt ons naar collega die nog niet klaar was, vindt normaal gesproken niet plaats want dan zijn er geen extra mankrachten over om elkaar te helpen, dan wordt door de veegmachine ingehouden.*

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Ze zijn veelal dankbaar maar ervaren ook overlast door de veegmachine en de opstoppingen die wijzelf veroorzaken.

Soms worden ze boos als we aan fietsen zitten of dicht langs auto's vegen.

4 mei bakken 1 op 1

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

5 jaar

Wat is de reden dat u stadsreiniger bent geworden?

De vrijheid die ik als wijkverzorger heb, je ziet ook nog eens wat van de stad

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Als je na je eerste ronde terug komt in je wijk en je ziet dat het er nog steeds goed uit ziet

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Vuilnisbakken legen, alleen op pad zonder gezeur, muziekje aan, geen druk maar je wordt wel verantwoordelijk gemaakt voor je eigen wijk

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Vegen, is zwaarder en intensiever werk dan vuilnisbakken legen, je kan niet alleen op pad om je eigen ding te doen

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Grofvuil ophalen, telkens in en uit de vrachtwagen klimmen om zware dingen te verzamelen

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Wanneer rond de prullenbak geen grof afval meer ligt of geen vuilniszakken meer liggen. Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Mensen blokkeren de prullenbakken met hun fietsen of huisafval op ophaaldagen. Ook kunnen ze ongeduldig zijn als je in de weg staat

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

De voorman stuurt je tijdens het vegen, vuilnisbakken legen doe je alleen.

Tijdens het vuilnisbakken legen heb je routes die snel klaar zijn, je kan dan in een andere wijk kijken of je kan helpen met de werkzaamheden in die wijk.

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren om de vegers terug naar de RAVO te roepen, kartonnen pizzadoos lag in de hoop en moest eruit, door te claxonneren en te gebaren wordt duidelijk gemaakt wat het probleem is en wie het oplost. Zelfde als de rest

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, geen officieel contact met andere teams, er zijn geen werktelefoons verspreid onder de teams om elkaar te bereiken. Zelfde als de rest

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

x

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Groeten en bedanken, boos wanneer je ze op de een of andere manier ophoudt, denk aan fiets blokkeren of bus breed op straat

Er liep een dronken man op straat die aan het schreeuwen was, de wijkverzorger zette de zwaailampen aan en sprak de man aan. Deze schrok en werd kalm

10 mei Afvalbakken man slecht Nederlands

Op dinsdagen wordt huisafval opgehaald, burgers zetten dit tegen de afvalbakken aan waardoor deze lastig te openen zijn door de wijkverzorgers. Deze moeten eerst een of meerdere zakken aan de kant zetten voor ze hun werkzaamheden kunnen verrichten. Geen interview gehouden, man sprak erg slecht Nederlands.

11 mei Afvalbakken legen

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

7 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Je krijgt veel vrijheid en je leert de stad goed kennen doordat je telkens andere leuke routes krijgt

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Als je een nette wijk achterlaat en mensen je hierover complimenten geven

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Afvalbakken legen, je krijgt vrijheid in je toegewezen gebied

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Grofvuil route lopen, zwaar werk

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Grofvuil ophalen, lichamelijk zwaar

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Wanneer mijn afvalbakken geleegd zijn

De kijk op het takenpakket verschilt per persoon, de ene persoon leegt de prullenbak, de ander maakt deze van binnen ook schoon

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Ze onderbreken je werkzaamheden door de weg te vragen, ze staan te laden en lossen, over het algemeen beïnvloedt het verkeer je in je werkzaamheden

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

De voorman stuurt je tijdens het vegen, vuilnisbakken legen doe je alleen. Zelfde als eerdere interviews

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren om de vegers terug naar de RAVO te roepen, kartonnen pizzadoos lag in de hoop en moest eruit, door te claxonneren en te gebaren wordt duidelijk gemaakt wat het probleem is en wie het oplost. Zelfde als de rest

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, geen officieel contact met andere teams, er zijn geen werktelefoons verspreid onder de teams om elkaar te bereiken. Zelfde als de rest

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

x

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Gesprekjes met omstanders, klachten en bedankjes

12 mei Bakken legen

Experimenteren met het autonoom legen van de afvalbakken. Medewerker Schoon liep alvast naar de volgende afvalbak als ik een bak aan het legen was en er een ander bak in de buurt was.

17 mei

Experimenteren met legen afvalbakken, tellen hoe vaak legen niet mogelijk was gedurende route. Werknemer heeft vaak moeten helpen maar wanneer dit niet het geval was raapte hij zwerfval in de buurt van de afvalbak op.

Houdt van de vrijheid, rijdt niet volgens route want eigen route is efficiënter. Vindt het fijn dat dit mag en kan.

18-5 Bakkenroute met iemand van uitzendbureau

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

1,5 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Via uitzendbureau, lekker buiten werken, je ziet veel gebeuren

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Als ik netjes werk aflever, als ik de taken van mijn takenpakket uitvoer

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Vegen, samen met collega's werken is gezellig.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Tenant shift rijden, meerijden met de RAVO is pijnlijk, klein klapstoeltje, weer alleen op pad

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Mr Fill legen tijdens het afvalbakken legen, de zakken die geperst worden zuigen vacuüm.

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Als mijn afvalbakken geleegd zijn.

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Mensen blokkeren de prullenbakken met hun fietsen of huisafval op ophaaldagen. Ook kunnen ze ongeduldig zijn als je in de weg staat, zelfde als de rest

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

De voorman stuurt je tijdens het vegen, vuilnisbakken legen doe je alleen.

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren om de vegers terug naar de RAVO te roepen, kartonnen pizzadoos lag in de hoop en moest eruit, door te claxonneren en te gebaren wordt duidelijk gemaakt wat het probleem is en wie het oplost. Zelfde als de rest

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, geen officieel contact met andere teams, er zijn geen werktelefoons verspreid onder de teams om elkaar te bereiken. Zelfde als de rest

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

x

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Maken een praatje als je even staat te roken, hebben vragen over hoe ze op hun bestemming moeten komen, klagen over rommel in de wijk, klagen over file door busje

23 mei Vegen Leidseplein 2 man team

Satisfaction

Hoe lang werkt u al bij de afdeling Schoon?

8 jaar

2 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Geen dag is hetzelfde door vele werkzaamheden en gebeurtenissen (beide)

Buiten werk doe ik liever dan op kantoor, heb ik eerst 15 jaar gedaan

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Het resultaat, een schone straat afleveren voelt goed (Beide)

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Vegen, ben voorman

Vegen, je bent onder de mensen in je gebied

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Grofvuil ophalen, is erg zwaar werk, zou ik niet tot ik oud ben volhouden (Beide)

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Grofvuil ophalen, lichamelijk zwaar

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Wanneer het straatbeeld netjes is en het grootste afval opgeruimd is.

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Blokkeren de weg, blijven staan als je met de hoge druk spuit aan de slag gaat

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

Ik stuur de jongens naar de straten, ik vertel de RAVO welke straten we gaan doen

Ik volg de aanwijzingen van de voorman, hou hem in de gaten

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren tussen RAVO en vegers en voorman

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, vooraf bespreken of een straat aan beide zijdes wordt aangepakt of maar 1 keer.

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

Vooraf geef ik aan hoe we een straat aanpakken en als ik meer vegers heb verdeel ik ze over de straten die we gaan doen.

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Vrouw raakte geïrriteerd toen de hoge drukspuit vuil op haar af blies.

24 mei Bakken legen

Experimenteren met legen van de bakken alsof het autonoom gebeurt. De reiniger ging zelf zwerfafval opruimen in de tijd dat ik de vuilniszak verving.

Wat is de reden dat u stadsreiniger bent geworden?

Geen dag is hetzelfde, de ene dag veeg ik, de andere dag spoel ik, ben een allrounder

30 mei bakken legen

Experimenteren met legen van de bakken volgens vaste route om invloed op vrijheid te onderzoeken. Het volgens de route rijden was geen inbreuk op de vrijheid, alsnog kan je je eigen dag inplannen. Tijdens het legen raapte de man zwerfafval op.

31 mei Bakken legen

Experimenteren met legen van de bakken alsof het autonoom gebeurt. De reiniger ging met een schep en bezem zwerfafval in de buurt van de afvalbak opruimen terwijl ik de bak aan het legen was. Ook nam hij zwerfzakken mee toen hij op mij wachtte. Hij gaf aan dat wanneer een robot de bak zou legen hij op voorhand al een priksetje mee zou nemen om in de buurt van de bak te gaan prikken.

Hoe lang werkt u al bij de afdeling Schoon?

9 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Ben begonnen via het uitzendbureau, toen beviel het buitenwerk goed, er zit een goed loon aan verbonden.

1 Juni Bakken legen

Hoe lang werkt u al bij de afdeling Schoon?

4 jaar

Wat is de reden dat u stadsreiniger bent geworden?

Vanwege ADHD kan ik lastig binnen zitten, ik houd van de reuring van de stad en ik krijg de vrijheid om zelf mijn werkzaamheden te bepalen tijdens het afvalbakken legen.

Welke aspecten van uw werk zorgen ervoor dat u voldoening voelt? Waarom is dit zo?

Het feit dat ik mijn stadje netjes kan maken, ik zou zelf ook een schone straat voor mijn huis willen.

Welke van de taken van het takenpakket voert u het graagst uit? Waarom is dit zo?

Het legen van de vuilnisbakken, je krijgt veel vrijheid om zelf je werkzaamheden te bepalen en hieraan zit dan ook een bepaalde verantwoordelijkheid verbonden.

Welke van de taken van het takenpakket voert u het minst graag uit? Waarom is dit zo?

Iedere shift die vroeg in de ochtend begint.

Welke taak die u uitvoert tijdens uw werkzaamheden is het zwaarst? Waarom is dit zo?

Meerdere dagen achter elkaar vegen, je maakt dan veel kilometers achter elkaar. Dan begint een oude blessure op te spelen en krijg ik last van mijn been.

Van welke taak/taken van het takenpakket vindt u dat deze niet in het takenpakket thuis hoort/horen?

Geen

Is er een handeling die volgens u aan het takenpakket toegevoegd hoort te worden?

Geen

Wanneer vindt u een straat voldoende schoon om door te gaan naar een volgende straat?

Als het grootste zwerfafval weg is en de straat netjes oogt.

Aan welke van uw taken zou er meer aandacht besteed mogen worden?

x

Samenwerking

Op welke manier beïnvloeden omstanders uw werkzaamheden? Kunt u voorbeelden geven?

Vrachtwagen blokkeert deel van de route, later terug komen. Fout geparkeerde fietsen blokkeren doorgang.

Als u tijdens een shift samenwerkt met uw collega's, hoe ziet deze samenwerking er dan uit? Kunt u voorbeelden geven?

De voorman stuurt je tijdens het vegen, vuilnisbakken legen doe je alleen.

Ik heb van bepaalde collega's waar ik goed mee om kan gaan de telefoonnummers, als ik snel klaar ben bel ik ze op om te vragen of ik ze kan helpen bij hun werkzaamheden.

Zijn er momenten dat u wel eens hulp moet vragen aan collega's? Waarom is dit dan het geval?

Nee

Als u op de veegkipper of veegwagen zit, hoe vindt de samenwerking met uw overige collega's dan plaats?

Handgebaren en claxonneren om de vegers terug naar de RAVO te roepen, kartonnen pizzadoos lag in de hoop en moest eruit, door te claxonneren en te gebaren wordt duidelijk gemaakt wat het probleem is en wie het oplost. Zelfde als de rest

Als u als veger werkzaam bent, hoe vindt de samenwerking met de veegwagen en de voorman plaats?

Gebaren en bevelen, geen officieel contact met andere teams, er zijn geen werktelefoons verspreid onder de teams om elkaar te bereiken. Zelfde als de rest

Als u voorman bent, hoe vindt dan de samenwerking met uw collega's plaats?

x

Op welke manier ontstaan er interacties met bewoners? Wat zorgt ervoor dat deze interacties plaats vinden?

Ze zien mij werken en spreken mij aan. Meneer helpt ook vrolijk mensen met het passeren van zijn bus of het zoeken van een adres. Weer dient de wijkverzorger als een verlengde van "de stad" en wijst hij mensen de weg.