

# The potential of big data technologies in improving the management of activity-based working

An isometric illustration of a modern office environment. The scene is filled with people in business attire engaged in various activities. Some are sitting at desks with laptops, others are standing and talking, and some are walking. The office has a clean, minimalist design with white desks, blue chairs, and a light blue floor. There are also some plants and a water cooler visible. The overall atmosphere is one of a busy, collaborative workspace.

Using qualitative and quantitative big data tools to help resolve current issues on the management of activity-based working



### **Master Facility & Real Estate Management**

Title assignment	: Thesis
Name module/course code	: BUIL-1230
Name Tutor	: Hester van Sprang
Name student	: Quintus Bol
Full-time / Part-time	: Full-time
Greenwich student nr.	: 001203375
Saxion student nr.	: 522623
Academic year	: 2021-2022
Date	: 22-08-2022
Word count body text	: 19.965

## Summary

---

Since the start of the COVID-19 pandemic, organisations have drastically started to reformulate the functionalities of their offices. The trend hybrid working has caused office buildings to have considerable low occupancy rates, as employees rather perform certain tasks at home and do not feel like the office and its workplaces optimally supports their work activities anymore. Here, the work activities remained the same, but the needs and preferences of employees have changed. This calls for a shift in workplace concepts. One of these concepts is called activity-based working. Herein, facilities like concentration rooms, leisure areas, meeting rooms and collaboration spaces are designed to provide the optimal space for employees to perform their desired work activities. However, many organisations cope with the issue that these rooms are not being used according to their purpose. This is mainly caused by the fact that employees are not sufficiently involved in the design phase. With this mismatch, office space is not being used optimally. In combination with the surplus many organisations experience due to hybrid working, the potential of technology, in particular big data technologies and its side constraints, have been researched to improve this usage of space and create a better match between the organisational goals and needs and preferences of employees regarding the concept of activity-based working.

The main findings were that organisations determine the characteristics of their workplace concept in diverse ways. However, all respondents mentioned that rooms were being misused, as employees perform individual online meetings or concentration work in large conference rooms. Organisations experience difficulties when measuring these activities and predicting the usage of rooms in the future. Possible big data technologies that provide a solution are sensorics. These gather objective occupancy data that give more insights into how frequently rooms are being used and which are more popular than others. But these cannot measure the actual activities that are performed within these rooms. For this reason, qualitative big data tools are also necessary to draw a complete picture of the usage of workplaces. These qualitative tools can be utilized to question employees multiple times a day about where they are located, what activity they perform and to what extent that workplace optimally supports their work activity. By combining these insights, an organisation can identify the misuse of rooms and assess the needs and preferences of employees, which allows for an optimization of functional space. However, these technologies do come with considerable side constraints. Firstly, the height of necessary investments is relative to the degree which the organisation wants to apply this technology, where simple occupancy sensorics are more affordable than the combination with qualitative tools and analytical dashboards which interpret data. Necessary skills and competences of employees that can correctly analyse and interpret data are also an investment. Secondly, data has to be collected, stored and analysed in an anonymous way to guarantee the privacy of users.

It can be concluded that big data technologies may improve the management of activity-based working, given that the implementation and the goal of the application is considered thoroughly. It is not a one-size-fits-all solution, so one must examine the exact workplace issues and its underlying causes. It is advised to involve users in the design phase of activity-based working by using qualitative tools like interactive survey apps, which ensures the adherence of employees' needs and preferences. This can be paired with applying sensorics in the form of pilot phases, which allows the users to gradually adapt to a new workplace environment, while simultaneously objectively measuring occupancy and collect feedback from users through qualitative surveys. The combination of these three tools optimizes the design, usage and evaluation phase of activity-based working and allows for an optimization of space.

Firstly, since this research involved a small population, further research can be conducted on a quantitative basis with a larger population. Secondly, research can be conducted on how this technology is applied in other countries, to serve as a best practice for offices here in the Netherlands. Thirdly, since the behaviour of employees is a social aspect, further research can be conducted on the usage of big data technologies to stimulate desired behaviour, like correctly using facilities or steering towards a new desired workplace culture.

## Foreword

---

In front of you lies my MSc. Thesis “The potential of big data technologies in improving the management of activity-based working”. This is my final research paper for completing my master’s degree in Facility and Real Estate Management at Saxion University of Applied Sciences and the University of Greenwich. The thesis has been written in the timespan from April 2022 to August 2022 and it will conclude my educational life and serve as a steppingstone in my professional career as a graduate. Looking back, 2022 has been a year with ups and downs for me, where the second semester of the master’s program had some setbacks. Nevertheless I was determined in finishing the thesis research and feel satisfied with the end result. Writing this thesis would not have been possible without the support and insights from many people. I hereby declare that this thesis research has been written by me individually and that I have adhered to the guidelines of Saxion University of Applied Sciences and University of Greenwich.

Firstly, I would like to thank my tutor from Hogeschool Saxion, H. van Sprang, for her consistent support and guidance throughout the entire thesis procedure. Also, her help in finding interview respondents for this thesis and her availability for discussions have been of great value.

Secondly, I would like to thank the assessor for my proposal, S. Borghuis, For grading my thesis proposal together with H. van Sprang with a high mark. This motivated me to persevere with the execution phase of the thesis.

Thirdly, I would like to thank my family for their infinite support in me during this master program. They ensured I made the best of my student career and motivated me to climb to new highs continuously.

Lastly, I would like to thank all interview respondents who contributed to this thesis. Without your input, this report would not have been possible.

I hope you enjoy reading my thesis.

Quintus Bol

Bunschoten-Spakenburg, 22 August 2022

## Table of contents

---

1 Introduction .....	6
1.1 Research problem .....	6
1.2 Context .....	7
1.2.1 Work environments .....	7
1.2.2 Workplace management .....	8
1.3 Related themes .....	8
1.4 Issues and sub-problems .....	8
1.5 Variables.....	9
1.6 Key concepts .....	9
2 Literature review .....	10
2.1 Purpose .....	10
2.2 Activity-based working.....	10
2.2.1 The concept.....	10
2.2.2 Drivers of applying ABW .....	13
2.2.3 Constraints of applying ABW .....	13
2.2.4 Operationalisation .....	15
2.3 Big Data .....	15
2.3.1 The concept.....	15
2.3.2 Big Data analytics.....	16
2.3.3 Predictive analysis.....	17
2.3.4 Prescriptive analysis.....	17
2.4 Workplace effectivity.....	18
2.5 Activity-based working and Big Data.....	18
2.6 Operationalisation.....	18
2.7 Conceptual model.....	19
3 Methodology .....	20
3.1 Research objective .....	20
3.2 Research question and sub questions .....	20
3.3 Operationalization.....	21
3.4 Research strategy .....	22
3.4.1 Philosophy.....	22
3.4.2 Approach .....	22
3.4.3 Strategies .....	22
3.4.4 Sampling .....	23
3.4.5 Triangulation.....	23
3.4.6 Time horizons.....	23
3.4.7 Data collection.....	24
3.4.8 Measurement instruments.....	24
3.4.9 Methods of data analysis .....	24
3.4.10 Summary .....	26

4 Results .....	27
4.1 SQ1 Determining the ABW concept .....	27
4.1.1 Organisational goals.....	27
4.1.2 Sub-conclusion SQ1.....	30
4.2 SQ2 Management issues of ABW .....	30
4.2.1 Dimensions.....	30
4.2.2 Workers' fit .....	33
4.2.3 Sub-conclusion SQ2.....	34
4.3 SQ3 Big Data technologies for improving ABW .....	34
4.3.1 Predicting room usage .....	34
4.3.2 Workplace management .....	36
4.3.3 Sub-conclusion SQ3.....	37
4.4 SQ4 Side constraints .....	38
4.4.1 Privacy.....	38
4.4.2 Building characteristics .....	38
4.4.3 Added value of Big Data technologies .....	39
4.4.4 Sub-conclusion SQ4.....	39
5 Conclusions .....	40
5.1 findings on sub-questions.....	40
5.2 Findings on main research question .....	41
6 Recommendations.....	42
6.1 Recommendations.....	42
6.2 Recommendations for further research.....	43
7 Discussion .....	44
7.1 Reliability, validity and limitations .....	44
7.2 Insights .....	45
List of references .....	47
Appendix A: Operationalisation of ABW .....	55
Appendix B: Operationalisation of Big Data .....	56
Appendix C: Codebook.....	57
Appendix D: Participant information letter .....	60
Appendix E: Interview topic lists.....	62
Appendix F: Interview transcript sample .....	65
Appendix G: Coding process.....	68



## 1 Introduction

---

*In this chapter, an introduction of the research is given. The problem and context are described, as well as related themes and the addressed issues regarding the research. Finally, a brief explanation of the key variables, definitions the boundaries and limitations are elaborated.*

### 1.1 Research problem

The COVID-19 pandemic has caused many organisations to revisit their workplace design. According to Hoendervanger (2021) the pandemic is likely to accelerate the pace at which activity-based working (hereafter abbreviated as ABW) is applied within organisations as user experience and cost-savings are becoming more prominent. With hybrid working becoming more popular, a lot of office space has become unused, forcing organisations to rethink the functions of what an office building needs to fulfil (Teem, 2022). Timmer, an in-house researcher at Measuremen, wrote a blog about the rise of ABW and its drivers and constraints when wanting to implement the concept. He states that organisations can tailor the functional space of an office based on the needs and preferences of employees (Timmer, n.d.). If managed correctly, organisations can gain valuable insights into the usage of rooms and potentially reduce real estate costs (CBRE, 2021). However, measuring room usage is complicated when a concept like ABW is applied, because these are used by multiple employees. Also, it is not entirely certain that employees use these types of workplaces for their designed purpose. This asks for application of real-time data to measure room usage and occupancy levels. Due to the pandemic and hybrid working, an estimated 13,3% of total Dutch real estate is vacant, which is concerning for the flow of real estate (Colliers, 2022).

Nowadays the absence of data in organisations processes seem unthinkable. The revolution of big data technologies (hereafter abbreviated as BDT) is picking up steam and more departments need to be able to cope and work with the interpretation of this data. Chen, Mao and Liu (2014) stated that in 2011 the worldwide created and copied data increased nine times in those past five years and is expected to double every two years in the upcoming future. This shows that an increasing number of companies are utilizing the opportunities of data as input. In their research, Chen et al (2014) also found that organisations need to be able to collect Big Data, which is a concept of collecting vast amounts of real-time information about the objective usage of space within a building. This information could be of immense value for the management of the physical office environment, if analysed and implemented correctly.

Within the workplace environment trends, the concept of ABW has picked up pace in the last thirty years. More recently, the possibilities of connecting data with workplaces has also become more popular. Especially within pandemic times, organisations can use data to track movement and usage patterns, gaining more insights in the organisation and the behaviour of employees. However, it is still unclear how this evolving concept can aid in the improvement of the management of ABW concepts (Your Workspace, 2018). According to Hoendervanger (2019) there is also a strong need to explore evidence-based optimization of workspaces, to improve the effectiveness of ABW. This is confirmed by Bosman (2022), who states that data and digital innovations are gaining ground. He believes smart buildings are going to be the future and that sensors will play a key role in designing the building for the future. Data-driven buildings can predict daily activities. Moreover, sensorics are becoming cheaper and more accessible throughout the years. Using data as a starting point is an absolute must to make buildings smarter and more sustainable (Veenstra, 2022).

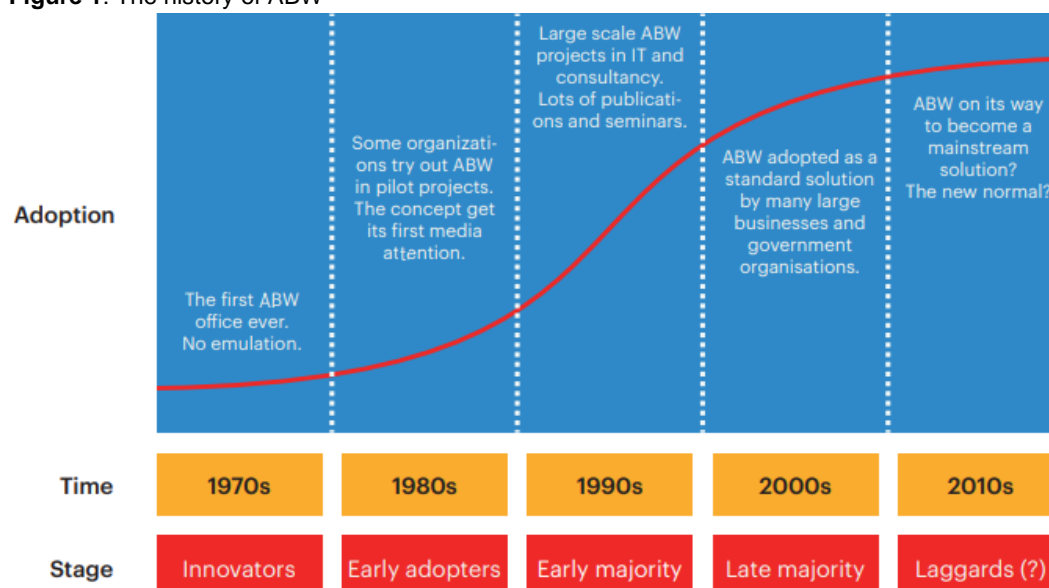
## 1.2 Context

### 1.2.1 Work environments

The work environment has changed significantly over the past decades. In the early 1900's the main instrument for creating a more effective and productive organisation, was optimizing the processes. There was hardly any attention paid to satisfaction and social interaction between workers. A few decades later, performance of a relationships between employees became more prominent in organisations. Company owners foresaw that an increase in satisfactory levels would also mean an increase in productivity (Spielberger, 2014). During the same years, a study was conducted under a group of workers at the Western Electric Company plant in Hawthorne. Here, the effect of the physical work environment on the performance of employees was studied. This study found that employees perform better and work harder when they feel like changes are being made when they engage in the decision-making process. This principle was named the Hawthorne effect and is still relevant to this day (Sedgewick & Greenwood, 2015).

Stone and Luchetti (1985) acknowledged the idea that no workspace perfectly supports or fits the large variety of work activities employees perform in a day. With the emergence of technological revolutions, it was predicted that they would completely reshape the work environments. And they were right. With the rise of the internet and remote communication, companies were excited to experiment with new types of workplaces. In the following years, the concept kept on transforming. As of today, organisations are once again experimenting with new office environments to reduce costs, optimize square meters or improve the connection between the workplace and its users (Van Meel, 2020). Companies want to keep organisational costs at a minimum, meaning a closer look is needed regarding aspects like usage of space and performance of buildings (Atkin & Bildsten, 2017). An evolution of workplaces was the logical result. Organisations can adapt technological advancements that can help the office building to analyse real estate data and evaluate building performance (Sheynkman, 2021). These developments initiate a whole new era and structure of an office building. Up until now, it is still unclear what the impact is of the usage of Big Data on the management of concepts like ABW (Hatcher, 2018).

**Figure 1:** The history of ABW



Source: ABW Practice Guide (Van Meel, 2020)



### 1.2.2 Workplace management

Since managing a large variety of workplaces in different environments is more complex than managing the same type of office rooms, it also requires a different approach (CBRE, 2021). There are a lot more elements that determine the effectiveness of this workplace concept like furniture, layout, functionality, and compatibility. Among others, these elements define the physical office environment and need to be adjusted in accordance with the goals and behaviour of the organisation and its employees (Hoendervanger, 2021). It is therefore of utmost importance that the behaviour and preferences of employees need to be considered.

Applying the concept of ABW is not the most challenging part. The hurdle is effectively and efficiently monitoring the way the concept needs to be managed to combine it with the types of employees within offices. One way to do this is to have conversations with employees to gather feedback about how satisfied they are with the concept. The problem here is that employees may feel quite different from day to day, giving divergent results based on factors like personal situations, economic stability or the time of the year. This calls for a combination of subjective and objective (data) management to get a complete picture of measuring the efficiency of ABW concepts (CBRE, 2021; Timmer, n.d.).

### 1.3 Related themes

#### **Collaborative space**

According to Van Meel (2020) office designs are primarily focused on promoting collaboration within organisations. Meeting and socialising spaces need to be attractive for workers and they need to have a strategically placed location within an office building, to improve usage experience. Organisations do this to stimulate knowledge sharing. This is also the reason organisations manage open-space office plans to improve collaboration. However, ABW goes further than just promoting collaboration. It also concerns other ways of work activities, like focus work and relaxing.

#### **Smart offices**

The term smart workplace is strongly connected to the usage of Big Data. Sensorics is used to gather all kinds of information e.g., usage patterns, occupancy levels or detecting presence within rooms. These processes can be automated, with the end goal of optimizing user experience and getting as many insights into a building's usage as possible. Departments like FM and real estate can utilize this information to adjust their services in accordance (Van Meel, 2020). Another approach to using this information is by optimizing the maintenance of an office building. JLL (n.d.) recognizes this by stating that a large number of building components can be connected with smart systems. The malfunctioning of systems can be detected from a distance, allowing for targeted maintenance. These insights can also help forecast maintenance. However, the pace at which this trend is applied to the ever-changing workplace is insufficient.

### 1.4 Issues and sub-problems

#### **Major issues**

The main issue regarding the management of ABW is the prediction of room usage by employees. Predicting how employees use the workplace concept is considered hard by workplace departments. This shortcoming causes a sub-optimal usage of space, as workplaces are being used incorrectly or not at all. This sub-optimal usage of space is detrimental to factors like workplace satisfaction and real estate costs. To this day, it is still unclear how this issue can be resolved using BDT.

## Sub-problems

Researching the potential of BDT in improving the management of ABW causes several sub-issues. First is the involvement of users, which covers the input derived from employee preferences and needs. Second is the fact that not all BDT are relevant to exploring this potential, meaning that they have to be focused towards predicting room usage. Third are the side constraints which go paired with the application of Big Data, as time and resources play a significant factor.

## 1.5 Variables

Variables that provide input for this research, are organisation that apply ABW as a concept, workplace consultancy organisations, professors specialized in the field of (smart) workplace management and Big Data consultancy organisations. These stakeholders are interviewed to gain insights into the management problems of ABW and what the corresponding potential for BDT are.

## 1.6 Key concepts

Activity-based working, workplace management, workers' fit, Big Data technologies, optimization of space, occupancy, sensorics, investments

## 2 Literature review

*In this chapter, the keywords in this research are broken down. Relevant literature is used to define and operationalise the definitions. Finally, a conceptual model is illustrated to conclude the findings of the literature review.*

### 2.1 Purpose

Before the literature review has been conducted, the purpose and methods of the literature review have been established to define what to research, how and why. For this study, the inductive approach was used as a starting point. According to Saunders, Lewis and Thornhill (2015) this method is based on exploring relevant literature and formulating a conceptual framework which summarizes the findings and relationships between concepts. This literature-based conceptual framework is then assessed in the field using interviews. To guarantee a high-quality literature review, the majority of sources used are a mix of mostly academic papers and partly industry reports.

### 2.2 Activity-based working

#### 2.2.1 The concept

The definition of ABW is described by Engelen et al. (2019) as the optimal support of performing work activities, by adding workplace features that are ergonomic and flexible. For instance, project- or brainstorm rooms have team desks and whiteboards, isolated concentration areas have room for one or two persons to perform concentration work. Using this principle, every room or area has its own unique feature that optimally supports the desired actions. Figure 2 below illustrates this concept. On the right, concentration rooms with natural daylight are shown. On the left, open workplaces to discuss and socialize are present.

**Figure 2:** Activity-Based Working



Source: (Kinnarps, n.d.)

Wyllie et al. (2012) define ABW as a workplace strategy that offers employees a variety of workplace environments. People are free to locate themselves in areas that are suitable for their specific tasks. Spaces range from meeting places to focused work. A key variable here is flexibility. ABW allows corporate real estate departments to shrink and expand the workplaces depending on the demand and organisational possibilities. ABW spaces typically also have an employee ratio less than 1.0, which enables the contraction of functional square meters and a reduction of operational costs. This is because traditional office spaces are replaced by fragmented spaces that all support a specific activity, thus reducing square meters per employee.

A third definition of ABW is mentioned by Arundell et al. (2018). They emphasize the importance of an active and supportive work environment on the physical and mental health of employees. They describe ABW as the transition of traditional allocated seating of employees to a variety of workspaces specially designed for specific tasks like individual concentration work, phone conversations and meetings. Employees are free to choose their work environment as they see fit. They also mention the incorporation of centralised areas for eating and travelling inside the building. This way, organisations want to stimulate social interactions and cohesion.

According to Ross (2006) the concepts' foundation is based on three pillars. These are people, place and technology. It helps understand employees when they perform various daily tasks, making sure the office environment suits and supports these tasks. When realising how people want to perform their tasks, it can be defined what technologies and space they need in order to execute these tasks optimally. This correlates with hybrid working, which enables the possibilities for employees to do high-concentration or creative work in environments other than offices, wherever they desire.

One of the most recent and acknowledged sources of ABW is the Activity-based working practice guide from Juriaan van Meel. In his guide, he defines ABW as "a way of working in which employees make shared use of a diversity of work settings that have been designed to support different kinds of activities" (Van Meel, 2020). There are three dimensions that depict the concept of ABW: Spatial, digital and social. The spatial dimension is about the building itself and the kinds of workplaces it offers. The digital dimension is about the technological tools that employees require to work anywhere at any time. The social dimension is about how employees and management communicate and interact with each other. A more detailed description is illustrated below.

**Table 1:** The three dimensions of ABW

SPATIAL DIMENSION	DIGITAL DIMENSION	SOCIAL DIMENSION
The building and the spaces it provides.	The technologies that people need to be able to work mobility.	The way staff and management work, manage and interact.
<p><u>Diversity</u> – different settings for different activities, balancing open and enclosed spaces.</p> <p><u>Free seating</u> – all spaces can be used by everyone.</p> <p><u>Availability</u> – workspace numbers should provide staff with real choice.</p> <p><u>Ergonomics</u> – all settings should be usable by everybody.</p> <p><u>Zoning</u> – different areas for quiet and lively activities.</p> <p><u>Limited storage</u> – as few filing cabinets as possible, although there should be room for personal items and some team storage.</p>	<p><u>Mobile devices</u> – light, powerful tools with long battery lives that can be quickly fired up from any location.</p> <p><u>Collaboration apps</u> – applications that allow employees to stay in touch in an easy and intuitive way.</p> <p><u>Workplace apps</u> – apps that enable employees to find empty workspaces and to locate their colleagues.</p> <p><u>Cloud solutions</u> – Internet-based applications and filing systems that allow employees to work from anywhere.</p> <p><u>Top-notch infrastructure</u> – all the practicalities: docking stations, power sockets, a robust Wi-Fi network and high-quality screens.</p>	<p><u>Autonomy</u> – greater freedom (and responsibility) for employees to decide when and where to work.</p> <p><u>Results-oriented management</u> – judging employees on their performance rather than their presence in the office.</p> <p><u>Mutual trust</u> – as employees are not necessarily in the direct sight of their managers, mutual trust is essential.</p> <p><u>Courtesy and respect</u> – sharing workspaces requires that people are more considerate of one another's workplace needs.</p> <p><u>Being mobile</u> – moving to different spaces or locations when the task requires it.</p>

Source: ABW Practice Guide (Van Meel, 2020)

### *Spatial dimension*

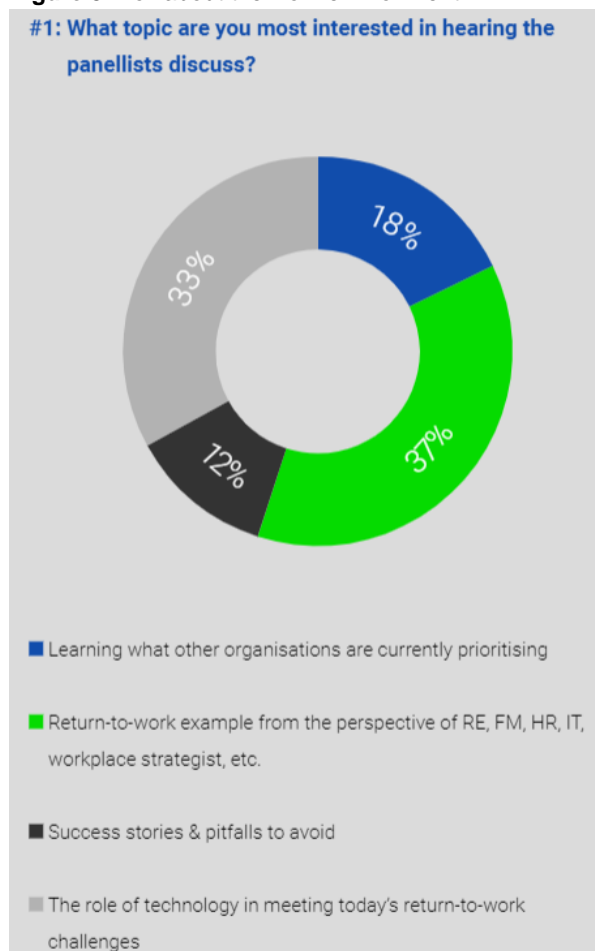
This table shows that the three different dimensions are rich in relevant aspects. For example: within the spatial dimension, it is not only about how the lay-out of the building is used, but also the occupancy

levels, diversity of workplaces, flexibility of furniture and psychological nudging to stimulate desired behaviour (Van Meel, 2020). For an effective workplace, it is necessary that the balance of workplaces must be aligned with the behaviour and needs of the employees (Hoendervanger, 2021). When employees have insufficient insights into the availability of workplaces, their uncertainty grows, as the confirmation of being ensured a workplace is absent. This requires methods which reliably measure active presence of workplaces, combined with a straight-forward overview for the employee to see (Kallenbach, 2016).

### *Digital dimension*

In order for the modern ABW concept to work as intended, it needs to be combined with digital tools which enhance the workplace experience and give better insights for improving the management of the workplace concept. Workspaces may seem to be well-fitted with the right types of technology and the occupancy may seem sufficient, but both of these elements vary between types of organisations and even workdays within the week (Van Meel, 2020). When managing a workplace concept on a strategic level, tailored data insights and planning enables the ability to forecast the usage of rooms and workspaces (Planon, 2022). Since organisations are gradually adapting to new ways of working, this usage of data is becoming an increasingly interesting topic. Planon regularly organises panel discussions about the emerging trends and developments within the field of FREM and digital innovations. Prior to their latest discussion, a poll was held about the most prominent factors in today's work environment. Out of 880 respondents in the field of FREM, 33% of them said they wanted to learn more about the role of technology in meeting today's return-to-work challenges.

**Figure 3:** Poll about the work environment



Source: Key findings: Workplace experts discuss facility management, technology & the future of work (Planon, 2022)

### *Social dimension*

The social dimension is about communicating and interacting. The critical success factor is that mutual trust needs to be established between employees and management staff. This benefits the degree of responsibility employees can manage when wanting to work from any place at any time. In an ABW environment, workers can choose any desk they like or even work from outside the office, while the management is convinced of the fact that they conduct their work properly (Van Meel, 2020)

The way Van Meel (2020) describes the definition of an ABW environment fits this research best. In his practice guide, he fully dissects and analyses the origin, concept and applications. Because this research is about the combination of Big Data and ABW, the added value of the digital dimension will be of excellent value to explore the possibilities of the two concepts. Also, because there is a strong need to gain insights into the role of technology in bringing people back to work in newly designed workplace concepts, including the technological part would make it easier to relate the concepts of Big Data and ABW. Ross (2006) also mentions people, place and technology, but not as detailed as described in the Activity-based working Practice Guide by Van Meel. Moreover, the latter is published fourteen years later, making it a more viable and current source.

### 2.2.2 Drivers of applying ABW

The popularity of changing corporate workplaces is increasing and companies are starting to see the potential benefits the concept brings. Cushman & Wakefield (2013) conducted a survey in North America, Europe, the Middle East and Asia about the degree to which companies actively steer towards a new workplace concept. 65% of the respondents were in the process of implementing a change. When asked what the biggest factor to evaluate the success is, they mentioned employee satisfaction and real estate cost savings as the main two drivers. In his PhD research about workers' fit and activity-based workplace concepts, Hoendervanger (2021) mentions that the need for ABW is increasing rapidly because of the COVID-19 pandemic. A flexible work policy also calls for a flexible office space, where employees can perform their own desired work activities at the office. In this way, an office building needs to be optimized to offer as many workplaces and functional space as possible.

Timmer (n.d.) mentions that sustainability will be the main driver for ABW. Large office buildings and commuting to and from work contribute to a substantial portion of carbon emissions from the built environment. Another driver he considers is the optimization of real estate usage. This is one of the biggest sources of costs an organisation structurally has, so a professionally managed ABW concept may reduce real estate size.

Another driver to apply ABW is the increased need for autonomy of employees. In a hybrid working survey with over 5.000 employees, 59% of respondents mentioned they would prefer an organisation which allows them to work from anywhere at anytime. These are more output-driven organisations, as they are more focused on results rather than strict protocols and policies about working at the office (Reisinger & Fetterer, 2021).

### 2.2.3 Constraints of applying ABW

#### **Resources**

Although companies want to use the concept of ABW to increase e.g. job autonomy, work pleasure, higher productivity and flexibility, there are some misunderstandings about applying the new way of working (Van der Voordt, 2004). ABW differs significantly from organisation to organisation, and these aims are often miscalculated. This can have multiple causes. Cushman & Wakefield (2013) assessed barriers to the implementation of workplace change in organisations in the same survey as mentioned in Paragraph 2.1.2. The top three barriers were resistance from managers, lack of funding and

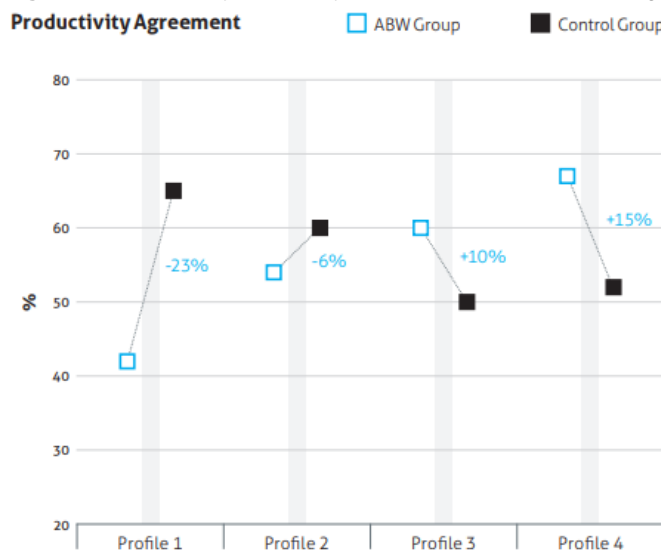


resistance from staff. Other resources needed for implementation like the number of people and training were not considered as constraints by the respondents. Van Meel (2020) examined the issues when applying ABW. For instance, the availability of space is a factor that influences the success of the concept. From the user perspective, it means that employees may feel the need to reserve workspaces longer or earlier than necessary. This is the result of too few seating possibilities. This report mentions seven solutions to counter this problem. Examples are reducing the share ratio of spaces, making an overview of bookable spaces and creating an overview to give employees insights on the availability and reservation options of rooms.

## Workers' fit

Leesman (2017) created the largest benchmark about how corporate workplaces support employee and organisational performance. The survey examined more than 1.700 workplaces in 63 countries, which support more than 220.000 employees in their daily activities. The goal was to give organisations an effective method of evaluating the quality of the workplace. One limitation they mentioned was that employees have diverse needs regarding workplace facilities. There are four profiles that characterize the majority of employees. Profile one represents the type of person who occupies the majority of his day at a single workstation and rarely moves. Profile two also does this, but occasionally moves around the office to use other workstations. Profile three is mostly on the move within the office and rarely sits down at a single workstation the entire day. Finally, profile four is always using different types of work settings based on the work activity. This person does not base itself at a single workplace. Leesman concluded that 84% of young people work from a single work setting and rarely change settings (profile 1). This is a problem quickly overlooked by organisations. An example is shown in Figure 4 below.

**Figure 4:** Productivity of employees within ABW and control groups



Source: The rise and rise of activity-based working (Leesman, 2017)

The analysis shows that the perceived productivity of 'Profile 1' employees is 23% lower than the control group. This corresponds with the profile descriptions, as these employees fix themselves at a single workplace throughout the day and do not perform optimally when needing to work in an ABW environment. On the other side of the spectrum, there is the 'Profile 4' employee. These people are used to switching places all the time. When an ABW concept was applied, perceived productivity was increased by 15%. These results show a direct correlation between the type of personality and the degree to which an ABW concept is beneficial to the employees. In addition, Timmer (n.d.) emphasizes that employees need to feel confident they can change workplaces without backlash from their manager.

## 2.2.4 Operationalisation

A full overview of the operationalisation of ABW can be found in Appendix A: Operationalisation of ABW.

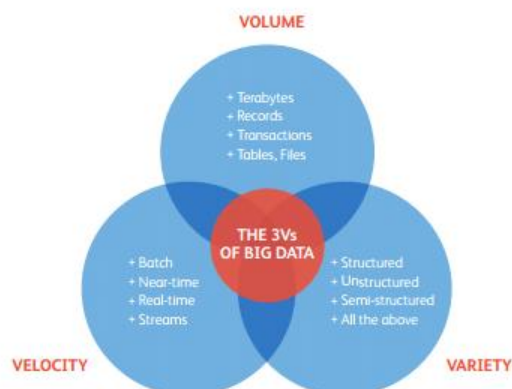
## 2.3 Big Data

### 2.3.1 The concept

When Big Data was becoming increasingly popular in operational processes, Gartner (2012) defined it as the following: “Big Data is high-volume, high-velocity and/or high variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making and process automation.” In a more recent paper from Gartner (2022) shows that data analytics can be utilized to identify, prioritize, fit, rethink and build strategic decision-making within a large variety of business processes. Kaisler, Armour, Espinosa and Money (2013) characterise Big Data with four components. First is value, which determines the usability of the generated data in decision-making. Second is variability, which implicates the irregularity of data flow with peaks and dips based on usage intensity. Third is complexity, which is the degree of collaboration connections of systems data. And finally there is veracity, which is reliability of data. The information derived from systems need to be accurate and real-time.

Three years later, Hartmann, Zaki, Feldmann and Neely (2016) later described Big Data as ‘the new oil’ and that the information derived from Big Data can be used to improve business processes and autonomy of systems. Moreover, they state that the evolvement of the literature about Big Data has caused a rapid growth in applying the technology to create value in a companies’ innovation capacities and strategic management. Although this source dates back to 2016, the popularity of this technology is still gaining ground (Veenstra, 2022). Ahmed, Aziz, Tezel and Sibley (2017) described that Big Data has gained ground since the early 2000s during the Big Data revolution. It was then defined as the volume of data which traditional databases were unable to process and analyse. The systems and databases evolved alongside the evolution of Big Data in order to keep up. They defined it as data that is at the edge of modern technology’s ability to store and manage. Oracle (n.d.) defines the term by using the three V’s: (1) volume, (2) velocity and (3) variety.

**Figure 5:** The three Vs of Big Data



Source: (Psannis et al, 2018)

In a dissertation of the MSc program Engineering Management, Kiziltan (2018) described a similar difference between regular data and Big Data (see Table 2). The volume of data is exceptionally larger than regular (structured) data. This is due to the fact that the data is collected unstructured and in much

larger quantities. Moreover, defining the relationship between various sources of Big Data is more complex, as it arrives in large quantities. Because of this, the performance management of technical departments need to be restructured, as more analytical skills and resources are required (Portela, Lima & Santos, 2016).

**Table 2:** Traditional versus Big Data

<i>Parameters</i>	<b>Traditional Data</b>	<b>Big Data</b>
<i>Type of Data</i>	Structured	Unstructured
<i>Volume of Data</i>	Terabyte	Petabytes and Exabytes
<i>Architecture</i>	Centralised	Distributed
<i>Relationship between data</i>	Known	Complex
<i>Sources of Data</i>	<ul style="list-style-type: none"> <li>• Documents</li> <li>• Finances</li> <li>• Stock Records</li> <li>• Personnel Files</li> </ul>	<ul style="list-style-type: none"> <li>• Photos</li> <li>• Audio and Video</li> <li>• 3D Models</li> <li>• Simulations</li> <li>• Location Data</li> </ul>

Source: Kiziltan (2018)

These different sources that describe the components of Big Data are similar. All mention that this type of data is unstructured, large in quantity and complex in terms of handling and analysing. However, the three Vs as described by Oracle (n.d.) and illustrated by Psannis (2018) are most organized and therefore practical to dissect. In addition, this definition describes the term variety (which is reliability of data). according to Talend (n.d.) this reliability of data is for many organisations the foundation on which they build their systems, as a constant flow of the same type of data is necessary to correctly interpret and analyse it. Kaisler et al. (2013) also mention variability, which means that the flow of data is irregular based on usage intensity, which also impacts reliability of data. Therefore, this element is of essence to include.

### 2.3.2 Big Data analytics

To have a better understanding of the application of Big Data workplace management, it is essential to define the term Big Data analytics. This term is first described by Boyd and Crawford (2012) as a skill that turns substantial amounts of raw and unstructured data into usable actions for the organisation. Herein, added value for the business and return on investment are considered drivers to correctly analyse Big Data. Japkowicz and Stefanowski (2016) define the term by mentioning the difference between Big Data analytics and traditional data analytics. Regarding processing of data, they describe that Big Data comes in constant and large streams and need continuous attention, as opposed to regular data that comes in batches which do not need intensive monitoring. Also, Big Data may not fit into the standard memory systems, implying the need for more advanced storage of data. The biggest barrier to Big Data is that valuable data is buried in massive amounts of useless data. Chen et al (2014) and Sariroglu and Sinanc (2013) mention eleven main potential barriers when analysing Big Data.

**Table 3:** potential barriers for implementing Big Data analytics

(1) Data presentation	(7) Data redundancies
(2) Data lifecycle management	(8) Data security and confidentiality
(3) Energy management	(9) Interdisciplinary cooperation
(4) Inexpert staff	(10) Investment and maintenance costs
(5) Hardships in designing analytic systems	(11) Lack of current database software analytics
(6) Lack of business leadership	

Source: Chen et al. (2014); Sagioglu & Sinanc (2013)

In the following years, Big Data analytics has been automated in a rapid pace. This was the next step in data analytics, where researchers from Massachusetts Institute of Technology found that computers were far more efficient in analysing Big Data than humans, where it took them just a few days to decode an algorithm with corresponding data, while it took humans months to execute the same analysis

(Engineering.com, 2016). The benefit of automation is that this technology reduces operational costs, due to the reduction of human interaction. In addition, the efficiency could improve as computers are better at solving algorithms and analysing data (Goyal, 2017). Another benefit of automation is that it collects data more quickly, allowing for a higher input which can be categorized in formats, which makes it easier for data analysts to read and understand. This way, these data analysts can make choices more effectively and quickly. However, the automation of data also bears risks. According to Deloitte (2019) the most probable risk is an increased vulnerability to cyber attacks. By involving less human interaction with the handling of sensitive information, a cyber breach would mean amplified damage to the organisation. Also, using these systems means that the necessary skills and competencies need to be present: employees who know how to operate the software and all its constraints.

Although there are many ways to analyse Big Data, there are three generalised applications for organisations. These are (1) descriptive analytics – involving the description of knowledge patterns, (2) predictive analytics – forecasting to determine future possibilities, (3) prescriptive analytics – helping in decision-making by assessing actions and their impact (Wong, 2017).

There are two definitions that are best suited for this research. First is the theory from Japkowicz and Stefanowski (2016). They emphasize the differences between regular data analytics and Big Data analytics, which require specific competences and expertise. This theory is supported by the studies of Chen et al (2014) and Sarioglu and Sinanc (2013), who mention inexpert staff and hardships in designing analytic systems as a barrier. The second theory is from Wong (2017). They describe the several types of use-cases for Big Data, two of which are useful for this research, namely the predictive and prescriptive analysis. This correlates with the improvement of the management of ABW by predicting usage room usage. Automation can play a role here according to Goyal (2017). Automatically collecting, storing and analysing data can help reduce operational costs and can make it easier to use this data to improve organisational processes or, in this case, the management of ABW.

### 2.3.3 Predictive analysis

Predictive analysis is a tool to predict future results and usage with the help of historical data and AI. Organisations use this type of analysis to gain a better understanding of how their building and organisational processes are used. This type of analysis is based on four sequential steps: (1) Collecting data. In this stage, data is collected from various sources like room usage, feedback forms or apps and survey results. The type of data to be collected depends on the type of organisation and its goals. (2) Processing data. When data is collected, it needs to be stored in systems that are designed to manage vast amounts of data. This is usually done by gateways which are spread out throughout the building. The data will be gathered in an organised and central manner. (3) Cleansing. The data input is raw, so it needs to be cleansed of errors, irrelevant info and duplications. (4) Analysing. After the relevant data remains, tools like data mining (which helps uncover patterns) and self-learning machines can be used to help analyse the data (Kvartalyani, 2021). All this information can be made visible in dashboard tools like Power BI, which organizes raw data and Excel-input into structured, interactive and user-friendly data (BI.nl, n.d.).

### 2.3.4 Prescriptive analysis

Where predictive analysis examines based on historical data, prescriptive analysis focusses on what the course of action needs to be. This is a process where data is used as input to determine the optimal course of action. The output contains objectively-based recommendations. In many cases, machine learning tools are used when conducting this type of analysis. It can be combined with input from predictive analysis. For instance, when the majority of employees fill in a survey about their low level of satisfaction of the workplace, it will acknowledge this and give recommendations on how to improve the workplace. However, it is important to note that software cannot replace emotional decision-making, so it should be combined with human interaction in order to be successful (Cote, 2021).

## 2.4 Workplace effectiveness

Big Data has gone from a tool to optimize business processes, to being multi-use for all kinds of organisational aspects. Waller (2020) stated that the creation of data-driven organisations is not a technical matter, but a matter of culture. Data-driven cultures are usually created top-down. Striving leader tend to use innovative ways to make a business run more effectively, thus resorting to the usage and automation of data. The essence here is that this data is not meant to be more successful towards one's customers, but towards the employees themselves. This means that the right equipment, skills and structures are necessary to become truly data-driven. For this research, this extra insight has been useful, because, as stated in Paragraph 2.2.3, resistance from staff and employees might be a barrier when managing ABW, which is a social/cultural issue.

## 2.5 Activity-based working and Big Data

The usage of data to gain more insights into a building's performance has become significantly valuable, especially since the COVID-19 outbreak. The organisational leaders need to be very much aware of how the workplace is performing and what employees think of it. This can be done by using quantitative and qualitative data collection (Murray, 2019). Spacewell (2019) describes that the use of smart user interfaces and technologies can help improve the effectiveness of workplace management. For example, organisations are looking to utilize usage-data of spaces and areas to collect insights on real-time occupation. Employees can sequentially use this information to reserve rooms based on factors like occupancy, temperature and humidity levels. An increasing number of organisations are using these systems to track employee behaviour and optimise the offer in workplaces. (Van Rijn, 2022).

The combination of workplaces and Big Data is also mentioned by Your Workspace (2018). They emphasize that we already give and exchange vast amounts of data in our personal lives, like on social media or streaming platforms. All of these tools are designed to collect data about user preference based on their activity history. Regarding data in organisations, some departments already use data as input for future decisions, like finance to forecast expenses and HR to predict employee patterns and salaries. The application of Big Data and workplaces are beginning to form as well. Using this technology, organisations can establish strategical plans regarding employees by measuring usage patterns of ABW areas. Syp (2016) states that using Big Data could be beneficial when trying to optimize the workplace environment. Sensors and heatmaps track employee movement, providing insights into usage patterns and preferences. When certain rooms are used much less frequent than others, this could lead to more effective strategical decisions when forming the ABW concept.

## 2.6 Operationalisation

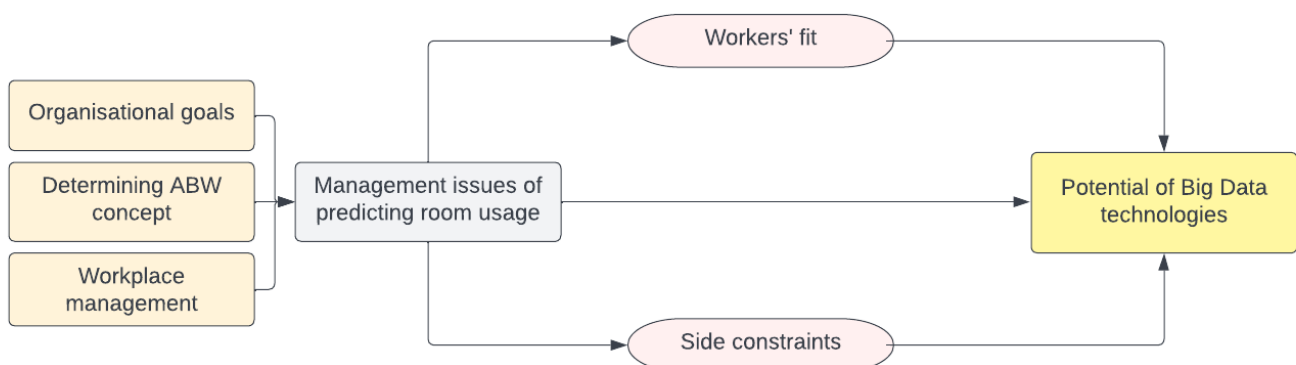
A full overview of the operationalisation of Big Data can be found in Appendix B: Operationalisation of Big Data

## 2.7 Conceptual model

The concepts of ABW and Big Data show several similarities. First, ABW and Big Data are both focussed on optimizing work processes and space. ABW does this by offering workplaces that are optimally designed for the desired work activity. Here, the ultimate goal is to decrease real estate costs, improve spatial flexibility and productivity and enhance job satisfaction. Big Data uses substantial amounts (batches) of data to gain insight in usage patterns and to ultimately decrease real estate costs, make systems and the building itself more efficient and effective and predict or prevent certain outcomes.

Not all of these factors will be considered in this research. The focus will be on exploring the potential that Big Data has on the management of ABW. The first factors researched are the reasons why an organisation choose for the concept and how this concept is established. Here, the three dimension of Van Meel (2020) have been used to give a complete overview of the concept 'workplace management,' to ensure an integrated approach to the problem statement. Based on this information, the management issues that organisations encounter regarding the prediction of room usage have been described. This forms a basis to what the potential of BDT are, that are focused on improving the prediction of room usage. The workers' fit is the moderating factor, which influences the relationship between the management issues and the viable solutions. If the concept is not based on the needs and preferences of the employees, BDT are not the solution. In that case, the ABW concept first needs to be improved. Applying the technology also has side constraints, like investments, knowledge and IT infrastructure. This can be measured and are crucial in understanding to what extend Big Data actually could deliver potential for improving the management of ABW.

**Figure 6:** Conceptual model





### 3 Methodology

---

*In this chapter, the research objective and questions that derived from the literature review, are described and operationalised. The main research question is divided into sub-questions, allowing for a more detailed exploration of the concepts.*

#### 3.1 Research objective

The main objective for this research has been to explore what the potential of BDT are to improve the management of the ABW concept. With this improvement, organisations can use BDT to optimize their usage of functional space. ABW has been around for almost thirty years and is now starting to take on a new shape because of the digital revolution caused by Big Data. Partly since COVID-19 has caused a rapid transformation of offices and workplace designs, the workplace facilities are transforming as well (Hoendervanger, 2021), meaning organizations need to reconsider their management of these facilities to get the full potential out of this combination of concepts.

#### 3.2 Research question and sub questions

##### Central research question

The central research question is derived from the introduction and the literature study. It is clear that the combination of Big Data and ABW needs further research. Extensive literature has been found on the concepts themselves, but not about the practical usage and implications of the concepts in relation to each other. For this reason, the following central research question has been formulated:

*“What is the potential of Big Data Technologies for improving the management of activity-based working in offices?”*

The central research questions give insights into what the potential is of BDT for organisations to improve their management of ABW. Using this type of technology requires a thorough investigation of where the issues are located within the management of ABW, to consequently find viable solutions that help resolve these issues. Moreover, Big Data is usually associated with quantitative data (Hiter, 2022). In this research, the possibilities and added value of qualitative Big Data tools have also been examined, providing another perspective to the potential of Big Data in ABW.

##### Sub-questions

The central research question has been broken down into four sub-questions, which have been examined in a chronological order. The insights of sub-question have provided the input for sub-question two, etc. The four sub-questions are described below.

##### *1. How do organisations determine the characteristics of their ABW concept?*

Answering this sub-question will give a clear picture of how companies determine why they choose for ABW. By researching this, the underlying drivers are objectified. These underlying drivers may have been of influence on the way the characteristics of an ABW concept has been established. This combination gives a complete picture of the motives to choose for ABW. It was expected beforehand that COVID-19 would have had a significant impact on why and how organisations choose for ABW, as stated by Hoendervanger (2021). For this reason, both elements were included. The output of this sub-question has also allowed for a better understanding of the perceived main issues regarding the concept.

## 2. What are the main issues with the prediction of room usage within the concept of activity-based working?

This sub-question provides insights into what the main issues are of predicting room usage. The focus of this sub-question was spatially- and technologically related issues, which allowed for a better connection with the third sub-question. ABW organisations themselves have a good understanding of where their main issues lie, as advisory parties have offered a different point of view, ensuring a more coherent answer. These use different metrics to measure issues and success, which allows for a more enriched input for sub-question three. Information has been gathered about what predictive processes are not being fully optimized, which will also give insights into the user-perspective side of the research question.

## 3. Which Big Data technologies are suitable for predicting room-usage?

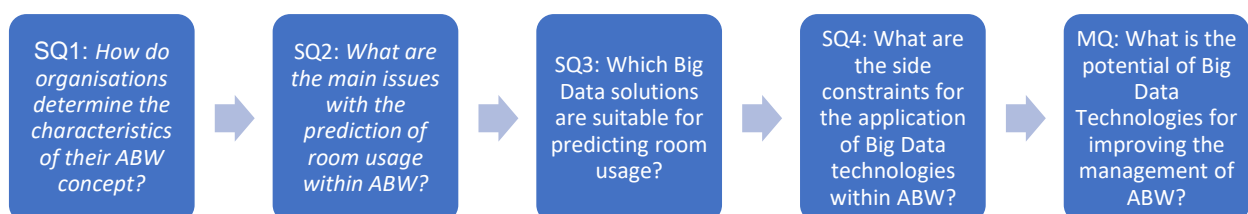
This sub-question gives insights into the supplier side of the application of Big Data within ABW. The knowledge of suppliers and advisory parties that are specialized in applying the technology into other organisations has been vital in drawing a complete picture of drivers and constraints from both sides. If only one of these groups would have been chosen, only the operational side or the technical side would have been researched, which would result in a loss in reliability. This sub-question is deliberately placed after the first and second, because the way organisations determine their ABW concept and analyze their issues has provided a more specific input for interview questions with specialized Big Data organisations. More information-rich questions can be formulated this way.

## 4. What are the side constraints for the application of Big Data technologies within ABW?

Based on experience of these specialized organisations, they can elaborate more on what actions need to be taken to implement the technology to improve the management of ABW. It is expected that organisations that do manage an ABW concept will give an exceptionally large variety of answers, because every organisation is different. For this reason, specialized organisations are more suitable. They can elaborate on the necessary general steps that they have experienced in their line of work. This makes the analysis of the results less difficult and allows for better categorization. This last question about the side constraints of applying Big Data within ABW will help draw a complete picture in answering the central research question.

The figure below summarizes the steps needed to answer the research question.

**Figure 7:** Summary of sub-questions and main research question



## 3.3 Operationalization

To code the transcripts efficiently, a codebook is formed, covering each sub-question. This way, text fragments have been linked directly to specific sub-questions. An overview of the codebook is shown in Appendix C: Codebook.

### 3.4 Research strategy

To formulate all necessary steps to create a coherent research approach, the research onion model of Saunders et al. (2015) has been used. In this model, the authors dissect research into manageable steps.

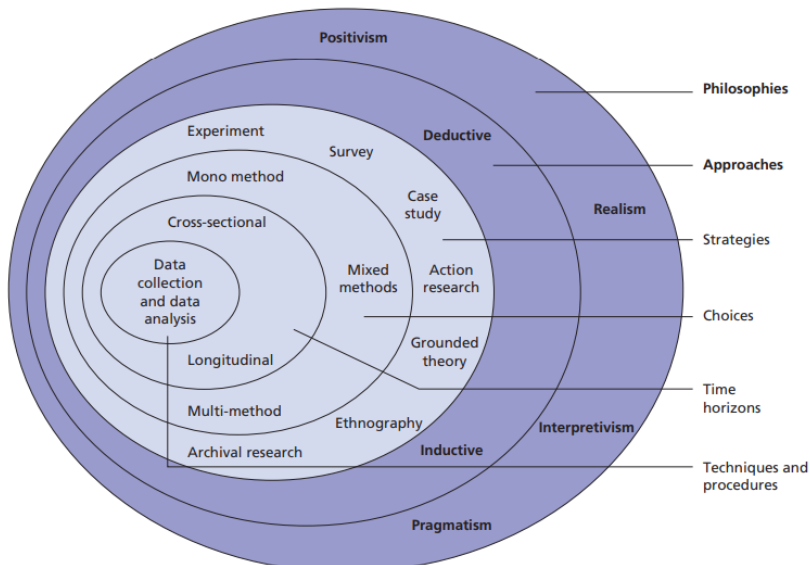
#### 3.4.1 Philosophy

The first step is to describe the philosophy in which the research is written. The philosophy that has worked best in this case is 'pragmatism.' According to Nottingham (n.d.) a few characteristics of this philosophy is that knowledge needs to be constructed based on real-world experiences, that an ideal situation is tentative and changes over time. Also, human interaction and inquiries go hand in hand with scientific and experimental studies. This research has the same characteristics, where objectively based BDT and information have been combined with workplace experiences, which are subjective.

#### 3.4.2 Approach

It is important to note that this is an explorative study. To this day, it is unclear as to what extent Big Data can help in improving the management of ABW, so this type of study is most suitable. The research can conclude both that it is useful, or that it has no added value. As the research problem is unsure, this research is aimed towards shedding new light on the possible combination between the two concepts. An explorative study is therefore most suitable (McCartan & Robson, 2016, p.52). As stated at the start of the literature review, the inductive approach has been best suited for this research. This method is based on exploring relevant literature and formulating a conceptual framework which summarizes the findings between concepts and allows for exploring new relationships. This literature-based conceptual framework is then assessed in the field using qualitative surveys, like interviews (Saunders et al., 2015).

**Figure 8:** The research onion



Source: Saunders, Lewis and Thornhill (2015)

#### 3.4.3 Strategies

The literature review is crucial in defining the scope and the focus of the research. It defines the desired outcomes and the operationalized measures that are needed to achieve this outcome. These are also the base of interview questions. According to Saunders et al. (2015) there are seven types of research strategies. The most suitable research strategy is a qualitative survey. This strategy is most suited for inductive, explorative research. It goes into rich detail to the why's and how's of explorative research. It is also suited for combining insights from field interviews with the existing literature. The literature chapter itself is based on primary and secondary sources. These sources have been combined with primary data from the field in the form of interviews.

### 3.4.4 Sampling

For this research, the non-probability sampling technique has been used. The reason for this, is that the research has an explorative nature and the 'perfect' sample size is unknown. Interviews were conducted with a variety of experts from the field. Suitable interview candidates have been selected based on criteria to ensure the results are of added value to the research objective (Saunders et al., 2015). Different stakeholders in the field have been interviewed. By analyzing multiple angles from which the research problem can be viewed, a complete overview is ensured that can benefit more organisations.

According to Saunders et al. (2015) the recommended sample size for semi-structured/in-depth interviews ranges from 5 to 25. This corresponds with the guidelines from the FREM program, which state that a minimum sample size of ten interviews is required to ensure a reliable outcome. Therefore, nine interviews with ten respondents have been conducted to comply to this guideline. For the first and second sub-question, four organisations with ABW have been interviewed. This was anticipated for beforehand, because four respondents are the minimum to draw conclusions about how organisations determine their concept. These needed to facilitate at least 500 employees in their office and needed to have a workplace-, housing- or facility department present. The initial plan was to interview three workplace consultancy organisations who advise organisations how to implement workplace concepts. Instead, only one has been interviewed, where the other two were professors in the field of (smart) workplace management. This has not particularly led to unwishful insights, as the professors were also academically skilled in this field, providing no hinder in asking the same questions. As for Big Data organisations, the plan was to interview three respondents. This has been reduced to two, due to a shortage of time. However, one of the interviews was conducted with two respondents, one of which was a data manager. Therefore, relevant information about BDT was still collected and combined with the other insights of sub-question 3 and 4.

**Table 4:** Selection criteria respondents

Selection criteria respondents			
Type of respondent	Criteria 1	Criteria 2	Number of respondents
Organisations with ABW	The organisation's building needs to facilitate a minimum of 500 employees.	There needs to be a workplace-, housing- or facility department present	4
Big Data consultancy organisations	The organisation has to offer solutions to actual workplace issues	None	3
Workplace consultancy organisations	The organisation has to offer solutions to actual workplace issues	None	1
Professors in the field of WPM and SWP	The person in question needs to be involved in the field of CREM or FREM	The person needs to have adequate academic knowledge on the subject	2

### 3.4.5 Triangulation

To ensure sufficient validity during the research, the triangulation-method has been applied. According to Noble and Heale (2019) triangulation is a method to ensure a higher degree of validity and trustworthiness of the research conducted. In this method, data is used from multiple angles to compare or enrich the data collected retrieved from literature, quantitative or qualitative approaches. Denzin (2017) defines four types of triangulations. The used in this research is data triangulation. This method goes into detail on the combination of data retrieved from literature studies, conversations, etc. This is also the case in this research. Available literature is assessed by using practical insights from the field.

### 3.4.6 Time horizons

In this research, data has been collected in the timespan of four months. This is in a concentrated period, so the time horizon applied is cross-sectional (Saunders et al., 2015). In longitudinal studies, data is collected over a large timespan, which has not been the case

### 3.4.7 Data collection

Data for the first sub-question has been gathered using interviews to get practical information about how organisations manage ABW in the current practice. The second sub-question has been answered by interviewing the same organisations about current issues they face when managing ABW concepts. In addition, both sub-question one and two also involved interviews with workplace advisory parties. These practical insights were necessary to move on to sub-question three. There, organisations that specialize in implementing Big Data to manage workplaces have been approached to gain insights on current technologies for analyzing prediction patterns and usage of space. Finally, the fourth sub-question also involves these Big Data organisations. A total of nine interviews have been conducted, with the ninth interview having two respondents. Table 4.1 below shows a list of actual respondents including their function. This overview is used in the results chapter.

**Table 5:** List of respondents

Respondent	Function	Category	Type of organisation
1	Housing advisor/professor	Workplace advisory	Leading tech university in the Netherlands
2	Workplace advisor	Workplace advisory	Large workplace consultancy organisation
3	Professor Corporate Real Estate Management	Workplace advisory	Leading tech university in the Netherlands
4	Facility manager	Organisation with ABW	Top five largest bank in the Netherlands
5	Service manager	Organisation with ABW	Big Four organisation
6	Business intelligence consultant (FM)	Organisation with ABW	Top five largest bank in the Netherlands
7	Global sales executive	Big Data consultancy	Worldwide data consultancy organisation
8	Project manager	Big Data consultancy	Worldwide data consultancy organisation
9	Data manager	Big Data consultancy	One of the largest tech companies in the Dutch industry
10	Manager strategic housing	Organisation with ABW	One of the largest tech companies in the Dutch industry

### 3.4.8 Measurement instruments

According to Saunders et al. (2015) semi-structured interviews are well suited for explorative studies but are also multi-interpretable. This means that each respondent can interpret the interview questions differently. To minimize this, respondents have received a topic list beforehand to demarcate the questions (see Appendix E: Topic lists). These varied among the four different stakeholders mentioned in Paragraph 3.4.4, because different information was searched for. Moreover, within these groups topic lists have been altered slightly to go more into detail on the organisation and the type of concepts and systems they use. This information was of value to create an in-depth and information-rich interview.

### 3.4.9 Methods of data analysis

The in-depth interviews have been established based on a pre-arranged topic list to ensure a well-designed focus when conducting the interviews and analyzing the collected data. In addition, Saunders et al. (2015) mention that a codebook helps break down interviews into measurable sections that eventually increase effectiveness of the analyzing process. This codebook has been created using the operationalization models in Chapter 2 and has been enriched with key words that were mentioned frequently during the interviews. In addition, the codes have been categorized per sub-question, which allowed for a more effective way of analyzing results (See Appendix C: Codebook). The analysis of data derived from interviews will be broken down into four steps. These are shown in the table below.

**Table 6:** Methods of data analysis

Methods of data analysis		
1	Transcribing	The interviews have been transcribed, meaning every word said in the recording will be noted to avoid misinterpretations.
2	Open coding	The transcribed interviews were then open coded using the codebook and the Atlas.Ti software.
3	Axial coding	The open code list from Atlas.Ti has been exported to an Excel-file where they were grouped into axial codes.
4	Selective coding	Finally, the axial codes were categorized again into overarching codes. This resulted in a few main codes that describes all text fragments.

All interviews have been recorded using the recording feature from Microsoft Teams or, if this was not available, using a voice recorder app on a smartphone. The recording of these interviews was necessary to ensure a correct transcription and increase the reliability and validity of the results. During the interviews held via Microsoft Teams, the automatic transcription feature was also used. These automatic transcriptions were raw data, meaning that all timestamps and words were transcribed in the literal sense. These have then been refined, where the timestamps, names of respondents were removed and sentences have been made readable when a respondent could not find the words or if the software transcribed words incorrectly. This has been made possible by playing the recording itself on the background and correcting the transcription simultaneously. The interviews recorded with a smartphone were transcribed by uploading the audio file to Word Online via the One Drive extension of Saxion. With this raw data, the steps from the recordings from Microsoft Teams were repeated here in the same way to create a correct transcription.

After the transcribing and coding process, the axial codes have been used to structure the sub-questions. Herein, the open codes that were mentioned most frequently and were overarching, have been described. First, the general/common view regarding the open code has been elaborated on. Next, the different perspectives of the types of respondents have been split up and weighed off. Lastly, the corresponding literature has been linked to the respondents' text fragments, which allowed for a more holistic view on the results. The results of this coding process is illustrated in Appendix G: Coding process.



### 3.4.10 Summary

Table 7 below shows a summary of the research approach.

**Table 7:** Methodological approach research

Research question	Sub-questions	Research strategy	Methods of data collection
What is the potential of Big Data technologies to improve the management of ABW?	1. How do organisations determine the characteristics of their ABW concept?	Field research	Four interviews with ABW organisations to explore drivers and ABW design  Three Interviews with workplace consultancy companies and workplace professors
	2. What are the main issues with the prediction of room usage within ABW?	Field research	Four interviews with managers about the issues of room usage and occupancy predictions regarding workplaces.  Three Interviews with workplace consultancy companies and workplace professors
	3. Which Big Data solutions are suitable for predicting room usage?	Field research	Three interviews with organisations that are specialised in applying Big Data in offices that use ABW
	4. What are the side constraints for the application of Big Data technologies within ABW?	Field research	Three interviews with organisations that are specialised in applying Big Data in offices that use ABW

## 4 Results

---

*In this chapter, the interview results are categorized and described per sub-question. The codebook established for analysing the interview text fragments, consists of selective codes, axial codes and open codes. These have also been categorized per sub-question, to give a better overview of what information is necessary to answer the sub-question.*

### 4.1 SQ1 Determining the ABW concept

This sub-question goes into detail on how organisations determine what their ABW-concept looks like. Factors like their motives and tools have been assessed. The coding of these interviews has given two selective codes which cover the sub-question: organisational goals and workplace management.

#### 4.1.1 Organisational goals

This main category is split up into two axial codes: 'Optimization of space,' which explains why organisations choose for the ABW concept, and 'Workers' fit,' which describes how the concept is formed within an organisation.

##### **Optimization of space**

###### *COVID-19*

The first organisational goal is the optimization of space. The interview respondents have mentioned multiple reasons why they want to optimize their space within their offices. First is the COVID-19 pandemic. They all mentioned COVID-19 as a catalyst for adjusting their office space, which needs to be up-to-date with the current trends and developments within the work field. Respondent 1 explains that COVID-19 has made the transition to a ABW concept more logical, because the pandemic has changed the way people work. This has strengthened the idea that workplaces need to be adjusted to the work activities themselves (1.42 & 1.44, personal communication, June 9, 2022). This is elaborated further by Respondent 3, who emphasizes that the work activities did not change since the pandemic, but rather the behaviour and the way employees like to carry out the work (3.8, personal communication, July 4, 2022). Respondent 5 confirms this, but also mentions the following:

###### *Quote Respondent 5*

"Well, yes definitely, because a lot of departments have not been in favour of this and because of Corona, this has adopted rapidly. It also has been more of a top-down decision and that has caused us to be an organisation who never or barely worked from home" (5.22, personal communication, June 24, 2022).

The latter elaborates on the fact that organisations who did not want to work activity-based, including working from home, have changed their viewpoints based on the COVID-19 pandemic. These respondents agreed that COVID-19 has been a catalyst for transforming the workplace and adopting ABW as a working style. These insights are confirmed by Hoendervanger (2021), who emphasises that the need for ABW has increased rapidly because of COVID-19. If organisations adopt hybrid working, a flexible office space is also necessary to fully support the employees in the activities they do at the office. When comparing the literature to the interview results, these seem to be in accordance with each other. Amsellem (2021) also mentions COVID-19 as a reason to optimize the use of office space, as organisations need to identify the motives why employees come to the office. They will seek experiences through digital tools that adapt to the users, which optimally supports them in their everchanging work environment.

###### *Occupancy rates*

A consequence of the COVID-19 pandemic is the change in occupancy percentages in office buildings. Eight out of ten respondents mentioned that their occupancy levels have changed drastically since the start of the pandemic. Respondent 6 states that their office has been significantly vacant since the start of the pandemic (6.3, personal communication, July 4, 2022). This person also goes into detail about the exact numbers.

*Quote respondent 6*

"(..) Now there are 8.000 people registered at that location, but that office is still half vacant. If you look at the occupancy rates on the most busy days, only 30% of those 8.000 people show up." (6.28, personal communication July 4, 2022)

This is confirmed by Respondent 7, who claims that the average occupancy rates in general are around 20-30% because of COVID-19 (7.22, personal communication, July 7, 2022). However, respondent 9 states that on the busiest days, their occupancy rates are around 60%, which is a significant difference. The difference in percentages lies in the types of organisations which have been interviewed. Respondents 6 and 9 both are large multinational organisations that work with ABW and both have about the same number of employees, but one performs more desk-orientated work, while the other is more practical-orientated. Respondent 7 is a Big Data organisation that helps other organisations acquire data about the usage of their office. Therefore, this viewpoint is based on general experiences, rather than occupancy rates from their own organisation. According to the literature, the low occupancy rates are connected with the vacancy in the Dutch real estate market. According to Colliers (2022), 13,3% of total square meters are currently unoccupied or unused, which has to do with the COVID-19 pandemic and its consequences on workplace concepts. When comparing the literature with the interview findings, the fact that the pandemic has caused a higher vacancy-rate is common ground. However, the amount of vacancy and the occupancy rates are dependent on the size and type of organisation.

*Reducing real estate costs*

The reduction of real estate costs is connected to the occupancy rates, as a consequence of the pandemic. Due to the changing hybrid working policies and low occupancy rates, companies are forced to repel square meters in order to save costs. These square meters are unused, due to the fact that many employees can work from home effectively.

*Quote respondent 4*

"Currently we have way too much square meters if you consider the fact that only 40% of employees still come to the office. If you would consider that we did not used to have a surplus of workplaces, then you can now conclude that that has now lead to a 60% surplus of square meters." (4.10, personal communication, June 18, 2022)

However, other respondents mentioned that repelling square meters due to low occupancy caused by the pandemic might be risky. This is due to the fact that these decisions are often based on current data. Respondent 6 emphasis that a longer timeframe is necessary in order to correctly judge whether square meters can be repelled. Governmental guidelines can be altered and closing down offices also incur costs (6.5, personal communication, July 4, 2022). Moreover, it is uncertain if the behaviour of people is going to change if they all come back to the office again, which hinders quick decision-making (6.52, personal communication, July 4, 2022). This goes to show that some organisations are more cautious when mentioning a reduction of square meters than other organisations. Szumilo and Wiegelmann (2021) confirm this statement. They state that a reduction in square meters is possible if the quality and functionality of an office is attractive enough for employees to use. This means that organisations can use fewer square meters and maintain a high quality of functionality when they know what their employees need.

**Workers' fit**

Workers' fit goes into detail on how the concept is determined and coordinated together with the users. There are multiple factors that play a role in determining the ABW concept.

*Autonomy of employees*

The freedom of employees to work from wherever and however they want has become a key factor in applying ABW. Nearly all respondents mentioned they do not have a minimum amount of days people should come to the office. They are free in deciding when they decide to do so, and the job of the organisation itself is to facilitate the desired activities, that employees want to perform at the office, as optimally as possible. In this sense, ABW is merely a mean to achieve a greater goal.

*Quote respondent 2*

"But in general, there is a greater cause behind it, in the sense of: we want to stimulate cooperation between people. We want to give people more freedom of choice about the way they work." (2.3, personal communication, June 15, 2022)

This also involves knowledge of the employees themselves and their work activities. In order to stimulate the autonomy of employees, an organisation needs to know what activities employees perform at the office. Respondent 4 emphasises that some job functions do not involve a diverse composition of work activities. While some employees have a lot of meetings, do focus work and collaborate with co-workers, some employees only do administrative work where they only need one desk with a computer. These people also need to have the autonomy to choose their preferred way of working, instead of forcing them to work unnaturally (4.6, personal communication, June 18, 2022). Other factors like the vicinity of the office and the time spend at work are also considered important (2.42, personal communication, June 15, 2022). According to the literature, the need for autonomy also has increased. Employees prefer the freedom of choosing to go to the office for the activities they see fit and stay at home for other certain activities (Reisinger & Fetterer, 2021). This shows a resemblance between the literature and the work field.

*Persona's*

The majority of respondents agreed that the different types of personalities were crucial in determining how the ABW concept will look like. Respondent 1 states that one person might find it easy to switch from workplace to workplace based on their activities, while the other person might have a stronger need for a steady and consistent work environment. The first type of person is more suited for changing environments and may have more diverse work activities (1.50, personal communication, June 9, 2022). This is confirmed by respondent 2, who mentions the following:

*Quote from Respondent 2*

"Yes, my profile is quite suited for that. I work with lots of different people and I find it no problem to work at six different locations throughout the building. That does fit the profile of a consultant quite a bit, but I think there are also a lot of profiles that find it difficult to do so." (2.11, personal communication, June 15, 2022)

Respondent 10 also confirms this viewpoint by stating that he himself does enjoy working at the office and can concentrate in busier areas, whereas other people tend to look for quite places or work from home to maintain a good level of concentration (9.47, personal communication, July 20, 2022). The literature also confirms this. A survey from Leesman (2017) found that people who were not fit for a certain work environment became less productive. This shows the importance of a suitable environment that fits the different personas within an office.

However, the extend to which these types of personas and other employee feedback are included in how ABW is applied, is done in different ways at different organisations. Respondent 6 mentions that an external bureau had designed their new ABW concept, together with the department workplace management. The employees were not included, as they worked from home at that time due to the COVID-19 regulations (6.23, personal communication, July 4, 2022). Now that it has been implemented, feedback is collected from users in the form of surveys about the extend of which the concept can be improved. However, according to Hoendervanger (2021) it is of utmost importance that the behaviour and preferences of employees are considered, which has not been the case in the organisation of Respondent 6.

Other organisations add that they prematurely inventorize user needs regarding the workplace concept. In addition, they state that they as a housing department has extensive knowledge on the needs of employees and can therefore estimate their needs (5.40, personal communication, June 24, 2022). This respondent also mentioned that they typically do not conduct surveys, because they see that as a strain for the employees, but have personal conversations about their needs regarding a new workplace concept (5.39 & 5.40, personal communication, June 24, 2022). The literature contradicts this way of generating input. As mentioned in Paragraph 1.2, a shortcoming of feedback conversations with employees is that they might feel quite different from day to day, giving unreliable results. Therefore, a need for qualitative and quantitative data collection is necessary to generate reliable input (CBRE, 2021; Timmer, n.d.).

A third organisation mentioned they also conduct surveys, but more focused on what activities they do on a workday. This is their input to decide what activities are better to do at home or at the office. Based on this decision, the rooms necessary at the office are determined (4.9, personal communication, July 18, 2022). This shows that all organisations have different approaches as to how they determine the concept.

From an advisory perspective, respondent 1 claims that it is too simple to only look at activities and that it is better to base it on the needs on the employees, rather than the activities. This is due to the fact that different employees can work less or more effective in the same work setting (1.48 & 1.49, personal communication, June 9, 2022). Respondent 2 confirms this viewpoint by saying that one person might be introvert and the other might be extrovert and when organisations ignore that, employees might get the same label based on their work activities, even though they have totally diverse needs (2.43, personal communication, June 15, 2022). This is contradicting to what Respondent 4 says. However, Respondent 4 also states that they have a decision-making layer system where all voices structurally get heard regarding work issues (4.13, personal communication, July 18, 2022). The literature states that companies need to ask themselves what users want and need, rather than basing it on their job title and expertise. The organisations, advisory parties and the literature all have in common that the needs of employees are crucial in defining the ABW concept, rather than only looking at activities. However, the organisations themselves all collect these needs differently in the form of feedback conversations, decision-making involvement or surveys.

#### 4.1.2 Sub-conclusion SQ1

The way organisations determine their ABW concept consists of two elements. The first element is their goal that they want to accomplish in the first place. Examples are reducing square meters, redesigning the workplace in accordance with external developments and increasing occupancy levels of their office(s). This has impact on how the concept will look like, because these motives determine what goal needs to be achieved before applying ABW, which is subsequently of importance in how the concept will be determined. The second element is how organisations want to adjust the workplace according to the work activities and needs of users. All parties involved in this research share this vision, but try to accomplish it in diverse ways. One organisation prematurely conducts surveys, while others consult external parties to define the workplace concept or go into direct conversation with the employees to inventorise needs. In conclusion, this is all organisation-dependent and correlates with the goals the organisations are trying to accomplish. However, these distinct types of approaches lead to some management issues, which will be analysed in Paragraph 4.2.

### 4.2 SQ2 Management issues of ABW

This sub-question is a consequence of the first sub-question. Based on how the ABW concept has been determined in the organisations, a variety of issues have formed in these organisations regarding the management of ABW. These have been categorized in Spatial, social and digital dimension, where spatial and social are the most relevant areas to be addressed. Also, workers' fit will be elaborated in further detail.

#### 4.2.1 Dimensions

##### **Spatial dimension**

###### *Misuse of rooms*

The first management issue that a considerable number of respondents encountered, was that activity-based rooms were not used according to their function. For example, the advisory parties mentioned that large meeting rooms were occupied throughout the entire day, but after observing this, they found that often a single person would reserve this room to do online meetings all day (2.77, personal communication, June 15, 2022). In addition, Respondent 1 mentioned that even if there are sufficient facilities, does not mean that they will be used correctly. The other side of the problem is that the organisation needs to ensure that users switch workplaces at the right time, according to their work



activity (1.11 & 1.14, personal communication, June 9, 2022). The organisations with ABW mentioned the same issue. Respondent 5 stated the following:

*Quote from Respondent 5*

"What we are mainly struggling with, is the behaviour of people, in the sense that you can create the best possible rooms for its intended purposes, but that people do not use it in the right way. So, they think: "Oh nice, a large meeting room with a big screen, let me make this my workplace for the day." While this room is intended for six to eight people. (..)" (5.50, personal communication, June 24, 2022)

Another factor related to the misuse of rooms is the lack of insights into availability of space. Respondent 1 states the following:

*Quote from Respondent 1*

"(..) I am not sure whether that concentration room is even available at that time. If I then pack my things, go search for a room that is sometimes on the other side of the building or even a different floor.. Yeah than it is even a possibility that you do not get a space at all and then all that effort has been for nothing." (1.17, personal communication, June 9, 2022)

### *Sufficient facilities*

Respondent 6 mentions the same problem that users occupy a large meeting room to do Team calls alone all day (6.20, personal communication, July 4, 2022). Respondent 10 also claims that rooms are used for activities that they were not intended for (9.16, personal communication, July 20, 2022). All respondents experience the same issue, but there are mixed assumptions about why this issue occurs. Some respondents think that a low occupancy is the cause. Due to the low occupancy in offices and therefore considerable number of available rooms, employees tend to care less about correctly using workplaces (9.16, personal communication, July 20, 2022; 7.27, personal communication, July 5, 2022). Others think that a lack of sufficient facilities is the cause. Respondent 1 states the following:

*Quote from Respondent 1*

"There is a lack of rooms intended for concentration work, which forces employees to do all their desk work in an open setting, including the work where they actually need that concentration so much. What I have seen on average, is that 10-15% is fitted for concentration work, while 50% of all work activities is seen as work where concentration is highly needed, so that is a huge mismatch." (1.24, personal communication, June 9, 2022)

This argument is confirmed by Respondent 3, who also mentions that there is a lack of sufficient concentration rooms at the office, which causes people to misuse other rooms or to not come to the office at all, because they can concentrate better from home (3.9, personal communication, July 4, 2022). The majority of respondents have agreed that rooms were not used for their designed purposes, but the perceived causes vary. The organisations themselves mention that the cause is a low occupancy, which stimulates undesired behaviour, while advisory parties mention that they see a lack of sufficient concentration rooms. The literature also mentions a lack of insufficient quiet spaces to be a cause of why ABW concepts do not work (Babapour, 2019). Van der Voordt (2004) complements this viewpoint by stating that concentration areas create good conditions to improve the ability to concentrate.

## **Social dimension**

### *Change management*

The social aspect, in particular the behaviour of employees and managers, were addressed frequently during the interviews. The most prominent subject was change management. The guidance of employees during the transition towards or the management of a current ABW concept creates, according to the respondents, quite some issues regarding the prediction of how the ABW rooms are used. First, not instructing users about what the function of the rooms are, can lead to misuse of rooms. Respondent 3 says that it is necessary to convince employees what the intentions are for different workplaces and that the concept itself can be beneficial to one's productivity and well-being (3.14, personal communication, July 4, 2022). Respondent 6 mentions that they were doubting between



altering the behaviour of employees to better match it with the type of workplaces, or to adjust the workplaces in accordance with the current behaviour of employees (6.18, personal communication, July 4, 2022). Respondent 5 confirms this by stating that it is a challenge to convince everyone in person that a new ABW concept will be beneficial for them, or to instruct them on how to use the rooms properly. (5.24, personal communication, June 24, 2022). Respondent 3 mentions that users can maintain their old behaviour in a new workplace concept, which will have a negative impact on the usage of rooms:

*Quote from Respondent 3*

"People can hold on to their old patterns in their new workplace, which might only cause them to be more frustrated. That they claim a workplace, they are used to that. And that alone frustrates them already, because then you have to guard that workplace, so then you also don't use that concentration room, because then you might lose your workplace. That evokes really bad behaviour." (3.12, personal communication, July 4, 2022)

Respondent 5 is the only organisation that has put up instructions for the types of workplaces on the door. They have chosen for this, because they want to prevent misuse of the rooms (5.5, personal communication, June 24, 2022). However, Respondent 8, who generally collaborates with clients that have issues with their usage of rooms, claims that even though they put up signage to instruct employees about how rooms should be used, people simply ignore it and sit there anyway (8.15, personal communication, July 6, 2022). Van Meel (2020) also addresses this issue, by stating that employees might feel the need to reserve workspaces longer or earlier than necessary, because they are unsure about the confirmation of having a workplace. This resistance from staff (Cushman & Wakefield, 2013) comes from having insufficient insight into the availability of a workplace, which is also linked to the topic 'Sufficient facilities.'

*Expectation management*

Not only the resistance and change management of employees was mentioned during the interviews. The expectation management from the organisation itself also seems to be of influence. From an advisory perspective, Respondent 1 mentions that when ABW concepts were applied, the people in charge of designing the concept had the wrong expectations towards the needs of the users. Moreover, the idea that people only come to the office is widespread, but not fundamentally true. A lot of organisations want to stimulate employees to come to the office to socialize and collaborate, but the work activities did not change, hence the mismatch in the expectation from the management (1.33 & 1.34, personal communication, June 9, 2022). As an organisation who apply ABW, Respondent 6 confirm this viewpoint, stating the following:

*Quote from Respondent 6*

"But like you said, this was the expectation of most organisations. But it does not always work as well as you had expected. It was still a matter of looking into a crystal ball, and that has not changed, since you do not know what the future will bring. (6.17, personal communication, July 4, 2022)

In addition, rooms are currently available for employees are less popular than anticipated. Some rooms have incorrect characteristics, like standing meetings, while employees prefer to sit while doing meetings (6.10, personal communication, July 4, 2022), or social areas that are not used as frequently as the organisation wished (5.36, personal communication, June 24, 2022). These are issues that arise from the organisational side since the employees have different needs than expected. The difference between the findings of these respondents, was that the advisory parties mention that the expectations need to be communicated beforehand with employees, while the organisations with ABW came to this conclusion when their concept was already applied. According to Hayward (2017) it is of essence that early engagement with staff improves the expectations the staff and the organisation have from each other, as vital information can be integrated in the initial transition. This shows that the literature is aligned with the advisories' viewpoints, but with that of the ABW organisations.

#### 4.2.2 Workers' fit

##### *Involving users*

Another issue with the management of ABW regarding room usage is that the ABW concept has not been applied on the basis of the behaviour of employees, but the other way around, which causes the concept to be ineffective.

###### *Quote from Respondent 9*

"(..) When I started this job, I had to execute a reinforcement in fifteen worldwide locations, because people did not behave according to the workplace concept, but it was the other way around. The concept was rolled out without investing sufficiently in the preliminary phase, so actually it was a constant misfit and you would have a nicely filled office with good facilities, but then you have lots of desks with facilities on the one hand, but on the other hand you have too few meeting rooms or focus rooms, or whatever that club needs. Then it is not right to say: you need to behave according to the concept." (9.6, personal communication, July 20, 2022)

Respondent 6 experiences the same issue, where they executed a new ABW concept when the employees worked from home. Since they worked from home, the respondent mentioned they would not have a sharp vision about what the workplace needed to look like, so they organised it with an external architectural bureau. However, they have now concluded that the workplace concept does not comply to the anticipated behaviour of the employees. (6.13 & 6.25, personal communication, July 4, 2022). The next logical step was the consideration of changing the behaviour or changing the workplace concept.

###### *Quote from Respondent 6*

"That's quite an issue right now. Are we going to try and change the behaviour of employees in order for them to use the rooms as intended, or are we going to change the office environment? That's quite the issue, about which direction we are going to choose." (6.18, personal communication, July 4, 2022)

Respondent 5 also mentions this issue, but adds that they as a housing department know what is best for the employees. The organisation states that, because they have 4.000 employees on that location, it is impossible to include everyone's wishes. They do consider general feedback, but are convinced they themselves are at the wheel and that they need to make decisions. This is because they are in between the board and the employees and also need to consider budgets and time frames when applying a new ABW concept. This is why they need to be in the lead, instead of the employees. In addition, if they collect feedback all the time, this creates a message towards the employees that they do not know how to satisfy the needs of the employees, which results in less trust (5.42, personal communication, June 24, 2022).

Big Data consultancy parties mention that they also see this issue occur within the clients' organisations. According to them, the inadequate prediction of room usage is caused by the lack of insights into the way rooms are being used by the employees and if the needs have been inventorized prematurely. This differs from organisation to organisation, as some do decide to involve employees in the preliminary phase, while others do not. However, even when organisations decide to execute the new concept on their own, they can still involve employees by prematurely assessing the needs of the employees (7.5, personal communication, July 5, 2022). Workplace advisory parties mention that it needs to come from both directions. Respondent 1 states that the physical office environment indeed needs to fit entirely with the way people work and what the work activities are, but on the other hand employees also need to behave accordingly to the workplace concept and that these are two separate issues. When aligned correctly, organisations have better understanding of how their workplace concept will be used when applied (1.10 & 1.12, personal communication, June 9, 2022).

There are mixed perspectives from the diverse types of respondents. Some mention that the mismatch in room usage expectations lie in the fact that employees and their behaviour are not involved in the preliminary phase, while others state that the employees also need to change and that it needs to come from both ways. CBRE (2021) state that this prediction of room usage is exceptionally complicated due to the fact that rooms are used by multiple people on demand. Moreover, it is also uncertain if employees use the workplaces according to their intended purpose and that it still calls for improvements.

### 4.2.3 Sub-conclusion SQ2

The literature and interview results both indicate that there is still a knowledge gap in the correct prediction of how rooms will be used when applying the ABW concept. There is no uniform way of how organisations predict what the offer of facilities should be. Some companies choose to execute it solely on their own, with some involving users in the preliminary phase, while other organisations include the users' needs and demands during the design, execution and evaluation process. The latter is also done in separate ways. Some organisations only conduct feedback conversations, while others perform surveys about to what extent the employees think they are offered the correct facilities. Advisory parties emphasise the importance of involving the users during the preliminary phase, while Big Data consultancy parties mention the importance of both qualitative and quantitative research methods to assess the demand before, during and after the execution of a new ABW workplace concept. The literature also states that there are still improvements to be made in the way the needs and quality of the workplace is assessed, using a combination of research methods. This combination of qualitative and quantitative research has been further elaborated on in Paragraph 4.3.

## 4.3 SQ3 Big Data technologies for improving ABW

This sub-question goes into detail about which BDT are currently available that help resolve the issues explained in sub-questions 1 and 2. These technologies are split up into two categories: predicting room usage and workplace management.

### 4.3.1 Predicting room usage

#### Sensorics

##### *Measuring occupancy*

Objectively measuring occupancy of rooms has been mentioned frequently during the interviews. Almost all respondents mentioned they already do so, others plan to apply it and the advisory parties all stated the added value of this type of measuring. All organisations interviewed actively measure the occupancy of their buildings. For example, Respondent 4 mentions that they have an Evaluating Assurance Level (EAL) entry system, which keeps track of how many employees are present in the building by registering them at the central entry gates. With this information, they assess how many people come to the office and how they can improve those occupancy numbers (4.29, personal communication, July 18, 2022). Respondent 5 states that they too use measuring systems integrated with the entry gates, but that they also have sensorics present in the building itself to measure occupancy. However, they use that technology less frequently and focus more on just the number of present employees, as the need for measuring every room is less urgent, given the fact that the building has such a low occupancy (5.33 & 5.32, personal communication, June 24, 2022). Respondent 6 also mentions that they have sensorics and entry measuring tools available, but they use the sensorics throughout the building more intensively. Every fit desk (so excluding all the loose seating areas) is fitted with Wi-Fi sensors that measure the presence of a workplace. These insights are available to only them, so that they can gain more insights into the prediction of room usage (6.32, personal communication, July 4, 2022). Lastly, Respondent 9 mentions that they also measure entry numbers and room occupancy. For instance, the meeting rooms are fitted with detection sensorics (9.17, personal communication, July 20, 2022).

Advisory parties more into detail about why this could be beneficial for predicting room usage. For example, Respondent 1 claimed that measuring room occupancy meant that the need for subjective estimation from a management perspective would make the results more reliable.

#### *Quote from Respondent 1*

"(..) The collection of data about actual occupancy is definitely a good idea, because then the idea that people have to predict for themselves whether they want to use a room or not, would become obsolete. It will become factual and it will also give insights into what rooms are used frequently or not, which could rise the conclusion that those rooms would benefit the needs of the users more."  
(1.64, personal communication, June 8, 2022)

Respondent 3 confirms this by stating that with sensorics, organisations get new insights into room usage, which could help conclude that some rooms are being used less frequently or incorrectly. In addition, this person also mentions that there can be underlying factors as to why these rooms are less popular, which could be determined by sensorics. For instance, the amount of daylight can be too intense, or the air inside that room is too chilly (3.35 & 3.36, personal communication, July 4, 2022). Respondent 7 mentioned that in addition to measuring occupancy, it is also necessary to measure activities. This way, not only the occupancy of rooms can be predicted, but also the activities that are being performed in these rooms, which allows organisations to gain more insights into the effectiveness of activity-based workplaces (7.23, personal communication, July 5, 2022).

It is noticeable that there is a large diversity to the degree of which organisations apply sensorics. Some only use it for inventorying occupancy rates of their buildings, to gain more insights into how many employees come to the office. Others use it in combination with workplace sensorics, which allows for a more detailed analysis of which workplaces are actually being used. Spacewell (2019) mentions this type of data collection can be beneficial for employees, but this is more focused on the benefits for employees when using workplace reservation systems. Syp (2016) mention that that sensorics technology can track employee movement, providing insights into usage patterns and preferences, which does comply to the respondents' results. Advisory parties mention that measuring occupancy of every ABW room makes for a more factual base about how the building is being used, which makes information more reliable. However, according to Jin et al. (2021) the information these sensors gather may be less credible when under disturbing circumstances like temperature swings, light intensity or humidity percentages. Lastly, advisors mention that it is also of added value to measure activities, and not solely the occupancy of rooms. In a more recent blog published on Smart Workplace, Spacewell (2022) states that there is currently a growing uncertainty of occupancy rates within offices. As long as managers do not know how rooms are being used in a new workplace concept, it is a challenge to determine what exactly needs be changed. They too are convinced that objective and actual data is far more reliable than human perception of tracking occupancy.

#### *Workplace reservation systems*

All organisations with ABW have mentioned they have a reservation system available for employees to reserve rooms on their own or are planning to implement this in the near future. Respondent 10 states that their organisation is internally designing an app which lets employees see the availability of rooms and reserve them. Right now, this is not necessary yet, because the occupation is so low (9.30, personal communication, July 20, 2022). Respondent 4 is looking for an external party that offers such technology, where they can implement their wishes and needs to integrate with other facility services or sensors. (4.34, personal communication, July 18, 2022). From an advisory viewpoint, Respondent 7 mentions that they offer such services, where employees can check on an interactive map which workplaces are occupied or available for reservation. Respondent 8 adds the following to this remark:

#### *Quote from Respondent 8*

"This way you can get insights into the reservations and how much of those reservations actually are being used. Then sometimes you see, especially early in the morning or late in the evening, that more than half of those reservation do not show up." (8.48, personal communication, July 6, 2022)

This shows that even the respondents agree on why workplace reservation systems are valuable for getting better insights into room usage, it also has its downsides. Conner et al. (2004) mentions another downside, namely that it is common for meetings to be shorter than the reserved slot, or that meetings are cancelled and do not take place at all, which can result in employees not being able to reserve a room, even though they are actually unoccupied. Respondent 4 also mentions that they are looking for a workplace reservation system, but that they do not want a certain type of behaviour that employees are able to reserve a workplace four weeks in advance, because this creates unwanted behaviour. However, when this is considered during the design phase, employees can easily reserve a duo-workplace where they can cooperate effectively (4.34, personal communication, July 18, 2022).

According to multiple respondents, workplace reservation systems are a useful tool for giving employees insights into available space. As stated in Paragraph 4.2.1, one barrier for employees to switch workplaces to match their activity, is that they do not know if that desired workplace is available (1.17, personal communication, June 8, 2022). This can be resolved by giving employees real-time data insights about where these free spaces are located throughout the building. Facilitating these insights



can be beneficial for both the facility manager, as for the users. (1.18, personal communication, June 8, 2022). Respondent 6 elaborates how this concept is applied in their organisation:

*Quote from Respondent 6*

(..) "By the way, on every floor at the elevators and throughout the building, we have a stack planning where you can see how crowded it is per floor. So if you arrive and do not really know where you want to sit, you can see on the screen how busy it is. (..) We also have generic floors, so if you see that your floor is busy, you can see: "Oh, then where can I sit then?" So we already had that data for ourselves, but we also placed those screens to also share that data with people."  
(6.50, personal communication, July 4, 2022)

Respondent 8 explains that they offer these types of services for other organisations, but that they also apply it within their own building. However, they use it in a different format. They have created an interactive dashboard where you can reserve your workplace and at the same time see the occupancy levels at different floors. This way, employees can not only gain insights into where the crowded or quiet areas are, but also reserve a workplace based on those insights (8.38, personal communication, July 6, 2022). Respondent 10 explains that they offer this technology in even more detail.

*Quote from Respondent 10*

"Via our app people can see the occupancy and reserved rooms on a live-basis. In addition, they can also see where all the workspaces, copy machines, coffee machines and plaza's are and using layouts of buildings people can get all types of information."  
(9.32, personal communication, July 20, 2022)

The advisory parties mention that these types of BDT are of added value for the organisations, as well as the employees. The organisations themselves are on the same page, given the fact that they all use these reservation systems to gain more insights into availability of space. The literature also mentions the necessity to gain insights into availability of space, both from the organisational and user perspective. When data shows that rooms are constantly occupied, the organisation can examine what the causes are and if there is a greater need for these workplaces in regard to others. Better insights lead to better analysis, which leads to a more effective workplace where people can have insights into the availability of workplaces (Planon, n.d.). Another factor that plays a role in effective management of office space using real-time data insights is the reduction of real estate costs. According to Bell (2021) one of the main advantages of working with these systems is the accurate information of the necessary space which is needed for employees. For instance, when rooms are used less than others, the organisation can lower the heating and lighting, or alter the diversity of rooms to increase the effectivity of room usage and reduce real estate costs. It is noteworthy that none of the respondents mentioned real estate costs in any form. They are mostly focused on practical purposes for users and their own space management. Kallenbach (2016) states that when employees have insufficient insights into the availability of workplaces, their uncertainty grows, as the confirmation of being ensured a workplace is absent. This requires methods which reliably measure active presence of workspaces, combined with a straight-forward overview for the employee to see.

## 4.3.2 Workplace management

### Workers' fit

#### *User involvement and user experience*

Some ABW organisations already use data to gain more insights into what the needs of employees are. By using sensorics, they discover which rooms are preferably used by employees. They use this information to adjust the furniture in these rooms, create more or less diversity of rooms or relocate them altogether to another part of the building. This way, the preferred way of working per department is considered (5.48, personal communication, June 24, 2022). As mentioned before, they also gather qualitative data by receiving feedback from users in the form of face-to-face conversations. Respondent 10 mentions they conduct a qualitative customer survey where employees are asked where they perform their work if they are satisfied with this workplace and if it benefits their productivity. However, they are designing an app with the same functionality, but that is also integrated with other workplace aspects

(9.46, personal communication, July 20, 2022). Workplace advisory parties are also convinced this is an effective tool to improve workplace management:

*Quote from Respondent 1*

"It is a technique which asks employees very simple questions throughout the day (...) at their workplace. Questions like: Which workplace are you using right now? What activity do you perform? And does these match with each other? This gives very valuable insights into what rooms people are using and how they are using them, and whether or not they make the right choices."

(1.22, personal communication, June 8, 2022)

This tool gave users also the opportunity to get a better understanding of how they work and how they use certain workplaces. Respondent 3 supports this, but also states the importance of such applications is that subjective interpretation from a management perspective is also a risk, because employees might use rooms incorrectly, but might not be aware of this. Thus, it is of value to question employees about what activities they perform and why (3.47, personal communication, July 4, 2022). Big Data consultancy companies explain that they also have applications that measure this. Moreover, this person states that these types of technologies can be applied before, during or after a transition to a new workplace concept.

*Quote from Respondent 7*

"We have all kinds of different services. Besides objectively data collection, we also have a tool which collects the needs of employees through your mobile phone where you get a notification with multiple questions, like: what are you doing at work? What activities do you perform? How well can you perform these activities at your current workplace and what could be improved?" (7.9, personal communication, July 5, 2022)

The ABW organisations mostly agree that they already use these types of qualitative data collection, but to a different degree. They all agree that it is of added value to evaluate the users' experience and satisfaction with the workplace, but one party does this by conducting face-to-face conversations, while others use workplace applications to question employees about their workplace experience. Using these apps, they can understand where certain types of behaviour come from and if they need to adjust the offer of workplace facilities. The literature agrees, stating that for an effective workplace, it is necessary that the balance of workplaces must be aligned with the behaviour and needs of the employees (Hoendervanger, 2021). Plume (2021) also states that an update of the workplace environment can lead to a more effective workplace. Employees might need different furniture or new equipment to optimally perform their work. Assessing their needs on a qualitative basis is one of the tools to acquire this information. However, Cote (2021) emphasizes that it systems cannot replace human interactions, for a combination is required to apply BDT most effectively.

#### 4.3.3 Sub-conclusion SQ3

The main management issues of ABW were that rooms were not used for their intended purposes and that the functionalities of these workplaces did not match the needs of users. There were multiple ways these issues were assessed by the organisations, but there was no clear and uniform answer as to which method was best suitable. However, there are BDT available to help resolve these issues. First, there is the occupancy measuring tools, which track availability of rooms to get a better understanding of room usage prediction. Second, these occupancy measuring tools can be combined with workplace reservation systems, which give employees autonomy of when and where they want to work. Other organisations go a step further and offer interactive tools where employees can see where the busy and quiet areas are, so that they can choose a room according to their needs. This in turn also helps spread the occupancy rates throughout the building and prevents overcrowded areas, which allows for a better prediction of room usage. Although these systems are beneficial to improve workers' fit, the actual usage of these measuring tools seem harder to analyse, according to respondents. Thus, a need for qualitative analysis is necessary to get a complete understanding of workplace usage and to optimize functional space. Some organisations are performing 'old-fashioned' feedback conversations or use a democratic decision-model, while others are more data-driven and use apps to collect user feedback. The latter can be done on a more automated basis, as these applications require some time to configure, but also sends, receives and analyses data automatically.



## 4.4 SQ4 Side constraints

Using BDT within the field of workplace management also has side constraints. These side constraints are grouped into four categories. These are privacy concerns, building characteristics and the added value of Big Data.

### 4.4.1 Privacy

#### *User anonymity*

The first concern with applying sensorics and using qualitative surveys is user anonymity. The respondents were asked if the employees would have the feeling of being watched or if their activities could be traced back to them by their superiors. The advisory parties mentioned that they have not yet experienced this issue when implementing sensorics (1.23, personal communication, June 8, 2022). The Big Data consultancy parties elaborated further on the fact that this type of data will be collected anonymously. It is not traceable to a specific employee and it will only help workplace management departments improve their workplace concept (7.33 & 7.34, personal communication, July 5, 2022). Respondent 10 shares this viewpoint by adding that employees can select what types of data they want to share with the management (9.61, personal communication, July 20, 2022). However, Respondent 8 said the following:

#### *Quote from Respondent 8*

"Yeah they might have that idea, because in those sensors sits something that looks like a camera. But it is not a camera, it is a heat sensor, so it only tracks the heat and movement. But it could be an issue, because a secretary department for example always has the same people at the same desks. They might feel being watched."

(8.50, personal communication, July 6, 2022)

This shows that most respondents had the same point of view, but that one differs from the rest. According to Dutch regulations, all personal data must be stored and analysed for ethical purposes. In the case of workplace management, it is forbidden to use occupancy measurements and qualitative surveys of a certain employee against them, meaning this data is to be dealt with anonymously (Duurzaam Gebouwd, 2017; Overheid.nl, 2022).

#### *Sharing data with co-workers*

The same thing goes for sharing your location and availability with co-workers. Respondent 3 mentions that, in modern times, this is fairly common to do, because we share our locations with our mobile phones all the time. That device can track everything we do, wherever we go, so why not share it with co-workers. Moreover, this person mentions it is also justified to share one's location in an office when an employee wants to know another person's location (3.43 & 3.46, personal communication, July 4, 2022). Respondent 8 mentions that users can choose with who they want to share their location. This is individually operable (8.39, personal communication, July 6, 2022). From an organisational perspective, Respondents 6 and 9 confirm this by saying that every person has a choice of who they want to share their data with (6.47, personal communication, July 4, 2022; 9.60, personal communication, July 20, 2022). All respondents that mentioned this subject, agree that these privacy issues are present, but can be overcome by a matter of individual configurations in the privacy settings of employees. No literature has been found on this subject to confirm this.

### 4.4.2 Building characteristics

Respondent 6 mentioned that equipping every seat or workplace with a sensor requires a large investment and it is not justified for them (6.34, personal communication, July 4, 2022). Respondent 9 states that it is also a large investment, but they are willing to allocate funds to improve their workplace management (9.37, personal communication, July 20, 2022). However, respondent 5 mentions that they too have these measuring systems, but that it is not a large investment. It is simply a matter of adding wires and sensorics to a new workplace (5.46, personal communication, June 24, 2022). Advisors mention the investments necessary to implement BDT can be a factor that prevents organisations to invest (7.19, personal communication, July 5, 2022). However, Respondent 8 claims the opposite:

*Quote from Respondent 8*

"Actually not much, because it is just a bunch of wireless sensors that run on batteries. If you put two batteries in there, they can last for a really long time. (...) But these are not huge adjustments that need to be done by organisations."

Respondent 10 also mentions additional required investments. Firstly, a business analyst is required to correctly read the collected data. Secondly, they intensified their degree of collaboration with IT to increase the quality of data reports. Lastly, they are investing in Data Science, which needs to analyse the data and form connections and conclusions about the impact of one data set on the other, which lead to more complex but valuable insights (9.62, personal communication, July 20, 2022). This corresponds with the literature, as stated by Portela, Lima and Santos (2016) that technical departments need to be strengthened and restructured to manage and correctly analyse the vast amounts of data.

The opinions about initial investments are mixed. The literature mentions an explanation for these mixed opinions about investments. According to Raguseo and Vitari (2017) investments are a factor that many organisations consider to be a barrier, due to the fact that the monetary benefits are not directly visible. However, Effectively implementing Big Data solutions grants a competitive advantage through increasing employee satisfaction, greater business value, increased rate of innovation and better firm performance. This corresponds with the statement of Respondent 9, who mentioned that they are aware of the initial investments, but would still like to apply it, because they want to improve their workplace management. In addition, Respondent 5 mentioned it was not a large investment. The difference here is that they designed their own (in their words simple) system that allows them to track occupancy, which is different from investing in technologies from external parties.

#### 4.4.3 Added value of Big Data technologies

##### *Useability*

Another important constraint is to which degree the respondents recognize the added value of implementing BDT. one ABW organisation mentioned they do not see the useability of applying Big Data. Respondent 4 states that insights on how to make a building more efficient by spreading out the occupancy, is not of added value due to the behaviour of employees. If they are used to working on set days at the office, the sensorics cannot change this behaviour, thus marking it as irrelevant (4.32 & 4.33, personal communication, July 18, 2022). However, Respondent 5 mentioned they do not yet combine quantitative with qualitative data by, for example, use an app to collect user feedback about how satisfied they are with their workplace. They do intend to explore these features, as they are intrigued by the possibilities (5.49, personal communication, June 24, 2022). Respondent 9 acknowledged the possibilities of Big Data, but stated that it is only of added value when organisations prematurely determine the roll this technology needs to play in the role of improving workplace management. They see it as a tool to improve their concept, rather than a substitute for human management (9.55 & 9.66, personal communication, July 20, 2022). This corresponds with the literature, which states that in order to improve the management of workplaces, a combination of quantitative and qualitative data is necessary, to include both factual and objective insights into room usage, along with the workplace experience of the users themselves (Murray, 2019, Measuremen, n.d.). Boyd and Crawford also mention the useability of Big Data as it creates added value and return on investment for an organisation. However, they do not mention side constraints, where respondents clearly state that it is only of added value when it is analysed and interpreted correctly.

#### 4.4.4 Sub-conclusion SQ4

All respondents seem to acknowledge that BDT can be of added value, but that it is not a one-size-fits-all solution, nor is it a substitute for human interaction regarding the management of ABW. Most respondents agree that the discussion of to what extent Big Data is useable and beneficial to improve the management of ABW is the most important one. Moreover, steering on data alone is not reliable. Big Data is useful for tracking occupancy of buildings and workplaces, but qualitative measuring tools need to be added to get to know the needs of the employees and how these workplaces are actually being used, which is not detectable by sensorics. In conclusion, Big Data and its useability is only half of the picture when wanting to improve the management of ABW.

## 5 Conclusions

---

*In this chapter the findings on the sub-questions have been concluded and the relationship between them have been elaborated on. The answer to the main research question has also been described.*

### 5.1 findings on sub-questions

#### **Determining the concept**

The sub-questions have been researched and assessed in chronological order. The first step was to examine how organisations determine their ABW concept. The reason respondents chose to apply ABW was based on their organisational goals. The COVID-19 has formed the basis and also functioned as a catalyst for organisations to reduce their real estate costs and optimize their workplace concepts. Offices have such low occupancy rates, due to a substantial portion of employees working from home and these organisations find it difficult to design a new workplace which makes the office more attractive and functional. Some organisations have prematurely involved employees in designing this new ABW concept and assessed the needs about which workplaces should be included and what functionalities they need. Also, based on the activities employees perform, diverse types of workplaces are designed.

#### **Management issues**

However, some organisations did not involve employees before or during the transition. This resulted in multiple management issues. The first issue is that employees misuse rooms in regard to their functions. Moreover, activity-based workplaces are used less frequently than anticipated, or are not used at all, which has a negative impact on the usage of functional space. This is primarily caused by the way the workplace concept is determined. If employees are not involved in the preliminary phase of determining the ABW concept, their needs are not (fully) included. This results in rooms being misused or not used at all, because employees might not need these workplaces in the first place. These needs are now being examined after the implementation, which is not the optimal course of action as it takes considerable number of adjustments afterwards. The issue that goes paired with involving the users, is that organisations do not invest enough resources in researching the types of personas and workers' fit. By basing the workplace concept on activities only, employees with the same job description, but completely different personalities, are treated as equals. This too causes rooms to be misused or used less frequently than desired, for these rooms do not optimally support all types of employees in regard to their persona, which makes the prediction of room usage more difficult. The fact that so many respondents mentioned that there is an insufficient number of concentration workplaces also confirms that the needs and preferences of employees are not included sufficiently. A third issue regarding prediction of room usage is the lack of insights employees have into availability of space. Most organisations track occupancy in the sense of daily attendance numbers, but few track the occupancy of workplaces and how employees use these. Moreover, not every organisation shares this information with their users. This uncertainty causes employees to remain in their workplace, which is not designed for their desired activity.

#### **Big Data technologies**

As for the issue of effectively involving employees during all phases of a new ABW workplace, qualitative tools are most suitable for collecting data. These tools collect data about how employees feel during the day and to what extent they can optimally perform their current task. A pitfall here is that organisations solely rely on this input and put the employees in the lead, while the department responsible for workplace management also needs to comply to the organisational goals. A balance is necessary to ensure both top-down and bottom-up interests are served. These data collection tools also give workplace management insights into what rooms are more popular, which allows for a better prediction of room usage. Quantitative data is also valuable, as many respondents stated they are already using it or are planning to do so. Using sensorics and workplace reservation systems benefits both the users and the management, as better usage insights lead to further optimization of the ABW concept to match the current and future demand of workplaces.

## Side constraints

These implementations come with the necessary side constraints. The most prominent one is that BDT does not illustrate a complete picture without combining it with qualitative tools to involve users. These two types of data collection are required to get a complete understanding of both the building and its users, to formulate an effective and efficient ABW concept. The sense of privacy is to some extent affected by applying sensorics. However, these acquire data anonymously, meaning that this is merely a matter of communicating how data is collected, stored and used. Also, the necessary investments need to be made in order to apply BDT. This differs per goal and size of an organisation.

## 5.2 Findings on main research question

The main research question of this thesis research was: *“What is the potential of Big Data Technologies for improving the management of activity-based working in offices?”* BDT can be beneficial for improving the management of ABW by using it as a method of data collection to assess how ABW workplaces are used. The department responsible for workplace management can get detailed insights into what rooms are used more frequently than others, which allows for optimization of workplaces and functional space. When combining this sensorics data with workplace reservation systems and interactive office layout maps, the users can also reap the benefits of using BDT. They gain insights into what workplaces are best suited for their work activity and can easily see where these rooms are located.

These sensorics need to be combined with qualitative tools like surveys, interactive apps or feedback conversations, which assess the current needs and preferences of employees. When utilizing these tools before the implementation of a transition to a new ABW concept, the needs and preferences can be inventorying beforehand, which allows for a more effective integration of the new workplace concept. Using these tools during and after the transition, the workplace management can combine these current needs and preferences with actual usage-data, to establish a thorough base which adheres to both the organisational goals, as to the preferred way of working of employees.

## 6 Recommendations

---

*In this chapter, the recommendations for the field based on the research conducted have been described. In addition, recommendations for further research have also been included. When wanting to implement BDT to improve the management of ABW, there are short- and long-term recommendations, based on how developed an organisation is in implementing BDT and what their goals are.*

### 6.1 Recommendations

#### Short term recommendations

Based on the findings of this research, organisations that use BDT to measure i.e. occupancy, are advised to further develop their sensorics to also measure workplace/room occupancy. This can be done by installing sensors at ABW workplaces which are used by multiple employees. Respondents frequently mentioned gradually implementing this change by using pilots. Transforming a portion of the office into a 'smart area' can help assess the necessity and satisfaction on further expansion of sensors. The added value of this, are more detailed insights on what rooms are used more frequently than others, which allows a reorganisation of ABW facilities and optimizes usage of space. This can go paired with using qualitative tools like survey apps or feedback conversations, which also measure activities and preferences of employees. Qualitative methods are subjective per organisation, so it is advised to examine the best way which fits the culture and the available resources of the organisation. Combining these two methods creates expansions in the future to fully apply Big Data in an organisation.

The application of BDT also needs to guarantee the privacy of users. Since these tools collect data anonymously, it is advised to clearly instruct all users how this data will be collected, stored and analysed, to prevent miscommunications and feelings of breached privacy.

#### Long term recommendations

One issue in this research has been the mismatch between the organisational goals and the involvement of employees. When these are not coherent, the most prominent issue that will occur, is workplaces being misused by employees, as they have no need for the original function of those workplaces. It is essential to align the organisational goals with the needs and preferences of employees, as this causes less management issues of ABW, thus leading to a more effective ABW concept as a starting point. When the goals and the concept are determined from both the organisational- and user perspective, it is advised to closely monitor during the usage phase. BDT like occupancy sensorics can be used to get evidence-based prediction insights into room usage. Besides measuring occupancy, it is also necessary to gain insights into activities of employees, which can be measured by using qualitative tools like interactive survey apps and feedback conversations. Combining these types of data collection will cover both tangible and intangible improvements regarding the management of ABW.

In addition, the height of the investments is relative to the degree to which the organisations want to apply BDT. Sensorics themselves have become more affordable, but this data needs to be stored and analysed correctly, which calls for investing in expertise and dashboards, which do require more funds. It is advised to research what the role of BDT needs to fulfil within the concept of ABW. This will lead to a better understanding of additional costs. It is important to note that these investments may seem like a barrier at first, but understanding how it can benefit the satisfaction and productivity of employees are a worthy investment. In the long term, this will eliminate management issues and improve overall performance of the organisation, as employees can work more effectively.

To further professionalise the FREM work field regarding BDT, sharing best practices is also recommended to instruct other organisations with interest what the added value of these tools are and if the investments justify its application. By doing so, valuable lessons can be learned from each other, since the application of Big Data is still in development.

## 6.2 Recommendations for further research

Since this research only involved ten respondents, it is advised to do quantitative research with surveys to gain better understanding of how a larger sample size involves users in the design-, execution- and evaluating phase of applying a new ABW concept. These research methods can deliver practical results, as noticed in this research that every organisation does it differently. Also, it is interesting to examine the same phenomenon in a different country. These organisations might look at the added value of Big Data in a different way, which could lead to valuable insights to improve this issue in the Netherlands. Other sectors like the healthcare and hotel industry, which are focused on user experience, might also lead to improvements of the office environment.

Further research in the types of personas within organisations and their preferred way of working is also advised. When conducting this in the form of a case study, the types of personas, along with their needs can be linked to corresponding BDT to help improve the match between supply and demand.

It is also recommended to conduct further research on methods to standardise the way organisations determine their ABW characteristics. Every organisation interviewed has done this differently, so it may be of added value to standardise this process. For the literature and the insights from this research were mixed about this topic, further professionalisation of the FREM work field can be realised when creating a baseline for organisations that are interested in transitioning to a (new) ABW concept.

Lastly, further research can be conducted on how BDT can be utilized to adjust the behaviour of employees as desired by the organisation, while guaranteeing the needs and preferences of users. This way, a more effective match can be established between the supply and demand. This recommendation involves the topic of organisational culture, which can be of impact when applying BDT, as discussed in this research. However, this phenomenon has not been researched extensively, thus experiments can be conducted regarding the usage of Big Data to describe workplace functions or stimulate desired behaviour.



## 7 Discussion

---

*This chapter involves the reliability, validity and limitations. Also, the outcomes of the research have been compared to the literature to describe new insights, similarities and differences. Since these similarities and differences have also been discussed in the results chapter, these will be more generally phrased in this discussion.*

### 7.1 Reliability, validity and limitations

#### Reliability

According to Saunders et al. (2015) reliability refers to if research would be conducted on another occasion or by someone else, it would give the same results. One threat to the reliability of a research is the degree to which respondents share sensitive information about their organisation. This might hinder the respondent to give enriched answers, in fear of breaching their privacy regulations. However, all interviews have been included in this research on an anonymous basis. This was promised beforehand to the respondents. This allowed them to speak freely about their business processes, knowing that nothing they mentioned could be traced back to them. This was beneficial for the reliability. On the other hand, since the leading organisations' and experts' names are not mentioned, it lowered the reliability, as the reader does not know who the respondents are. Only a description of their organisations has been described to balance this reduction of reliability. All interviews have been held in private rooms or private Teams conversations, not allowing any other person to intervene. This allowed respondents to speak freely without having to choose their words carefully when they spoke about their organisational issues.

To correctly analyse and compare the data, the four organisations interviewed have all been large organisations with more than 500 people and large offices. This gave the results more reliability, as all of them had some sort of ABW concept. However, the distribution of other respondents has turned out differently. The original plan was to interview three Big Data consultancy and three workplace consultancy organisations, to provide the same reliability as with the ABW organisations. Afterwards, it became two Big Data organisations and one data manager who was present at the ninth interview with the workplace manager, so these two interviews have been joined into one. This was the respondents' preference. Also, one workplace consultancy organisation has been interviewed, where the other two were professors specialized in (smart) workplace management. One professor emphasized during the interview that she had no clear picture of organisational drivers of applying ABW, as she is only active in the academic fields. This resulted in less reliable results and was the fault of the researcher, as the selection criteria has not been fully adhered to. All interview respondents were approached the same way, where most were informed about the nature of the research via telephone. A couple of days prior to the interviews, they received the topic list for preparation. This approach ensured more reliability. Since the guidelines from Saxion mentioned at least ten interviews, this has been adhered to. In this case, it were nine interviews, but with ten respondents in total. This amount has ensured that a saturation point has been reached, which also benefits reliability.

Another factor which has influenced this research is COVID-19. Since the pandemic, many organisations have low occupancy rates and different drivers (mostly real estate related) to apply ABW. In the future, when companies have sized down or occupancy rates go up, different results could be collected. This is not beneficial for the reliability, but it is a macro factor where many other studies are affected by, which nothing can be done about.

#### Validity

There are two kinds of validity: internal and external validity (Saunders et al., 2015). Internal validity is about drawing a causal link between two concepts. In this research, it has been concluded that the involvement of BDT is beneficial to improving the management of ABW, thus a causal link is established. Since the sub-questions have been researched in chronological order, the drivers, problem statement, corresponding solutions and side constraints have eliminated the chance of it being affected by some other solution. This has been beneficial for the internal validity. However, some interviews have been conducted cross-sectionally, meaning that an interview for sub-question three was held before an interview of sub-question one. This has occurred twice, which could have altered the input for other sub-

questions. For this was an explorative research, semi-structured interviews have been the right choice, as this new phenomenon studied could be approached from multiple angles.

External validity is about generalising a certain statement for a larger population, which in this research, are large organisations with more than 500 employees. Since this research concluded that a building itself is less of an issue when wanting to apply BDT, but more an issue of the management of the workplace, these findings can be applied to other organisations as well, provided that they have ABW. For instance, schools that have activity-based workplaces can also apply these technologies to improve their management. The wide-range of applicability of Big Data ensures a better external validity. Also, having included multiple types of respondents ensured that the results are relevant for a larger population, while widening the scope.

### **Limitations**

According to Saunders et al. (2015) every research has its own limitations and boundaries. They emphasize that an author or researcher needs to explicitly mention the limitations of their research in order to give readers a fair expectation. In this research, it is impossible to draw up conclusions for all types of organisations. If an organisation does not have ABW, it is not necessary to apply sensorics or track movement, since everyone has their own designated space. It also makes a difference in investments and range of applicability if a building is multi-tenant, single tenant or corporately owned. The timespan of this research is only four months, meaning that only a select amount of relevant organisations have been approached to give insights. This is why only ten respondents have been interviewed. Another limitation is the pace at which technology and Big Data evolves and adapts to organisations. The process of digitizing organisations and buildings are constantly developed and optimized, meaning that the outcomes of this research might be less relevant in five years where other technologies are applied to counter these issues.

## **7.2 Insights**

### **Similarities**

This research has lead to a better understanding of why and how organisations choose the characteristics of their ABW concept. The literature and the respondents both agreed that the goal of applying ABW is a fundamental question. Respondents all mentioned they considered this. However, the literature insists on involving the employees when determining the characteristics, which is not always applied by organisations. When this is not the case, related issues have followed. It is to be noted that only four ABW organisations have been interviewed. When a larger sample is included, other results may be found.

Most respondents also agree on the fact that too little attention is paid to the preferred way of working of employees and the fact that even employees with the same function might have quite different needs and preferences. However, not all respondents adhered to this during the creation of the ABW concept. Also, feedback conversations were held in some cases, which is not ideal according to the literature. Although these two viewpoints do not agree, it is still a matter of what tools organisations have at hand and how they effective they have performed in the future. Apart from that, organisations can still look for improvement regarding the generation of user feedback. The insufficient number of concentration facilities has also been mentioned frequently. As meetings have become more digital since the pandemic, the need for concentration rooms has increased. This is also acknowledged by the literature, who see the COVID-19 pandemic as a catalyst for the changing ABW composition.

### **Differences**

Differences between the literature and this research have also been identified. The literature goes into rich detail on why organisations need to apply BDT. However, the respondents mentioned that the necessity is not there yet, as they rather aim their focus on raising occupancy levels by exploring what the function of an office needs to be, rather than making their building more technologically advanced. As time progresses and the office building becomes more occupied, this technology might be more of a topic, as COVID-19 has raised many other issues regarding the office buildings. Another difference is

that the misuse of rooms was not found in the literature, while it was a major issue in practice. This may be caused by the changing work policies regarding hybrid working. These changes are new, so research may still be underdeveloped in this area. A third difference is that the literature is in favour of applying ABW, but that organisations are not yet aware of the possibilities and the issues they resolve. This has caused the idea that sensorics are large investments, while they are fairly accessible and affordable. This is a matter of lack of knowledge about the side constraints.

The majority of respondents also agree that no breaches are caused on privacy with tracking and measuring occupancy and activities. They emphasized the necessity to inform employees how data is being collected, stored and analysed. The literature supports this degree of anonymity, but says nothing about employees sharing data amongst each other regarding location and availability. This may be caused by the fact that the application of Big Data to improve workplace concepts is still in development.

The use of automated big data systems is mentioned in the literature but not by the respondents. This is due to the fact that automation of analytics are a developed stage of applying Big Data, while organisations are still struggling with the application. This may be of use in a more mature stage when the work field has applied BDT on a larger scale.

## List of references

---

- Abu-Elkheir, M., Hayajneh, M., & Ali, N. (2013). Data Management for the Internet of Things: Design Primitives and Solution. *Sensors*, 13(11), 15582–15612. <https://doi.org/10.3390/s131115582>
- Ahmed, V., Tezel, A., Aziz, Z., & Sibley, M. (2017). The future of Big Data in facilities management: opportunities and challenges. *Facilities*, 35(13/14), 725–745. <https://doi.org/10.1108/f-06-2016-0064>
- Amsellem, B. (2021, March 26). Optimizing your use of office space and real estate footprint. Retrieved 16 August 2022, from <https://www2.deloitte.com/ce/en/pages/real-estate/articles/optimizing-your-use-of-office-space-and-real-estate-footprint.html>
- Arundell, L., Sudholz, B., Teychenne, M., Salmon, J., Hayward, B., Healy, G., & Timperio, A. (2018). The Impact of Activity Based Working (ABW) on Workplace Activity, Eating Behaviours, Productivity, and Satisfaction. *International Journal of Environmental Research and Public Health*, 15(5), 1005. <https://doi.org/10.3390/ijerph15051005>
- Atkin, B., & Bildsten, L. (2017). A future for facility management. *Construction Innovation*, 17(2), 116–124. <https://doi.org/10.1108/ci-11-2016-0059>
- Babapour, M. (2019). *The Quest for the Room of Requirement - Why Some Activity-based Flexible Offices Work While Others Do Not*. Department of Industrial and Materials Science. <https://doi.org/10.13140/RG.2.2.21179.87849>
- BI. (n.d.). Power BI uitleg. Retrieved 9 July 2022, from <https://www.bi.nl/power-bi-100-vragen-over-power-bi/>
- Boyd, D., & Crawford, K. (2012). Critical questions for Big Data. *Information, Communication & Society*, 15(5), 662–679. <https://doi.org/10.1080/1369118x.2012.678878>
- CBRE. (2021). The complete guide to activity based working. Retrieved 11 August 2022, from <https://www.cbre.com/insights/articles/the-complete-guide-to-activity-based-working>
- CBRE. (n.d.). The Secret to Unlocking Productivity is the Activity-Based Workplace. Retrieved 14 June 2022, from <https://www.cbre.nl/he-il/global/thewayforward/the-complete-guide-to-activity-based-working?article=%7B94196d84-d5bf-411c-bd97-ac945ae39984%7D#:~:text=Activity%2Dbased%20working%20offers%20just,spaces%20and%20dedicated%20meeting%20rooms.>

- Chen, M., Mao, S., & Liu, Y. (2014). Big Data: A Survey. *Mobile Networks and Applications*, 19(2), 171–209. <https://doi.org/10.1007/s11036-013-0489-0>
- Colas, M., Finck, I., Buvat, J., Nambiar, R., & Singh, R. (2015, January). *Cracking the Data Conundrum: How Successful Companies Make Big Data Operational*. Capgemini. Retrieved from <https://www.capgemini.com/gb-en/resources/cracking-the-data-conundrum-how-successful-companies-make-big-data-operational/>
- Colliers. (2022, March 14). 3,3 miljoen m<sup>2</sup> kantoorruimte staat ongemerkt leeg. Retrieved 9 July 2022, from <https://www.colliers.com/nl-nl/research/verborgen-leegstand-in-nederland>
- Conner, W., Heidemann, J., Krishnamurthy, L., & Wang, X. (2004). Workplace applications of sensor networks. *Wireless Sensor Networks: A Systems Perspective.*, 1–16.
- Cote, C. (2021, November 2). What Is Prescriptive Analytics? 6 Examples | HBS Online. Retrieved 9 July 2022, from <https://online.hbs.edu/blog/post/prescriptive-analytics#:~:text=Prescriptive%20analytics%20is%20the%20process,data%2Ddriven%2Decision%2Dmaking>.
- Cukier, K., & Mayer-Schoenberger, V. (2013). The Rise of Big Data. *Big Data: A Revolution That Will Transform How We Live, Work, and Think*, 28–40. Retrieved from <http://cs.brown.edu/courses/cs100/lectures/readings/riseOfBigData.pdf>
- Cushman & Wakefield. (2013). *Workplace Transformation Survey*. Retrieved from <https://cwedm.com/wp-content/uploads/2015/05/WorkplaceTransformation.pdf>
- Deloitte. (2019, February 22). Evolving governance and controls for automation. Retrieved 11 August 2022, from <https://www2.deloitte.com/us/en/pages/advisory/articles/risk-of-automation.html>
- Demunter, B. (2022, January 26). Activity-based working en smarttechnologie: voor elkaar gemaakt? Retrieved 26 February 2022, from <https://spacewell.com/nl/resources/blog/activity-based-working-slimme-technologie/>
- Denzin, N. K. (2017). The Research Act. *The Research Act*, 301. <https://doi.org/10.4324/9781315134543>
- Duurzaam Gebouwd. (2017, July 5). Smart kantoren en privacy. Retrieved 5 August 2022, from <https://www.duurzaamgebouwd.nl/artikel/20170705-smart-kantoren-en-privacy>

- Engelen, L., Chau, J., Young, S., Mackey, M., Jeyapalan, D., & Bauman, A. (2018). Is activity-based working impacting health, work performance and perceptions? A systematic review. *Building Research & Information*, 47(4), 468–479. <https://doi.org/10.1080/09613218.2018.1440958>
- Engineering.com. (2016, October 21). Automation and Big Data Analytics. Retrieved 11 August 2022, from <https://www.engineering.com/story/automation-and-big-data-analytics>
- Facto. (2022, July 7). Dit worden de belangrijkste doorbraken in het facilitaire vakgebied volgens FM'ers. Retrieved 7 July 2022, from <https://www.facto.nl/21118/dit-worden-de-belangrijkste-doorbraken-in-het-vakgebied-volgens-fm-professionals>
- Gartner. (2012). Definition of Big Data - Gartner Information Technology Glossary. Retrieved 30 January 2022, from <https://www.gartner.com/en/information-technology/glossary/big-data>
- Gartner. (2022). How Data Analytics Help in Making Business Decisions. Retrieved 11 August 2022, from <https://www.gartner.com/en/information-technology/insights/data-analytics>
- Goyal, A. (2017, March 15). Big Data Analytics: Role of Automation. Retrieved 11 August 2022, from <https://www.dataversity.net/big-data-analytics-role-automation/>
- Hartmann, P. M., Zaki, M., Feldmann, N., & Neely, A. (2016). Capturing value from big data – a taxonomy of data-driven business models used by start-up firms. *International Journal of Operations & Production Management*, 36(10), 1382–1406. <https://doi.org/10.1108/ijopm-02-2014-0098>
- Hatcher, J. (2019, December 19). Smart Buildings Media Limited. Retrieved 30 January 2022, from <https://smartbuildingsmagazine.com/features/voxxpop-will-smart-buildings-change-the-role-of-the-facility-manager>
- Hayward, E. (2018, March 8). Activity Based Working: Applying Change Management to ABW Transformations. Retrieved 3 August 2022, from <https://www.linkedin.com/pulse/activity-based-working-applying-change-management-abw-emma-hayward/>
- Hiter, S. (2022, May 23). Qualitative vs. Quantitative Data. Retrieved 13 August 2022, from <https://www.datamation.com/big-data/qualitative-vs-quantitative-data/>
- Hoendervanger, J. G. (2021). On workers' fit with activity-based work environments. *On Workers' Fit with Activity-Based Work Environments*. <https://doi.org/10.33612/diss.159997877>



- Hoendervanger, J. G., van Yperen, N. W., Mobach, M. P., & Albers, C. J. (2019). Perceived fit in activity-based work environments and its impact on satisfaction and performance. *Journal of Environmental Psychology*, 65, 1–10. <https://doi.org/10.1016/j.jenvp.2019.101339>
- IFMA. (n.d.). What is Facility Management. Retrieved 30 January 2022, from <https://www.ifma.org/about/what-is-facility-management>
- Japkowicz, N., & Stefanowski, J. (2016). “A machine learning perspective on Big Data analysis”. In *Big Data Analysis: New Algorithms for a New Society* (pp. 1–31). Cham, Switzerland: Springer International Publishing.
- Jin, S., Xie, Y., Gao, Y., Zhou, G., Zhang, W., Tang, S., & He, W. (2021). Data Reliability Analysis of Wireless Sensor Nodes considering Perturbation. *Journal of Sensors*, 2021, 1–15. <https://doi.org/10.1155/2021/5591187>
- JLL. (n.d.). Facilities management goes digital. Retrieved 30 June 2022, from <https://www.jll.de/en/views/facilities-management-goes-digital>
- Kaisler, S., Armour, F., Espinosa, J. A., & Money, W. (2013). Big Data: Issues and Challenges Moving Forward. *2013 46th Hawaii International Conference on System Sciences*. Piscataway, New Jersey: IEEE. <https://doi.org/10.1109/hicss.2013.645>
- Kallenbach, B. C. (2016, March). *I'll be back: A novel system for managing, measuring, and optimising workspace availability*. TU Delft. Retrieved from <https://repository.tudelft.nl/islandora/object/uuid:375bd658-569e-44ae-9e54-41770943560b?collection=education>
- Kensek, K. (2015). BIM Guidelines Inform Facilities Management Databases: A Case Study over Time. *Buildings*, 5(3), 899–916. <https://doi.org/10.3390/buildings5030899>
- Kiziltan, A. (2018, September). *Challenges of Big Data Adoption in Turkish SMEs: A Case Study*. Brunel University London. <https://doi.org/10.13140/RG.2.2.19174.88648>
- Kvartalnyi, N. (2022, April 4). Complete Guide to Predictive Analytics and Big Data Analytics - Inoxoft. Retrieved 9 July 2022, from <https://inoxoft.com/blog/complete-guide-to-predictive-analytics-and-big-data-analytics/>
- Lee, W. (2002). The role of support services and FM in the introduction of change management. In J. Reuvid & J. Hinks (Eds.), *Managing Business Support Services* (2nd ed., pp. 19–87). Surrey, United Kingdom: Blue Ibex Ltd.

- Leesman. (2017, February). *The ruse and rise of activity-based working*. Author. Retrieved from [https://www.leesmanindex.com/The\\_Rise\\_and\\_Rise\\_of\\_Activity\\_Based\\_Working\\_Research\\_book.pdf](https://www.leesmanindex.com/The_Rise_and_Rise_of_Activity_Based_Working_Research_book.pdf)
- Lin, S., Gao, J., & Koronios, A. (2008). A data quality framework for engineering asset management. *Australian Journal of Mechanical Engineering*, 5(2), 209–219. <https://doi.org/10.1080/14484846.2008.11464549>
- Mawed, M., & Al-Hajj, A. (2017). Using big data to improve the performance management: a case study from the UAE FM industry. *Facilities*, 35(13/14), 746–765. <https://doi.org/10.1108/f-01-2016-0006>
- McCartan, K., & Robson, C. (2016). *Real World Research* (4th ed.). Amsterdam, The Netherlands: Wiley.
- Measuremen. (n.d.). Habital® | Werkleven verbeteren | Employee Experience | Measuremen. Retrieved 16 August 2022, from <https://measuremen.io/nl/solutions/habital/>
- Murray, C. (2021, August 9). The essential guide to activity-based working. Retrieved 26 February 2022, from <https://www.wework.com/ideas/research-insights/expert-insights/essential-guide-activity-based-working>
- Noble, H., & Heale, R. (2019). Triangulation in research, with examples. *Evidence Based Nursing*, 22(3), 67–68. <https://doi.org/10.1136/ebnurs-2019-103145>
- Nottingham. (n.d.). Understanding Pragmatic Research. Retrieved 12 July 2022, from <https://www.nottingham.ac.uk/helmopen/rlos/research-evidence-based-practice/designing-research/types-of-study/understanding-pragmatic-research/section05.html>
- Oracle. (n.d.). Wat is big data? Retrieved 30 January 2022, from <https://www.oracle.com/nl/big-data/what-is-big-data/#:%7E:text=Big%20data%20gedefinieerd,-Wat%20is%20big&text=De%20definitie%20van%20big%20data,datasets%2C%20vooral%20uit%20nieuwe%20databronnen.>
- Planon. (2022a). Key Findings - Workplace Experts Discuss Facility Management, Technology & the Future of Work.pdf. Retrieved 7 July 2022, from <https://planon.showpad.com/share/XSbh272ZVR0MNdAo5waa2>
- Planon. (2022b, March 4). Successful Workplace Strategy. Retrieved 6 July 2022, from <https://planonsoftware.com/uk/glossary/workplace-management/>

- Planon. (2022c, May 11). What is Space Management? Retrieved 5 August 2022, from <https://planonsoftware.com/uk/glossary/space-management/>
- Portela, F., Lima, L., & Santos, M. F. (2016). Why Big Data? Towards a Project Assessment Framework. *Procedia Computer Science*, 98, 604–609.  
<https://doi.org/10.1016/j.procs.2016.09.094>
- Raguseo, E., & Vitari, C. (2018). Investments in big data analytics and firm performance: an empirical investigation of direct and mediating effects. *International Journal of Production Research*, 56(15), 5206–5221. <https://doi.org/10.1080/00207543.2018.1427900>
- Reisinger, H., & Fetterer, D. (2021, November 5). Forget Flexibility. Your Employees Want Autonomy. Retrieved 2 August 2022, from <https://hbr.org/2021/10/forget-flexibility-your-employees-want-autonomy>
- Ross, P. (2006). ACTIVITY BASED WORKING. Retrieved 5 April 2022, from [https://scholar.googleusercontent.com/scholar?q=cache:qbdCDW2xjAgJ:scholar.google.com/+advantages+of+%22activity+based+working%22&hl=nl&as\\_sdt=0,5&as\\_vis=1&inst=15140133417573550095](https://scholar.googleusercontent.com/scholar?q=cache:qbdCDW2xjAgJ:scholar.google.com/+advantages+of+%22activity+based+working%22&hl=nl&as_sdt=0,5&as_vis=1&inst=15140133417573550095)
- Sanquist, N. (2014, November). *Big Data, Analytics & FM: From Lady GaGa to Workplace Management*. Presentation presented at the Internationaler Facility Management Kongress, Wien, Switzerland. Retrieved from [https://institute.tuwien.ac.at/fileadmin/t/ifm/Kongress/2014/Folien/4\\_N.Johnson\\_Sanquist\\_7.IF-M-Kongress\\_2014\\_Big\\_Data\\_red.pdf](https://institute.tuwien.ac.at/fileadmin/t/ifm/Kongress/2014/Folien/4_N.Johnson_Sanquist_7.IF-M-Kongress_2014_Big_Data_red.pdf)
- Saunders, M., Lewis, P., & Thornhill, A. (2015). *Research Methods for Business Students* (7th ed.). London, United Kingdom: Pearson Education.
- Schwartz, K. (2020, December 18). What Is BIM In Facilities Management? (Plus The Benefits). Retrieved 25 February 2022, from <https://spaceiq.com/blog/what-is-bim-in-facilities-management/>
- Sedgwick, P., & Greenwood, N. (2015). Understanding the Hawthorne effect. *BMJ*, h4672.  
<https://doi.org/10.1136/bmj.h4672>
- Sheynkman, A. (2021, January 31). Selecting the Best Facility Management Software (2021 Updated). Retrieved 22 February 2022, from <https://spaceiq.com/blog/facility-management-software/>

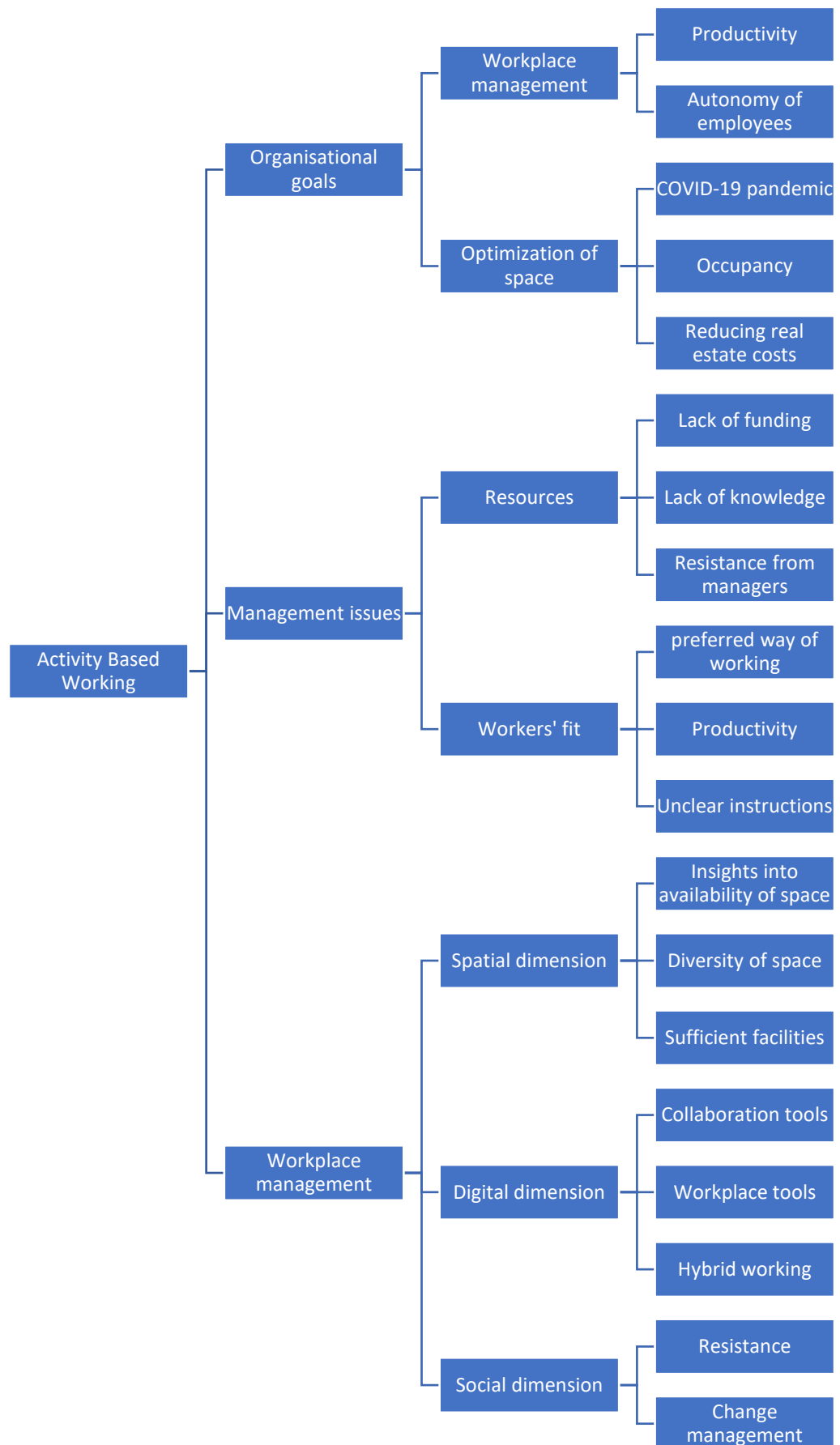
- Sisson, P. (2016, August 12). Office 2.0: Big Data is changing the design of our workplaces. Retrieved 26 February 2022, from <https://archive.curbed.com/2016/8/11/12446832/office-design-big-data-wework-nbbj-gensler>
- Spacewell. (2022, August 4). Van sensor tot inzicht – deel 7. Retrieved 4 August 2022, from <https://www.smartwp.nl/nieuws/20220804-van-sensor-tot-inzicht-deel-7>
- Spielberger, C. D. (2014). *Encyclopedia Of Applied Psychology*. Cambridge, Massachusetts: Academic Press.
- Stone, P. J., & Luchetti, R. (1985). Your office is where you are. *Your Office Is Where You Are*, 63(2), 102–117. <https://doi.org/10.5555/5080.5081>
- Szumilo, N., & Wiegmann, T. (2021, July 2). Do You Really Need All that Office Space? Retrieved 2 August 2022, from <https://hbr.org/2021/07/do-you-really-need-all-that-office-space>
- Talend. (n.d.). What is Data Reliability? Definition & Assessment Guide. Retrieved 11 August 2022, from <https://www.talend.com/resources/what-is-data-reliability/#:%7E:text=Data%20reliability%20means%20that%20data,data%20quality%2C%20and%20regulatory%20compliance.>
- Teem. (2022, March 22). Activity Based Working Benefits in the Hybrid Workplace Era | Teem by iOFFICE. Retrieved 14 June 2022, from [https://www.teem.com/blog/activity-based-working-post-covid#Activity\\_based\\_working\\_Post-COVID](https://www.teem.com/blog/activity-based-working-post-covid#Activity_based_working_Post-COVID)
- van der Voordt, T. J. (2004). Productivity and employee satisfaction in flexible workplaces. *Journal of Corporate Real Estate*, 6(2), 133–148. <https://doi.org/10.1108/14630010410812306>
- van Dijk, M. (2017, April). *Improve user performances by the use of big data in the physical office environment*. Wageningen University. Retrieved from <https://edepot.wur.nl/416132>
- Veenstra, M. (2022). Digital Life Centre. Retrieved 11 August 2022, from <https://www.digitallifecentre.nl/projecten/smart-systems-for-smart-services?lang=en>
- Veltmeijer, H. (2019, October 17). Data en facility: kansen en bedreigingen. Retrieved 30 January 2022, from <https://www.f-facts.nl/topics/smart-workspace/achtergrond/data-en-facility-kansen-en-bedreigingen>
- Waller, D. (2021, November 30). 10 Steps to Creating a Data-Driven Culture. Retrieved 11 August 2022, from <https://hbr.org/2020/02/10-steps-to-creating-a-data-driven-culture?registration=success>

Wang, L. (2017). Heterogeneous Data and Big Data Analytics. *Automatic Control and Information Sciences*, 3(1), 8–15. <https://doi.org/10.12691/acis-3-1-3>

Wyllie, T., Greene, M., Nagrath, R., & Town, A. (2012). jll-au-activity-based-working-2012 [Slides]. Retrieved from <https://www.slideshare.net/MichelleMoore40/jllauactivitybasedworking2012-68352230>

Your Workspace. (2018, December 12). Should we embrace big data in the workplace? Retrieved 26 February 2022, from <https://www.yourworkspace.com/news/should-we-embrace-big-data-in-the-workplace/>

## Appendix A: Operationalisation of ABW





## Appendix B: Operationalisation of Big Data



## Appendix C: Codebook

Sub-question	Selective code	Axial code	Open code	Text fragment
1 Determining the ABW concept	Organisational goals	Optimization of space	COVID-19 pandemic	1.43, 1.44, 3.8, 4.3, 5.1, 5.22, 6.25, 7.21, 7.40
			Occupancy	1.45, 1.46, 4.10, 4.29, 4.30, 5.32, 5.33, 5.34, 6.3, 6.4, 6.26, 6.28, 6.29, 6.40, 7.14, 7.22, 7.28, 7.52, 8.8, 9.11
			Activity-based workplaces	1.6, 1.42, 2.5, 2.10, 2.21, 2.72, 3.1, 4.41, 5.19, 5.27, 5.37
			Anonymous workplaces	1.8, 1.9
			Aligned with organizational identity	5.3, 5.4, 5.9, 5.12, 5.44, 9.2, 9.55
			Sustainable business operations	2.8, 2.23, 3.16
			Integration of buildings, systems and behaviour	2.44, 2.54, 2.86, 4.37, 11.37
			Creating uniformity	4.27, 4.28, 5.18, 9.54
			Innovation	2.8, 2.19, 2.50,
			Consulting experts	2.27, 5.16, 6.16, 6.23, 6.36, 7.6
			Flexibility	1.1, 1.10, 1.41, 1.47, 2.12, 2.13, 2.14, 3.2, 5.17, 9.12, 9.13
			Reducing real estate costs	1.40, 1.46, 2.2, 2.45, 4.10, 4.19, 4.25, 5.28, 5.29, 6.5, 6.27, 6.52, 7.53, 8.43, 8.44, 9.19
		Workers' fit	Productivity	1.22, 2.37, 2.79, 4.6, 8.36, 9.15, 9.23, 9.24
			Blending home and office environments	5.11
			Autonomy of employees	2.3, 2.57, 6.41, 6.51, 8.35
			Stimulating coöperation	2.1, 2.79, 5.54, 6.21, 6.22
			Flexibility	4.5, 4.8
			Diversity of the workforce	5.14, 5.56, 8.33
			Involving users	4.13, 4.14, 4.15, 5.13, 5.30, 5.39, 5.41, 6.24, 9.44
			Persona's	1.12, 1.22, 1.47, 2.11, 2.15, 2.43, 2.48, 5.13, 9.3, 9.7, 9.9, 9.47
			Performance evaluation	2.26, 2.32, 2.33, 3.22, 3.24, 3.25, 4.9, 5.31, 5.40, 9.4, 9.45, 9.48, 9.53
			Well-being	1.22, 2.7, 2.8, 7.15
	Workplace management	Social dimension	Autonomy of employees	7.36, 7.49, 7.51, 9.41
			Nudging	5.5, 5.7
			Personality tools	2.40
			Correctly using workplaces	1.11, 2.24
		Spatial dimension	Diversity of space	1.1, 3.10, 4.1, 4.2, 4.43, 5.3, 5.6, 5.8, 6.7
			Open work environment	1.3, 1.4, 1.5,
		Digital dimension	Hybrid working	1.2, 2.4, 2.6, 2.7, 2.71, 3.3, 3.5, 4.4, 4.7, 8.11, 8.45, 9.14
			Digital tools	4.23, 4.42, 5.10, 6.9

2 Management issues of ABW	Management issues	Resources	Lack of funding	
			Lack of knowledge	1.54, 2.18, 4.31
			Underestimation	1.37,
			Building characteristics	1.55, 1.56, 4.26
			Resistance from managers	4.16
		Workers' fit	Productivity	1.50
			Home situation	2.68, 3.7, 10.39
			Feeling of privacy	3.26
			Persona's	1.48, 1.49, 1.50, 2.16, 2.36, 6.15
				1.21, 1.22, 1.26, 1.30, 1.51, 2.25, 2.34,
			User involvement	3.13, 3.21, 5.42, 7.5, 7.55, 9.6
			Unreliable questioning	1.31, 1.52, 3.23
			Unclear instructions	3.14, 8.14
		Spatial dimension	Insights into availability of space	1.17, 1.18
			Diversity of space	1.7, 2.9
				1.14, 1.65, 2.77, 5.50, 6.8, 6.11, 6.12, 6.20, 7.4, 7.8, 7.26, 7.27, 8.12, 8.31, 9.16, 9.25, 9.26
			Misusage of rooms	
				2.56, 2.59, 2.60, 2.61, 2.62, 2.63, 2.64, 2.65, 2.69, 2.70, 4.12, 5.35, 5.36, 6.6, 7.16, 7.24, 9.10, 9.52
			Functionality of the office	
			Building layout	5.21, 9.56
			Flex factor	1.4, 1.5, 2.38, 2.39
				1.4, 1.7, 1.13, 1.20, 1.26, 1.32, 3.4, 3.6, 3.9, 3.17, 6.19, 8.13, 9.1, 9.20, 9.22, 9.27
			Sufficient facilities	
		Digital dimension	Hybrid working	2.20, 6.31, 8.34
			Collaboration tools	1.34,
		Social dimension	Shadowing behaviour	1.16, 1.52,
			Nudging	3.18, 3.19
			Light-hearted thinking	1.21, 2.46
			Willingness to coöperate	1.27, 3.20, 5.51, 8.28
			Unconscious behaviour	1.15, 3.47
				1.33, 1.34, 2.22, 2.28, 2.31, 2.66, 2.67, 4.17, 6.10, 6.13, 6.17, 6.38, 7.25, 7.50
			Expectation management	
				1.24, 1.53, 2.30, 2.35, 3.12, 4.18, 5.23, 5.43, 5.52, 6.45, 8.16, 8.32, 9.29
			Resistance from employees	
				2.17, 2.29, 2.41, 2.48, 3.11, 3.15, 5.15, 5.20, 5.24, 5.53, 6.14, 6.18, 6.42, 8.3, 8.15, 9.5, 9.28
			Change management	
			Autonomy of employees	2.43, 4.11, 4.32, 5.25

3 Big Data technologies for predicting room usage and improve workplace management	Predicting room usage	Sensing technologies	Automatic data delivery	6.2, 8.47, 9.58, 9.63
			Measuring activities	1.38, 1.39, 7.23, 8.46
			Workplace reservation systems	4.34, 5.38, 6.43, 6.49, 7.39, 7.45, 7.54,
			Insights into availability of space	1.19, 3.31, 6.33, 6.50, 7.17, 7.41, 8.38, 8.49, 8.52
			Measuring occupancy	1.61, 1.62, 1.64, 2.75, 2.82, 5.45, 5.47, 6.30, 6.32, 6.35, 6.37, 7.7, 7.11, 8.2, 8.24, 8.30, 8.41, 9.8, 9.17, 9.31, 9.42
			Future decision-making	Historical data Timing of implementation
	Workplace management	Stimulating desired behaviour	Describing workplace functions	9.33, 9.49
			Time distribution	1.35
			Inventorizing workplace facilities	7.10
			Insights into room usage	3.35, 3.36, 3.37,
			Self-control	3.29, 3.30, 3.32
			Future-proof office	2.73
		Workers' fit	Prematurely inventurise	1.36, 7.2, 7.3
			Vitality	3.40
			Creating a support base	7.32
			Personal awareness	7.29, 7.30
			Inventorizing user needs	7.1, 7.9, 7.12, 8.17, 8.26
			Optimizing user experience	3.42, 5.48, 7.31, 9.34, 9.43
			User involvement	3.41, 4.38, 7.35, 8.21
4 Side constraints of applying Big Data in ABW	Side constraints	Privacy	User anonimity	1.23, 2.81, 3.45, 6.46, 7.33, 7.34, 8.50,
			privacy regulations	3.50, 6.48, 9.59
			Sharing data with coworkers	3.43, 3.44, 3.46, 6.47, 7.46, 7.47, 7.48, 8.39, 9.60
		Building characteristics		1.56, 2.84, 2.85, 2.86, 4.39, 4.40, 5.46, 6.34, 6.53, 7.19, 8.53, 9.37, 9.62, 9.64, 9.65
			Investments	
			Technological advancement	1.57, 2.53
		User involvement	Decision-making	8.20
				1.22, 1.25, 1.26, 1.29, 1.65, 2.76, 2.80, 2.83, 3.27, 3.47, 4.36, 7.13, 7.18, 11.38, 8.18, 8.25, 9.46, 9.51
			Combining with qualitative measuring tools	
			Attractiveness of tools	1.28, 3.48, 3.49, 8.22, 8.23
			Evaluating	9.35, 9.36, 9.67
		Added value of Big Data		1.59, 1.60, 2.51, 3.33, 3.34, 7.20, 8.1, 8.54, 8.56
			Lack of knowledge	
			Popularity	2.52, 2.55, 3.38, 3.39, 8.19
			Accessibility	6.1, 7.42, 8.55
			Reliability of results	8.9, 8.10
				2.74, 2.87, 2.88, 4.35, 4.37, 5.49, 5.55, 7.42, 8.27, 8.29, 8.51, 9.38, 9.39, 9.50, 9.57, 9.66
			Useability	
			Responsibilities	1.63, 7.43
			Uncertainty about the future	1.58

## Appendix D: Participant information letter

### Introduction

Dear participant. I ask you to participate in the interview which is about how Big Data can aid in improving the management of the concept of activity-based working (ABW). Participation is voluntary. In order to participate, your permission is required. Before you decide if you want to do this, I will explain why I want to take this interview. Please read this information carefully. If you have any questions, please contact me. See contact information at the bottom of this information letter.

### Title of the research

How can Big Data aid in the improvement of the management of activity-based working concepts?

### Background and purpose of the research

Nowadays the absence of data in organisational processes seem unthinkable. The revolution of Big Data is accelerating and various departments within organisations want to apply this technology. However, it is still unclear for a lot of departments how the information that Big Data can provide, needs to be interpreted to improve organisational decisions. One of these decisions concern the workplaces within the offices, especially the ones that apply the concept of activity-based working, where different workplaces have specific functions to improve productivity and comfort. The combination of activity-based working with real-time usage information using Big Data, allows organisations to improve the effectiveness of this workplace concept. Moreover, smart workplaces are becoming increasingly popular, where employees can work from anywhere and anytime using personalized communication tools.

This thesis research is done for the Master programme of Facility and Real Estate Management within Hogeschool Saxion. After finishing this coursework, the master's degree of Facility and Real Estate Management will be rewarded. The purpose of this research is to explore the possibilities of improvement that Big Data can bring for the application of activity-based working concepts. Since technology is rapidly changing, so are communication tools and workplaces. This requires a constant flow of real-time information to keep the concept of ABW up to date.

### Execution of the research

In this research into the improvement of the management of ABW-concepts using Big Data, I will conduct twelve interviews with Big Data experts from the field, organisations that are already using Big Data and organisations which do not but wish to apply it to their workplace concepts. This information will be gathered to establish what the added value of Big Data is in the management of workplaces and how it needs to be applied.

### Contribution required from the participant

You will be asked to participate in an interview about various topics that are established using available literature and discussions with experts in the field. It is recommended that you already study these topics in preparation for the interview.

### Advantages and disadvantages of participating in the survey

To the best of my knowledge, there are no disadvantages associated with participation in this study. Based on the results of the study, the researcher aims to further improve the work field by providing insights from experts that are of added value to the concept of activity-based working.

### Use, storage and reuse of data

During the interview I will ask for permission to record the conversation, to eventually transcribe and code the text fragments. These insights will be compared to other interviews and these results will be used to draw up conclusions about the research. The interviews are anonymously, and your name will not be used openly. In order to protect your data and to limit privacy risks as much as possible, as a student I comply with the requirements of the General Data Protection Ordinance (AVG). In accordance with the AVG, I ensure that the specific requirements are met.

### Voluntary participation

If you participate in this research, you can always change your mind and still stop. I will then use your data until you stop.

### Costs or fees

You will not be paid to participate in this study. There are no costs for you to participate in this research and there is no compensation for participating in this research.

### Ethical review or advice

For this research, advice has been requested from the Saxion Ethics Advisory Committee.

### Contact

For more information or questions about this study, please contact:

Quintus Bol

[Quintus.bol@outlook.com](mailto:Quintus.bol@outlook.com)

+31 6 44 54 63 60

In case of complaints about data management you can contact Saxion via the Complaint and Dispute Desk: <https://www.saxion.nl/over-saxion/organisatie/klachtenloket>.

### Reference to the statement of consent

(online) On the next page you will see a statement of consent. This form provides you with information on how we process the data you enter in this interview. By digitally signing this form, you give us permission to use (anonymously) the data you have entered. Whether or not you participate in this survey has no effect on your further study progress and no assessment will be given for it. Click through to the next page for the statement of consent to give your permission to participate in this study. After signing, you can proceed to the questionnaire.

(offline) This information letter is accompanied by a statement of consent. By signing this statement of consent, you agree to participate in the survey.

### Consent form: How can Big Data aid in the improvement of the management of activity-based working concepts?

I ask you to indicate below whether you consent to participate in this interview. Please read the following points carefully:

As a participant in this research:	yes	No
Have I been informed about the nature, method, and purpose of this research in a way that is clear to me.		
Got enough time to decide on participation		
Have I had the opportunity to ask questions about this investigation		
Do I know that participation is voluntary		
I know I can stop participating at any time. I don't have to give a reason.		
I consent to the collection, retention and use of my data for the purpose of answering the research question in this study.		
Do I know that the results of this interview can be incorporated in a report or (scientific) publication?		
I consent to the re-use of my data after this research for as yet unknown research that falls within the scope of this research. In doing so, the recognised ethical standards for this form of research will be observed.		
I know that only for the purpose of verifying the scientific integrity of the research, some people can access my collected data.		
I understand that any information I provide in relation to this study will be collected anonymously and will not be traceable to me.		
Do I know that I can inspect the way in which the data is processed and stored?		
Do I know that if I withdraw, my data can be used until then, unless I also ask for the data already collected to be deleted?		
Permission to make audio recordings. These can only be listened to by the researcher(s) and to check the scientific integrity.		

Name:

Signature:

Date:



## Appendix E: Interview topic lists

### ABW Organisations

Topics	Sub-topics
<b>Activity-based working</b>	<ul style="list-style-type: none"> <li>• Definition <ul style="list-style-type: none"> <li>◦ What is your definition of the concept?</li> </ul> </li> <li>• Drivers and barriers <ul style="list-style-type: none"> <li>◦ What were the drivers of choosing for the concept?</li> <li>◦ What held you back?</li> </ul> </li> <li>• Determining the characteristics <ul style="list-style-type: none"> <li>◦ How did you determine the characteristics and the variety of workplaces? Did you consult any external parties?</li> </ul> </li> <li>• Impact of COVID-19 <ul style="list-style-type: none"> <li>◦ What were the consequences of COVID-19 on the occupancy and the way workplaces were used?</li> </ul> </li> <li>• Results and targets <ul style="list-style-type: none"> <li>◦ What were the organisational goals of applying ABW?</li> </ul> </li> <li>• Building characteristics <ul style="list-style-type: none"> <li>◦ What building adjustments needed to be made?</li> <li>◦ Which aspects of a building are crucial in applying ABW?</li> </ul> </li> </ul>
<b>Management of activity-based working</b>	<ul style="list-style-type: none"> <li>• Performance management <ul style="list-style-type: none"> <li>◦ How is the effectivity of the ABW concept measured?</li> <li>◦ How is feedback being gathered and what is done with this information?</li> </ul> </li> </ul>
<b>Big Data technologies</b>	<ul style="list-style-type: none"> <li>• Definition</li> <li>• Tangible results <ul style="list-style-type: none"> <li>◦ Who analyses this data and how does this person do this?</li> </ul> </li> <li>• Accessibility data <ul style="list-style-type: none"> <li>◦ Who has insights into this collected data?</li> </ul> </li> </ul>
<b>Side constraints</b>	<ul style="list-style-type: none"> <li>• Privacy <ul style="list-style-type: none"> <li>◦ How did employees react when this was introduced?</li> </ul> </li> <li>• Investments <ul style="list-style-type: none"> <li>◦ Which investments were needed (software, skills)?</li> </ul> </li> </ul>

## Workplace consultancy and professors

Topics	Sub-topics
<b>Activity-based working</b>	<ul style="list-style-type: none"> <li>• Definition <ul style="list-style-type: none"> <li>◦ What is your definition of the concept?</li> </ul> </li> <li>• Drivers and barriers <ul style="list-style-type: none"> <li>◦ What were the drivers of choosing for the concept?</li> <li>◦ What held you back?</li> </ul> </li> <li>• Determining the characteristics <ul style="list-style-type: none"> <li>◦ How did you determine the characteristics and the variety of workplaces? Did you consult any external parties?</li> </ul> </li> <li>• Impact of COVID-19 <ul style="list-style-type: none"> <li>◦ What were the consequences of COVID-19 on the occupancy and the way workplaces were used?</li> </ul> </li> <li>• Results and targets <ul style="list-style-type: none"> <li>◦ What were the organisational goals of applying ABW?</li> </ul> </li> <li>• Building characteristics <ul style="list-style-type: none"> <li>◦ What building adjustments needed to be made?</li> <li>◦ Which aspects of a building are crucial in applying ABW?</li> </ul> </li> </ul>
<b>Management of activity-based working</b>	<ul style="list-style-type: none"> <li>• Performance management <ul style="list-style-type: none"> <li>◦ How is the effectivity of the ABW concept measured?</li> <li>◦ How is feedback being gathered and what is done with this information?</li> </ul> </li> </ul>
<b>Big Data technologies</b>	<ul style="list-style-type: none"> <li>• Definition</li> <li>• Tangible results <ul style="list-style-type: none"> <li>◦ Who analyses this data and how does this person do this?</li> </ul> </li> <li>• Accessibility data <ul style="list-style-type: none"> <li>◦ Who has insights into this collected data?</li> </ul> </li> </ul>
<b>Side constraints</b>	<ul style="list-style-type: none"> <li>• Privacy <ul style="list-style-type: none"> <li>◦ How did employees react when this was introduced?</li> </ul> </li> <li>• Investments <ul style="list-style-type: none"> <li>◦ Which investments were needed (software, skills)?</li> </ul> </li> </ul>

## Big Data consultancy organisations

Topics	Sub-topics
Services of (..)	<ul style="list-style-type: none"> <li>• Workplace management <ul style="list-style-type: none"> <li>◦ Can you describe your service called workplace management?</li> </ul> </li> <li>• Data insights <ul style="list-style-type: none"> <li>◦ What services do you provide regarding data insights?</li> </ul> </li> <li>• Qualitative tool <ul style="list-style-type: none"> <li>◦ What qualitative tools do you offer and is this combineable with quantitative data?</li> </ul> </li> <li>• Other services/ideas?</li> </ul>
Trends	<ul style="list-style-type: none"> <li>• Werkplekmanagement <ul style="list-style-type: none"> <li>◦ What current trends do you see regarding workplace management?</li> </ul> </li> <li>• Datagebruik <ul style="list-style-type: none"> <li>◦ What trends do you see regarding the usage of data and how has COVID-19 impacted this trend?</li> </ul> </li> <li>• Hoe wordt hierop ingespeeld? <ul style="list-style-type: none"> <li>◦ How do you as an organisation respond to this?</li> </ul> </li> </ul>
Challenges and possible solutions	<ul style="list-style-type: none"> <li>• Expectation management between employer and employee <ul style="list-style-type: none"> <li>◦ This is seen as a major issue according to respondents. Do you also see this in practice?</li> </ul> </li> <li>• Organisational culture <ul style="list-style-type: none"> <li>◦ Respondents mentioned frequently that the culture was typical for unwished behaviour. To what extend is this visible to you?</li> </ul> </li> <li>• Involvement of users <ul style="list-style-type: none"> <li>◦ To what extend are users ideally involved in a transition to a new workplace concept?</li> </ul> </li> <li>• Measuring usage patterns <ul style="list-style-type: none"> <li>◦ Respondents found it difficult to predict and analyze usage patterns. What are the right tools for this?</li> </ul> </li> <li>• Not knowing what to do with data insights <ul style="list-style-type: none"> <li>◦ How is data ideally analysed to make it usable?</li> </ul> </li> </ul>
Side constraints	<ul style="list-style-type: none"> <li>• Privacy of employees</li> <li>• Investments <ul style="list-style-type: none"> <li>◦ Skills and software?</li> <li>◦ Building characteristics?</li> </ul> </li> </ul>

## Appendix F: Interview transcript sample

### Sample from interview with respondent 9 and 10

Researcher

Okay, yeah okay well, Let's get started. I will first introduce myself, I am (..) and I am 24 years old. Am now In the master's program in Facility and Real Estate Management at Saxion University of Applied Sciences and that is a one-year program. I saw that (..) had also completed this? Yes, well, so that's given from Greenwich. And yes, it takes a year and I'm now In completing my thesis phase and When I've handed this in, then I have hope and I hopefully passed. Yes and the research then is actually about activity based work. I had a number of discussions with my supervisor and she also said that the management of workplaces could be improved. With the rise of technology, there are so many opportunities for companies to make good improvements, but some don't know exactly how.

Respondent 9

So we also introduce ourselves I think. I myself have been working at (..) for 3.5 years now, of which the last 1.5 years in the housing and workplace experience department. We work together with other teams on developing workstations, developing services and Sufficient availability and quality of the workplace. That's basically what we do. Really very briefly.

Respondent 10

Yes, I am (..). I have been working for 3 years at (..) and I am currently responsible actually for the whole facilities field. Where (...) and the team is responsible for Making sure People get the right place the right workplace, I am with my team responsible for carrying out all facilities services and in addition I am also responsible for data management. We do that for worldwide and for all maintenance activities in the Netherlands. And In our organization we actually have a little bit, don't we? We call that competencies, so We have the competency around Developing the workplace experience and everything that goes with it that we work with the design and the thought of: How do we facilitate the employee of (..) In his work, yes, and the development of the vision on that and the whole toolkit is with the team of (..) and my team is actually responsible for the actual implementation, the day-to-day running of the facilities and the management of the suppliers so. We always work very closely together, where the team from (..) develops/implements and we actually manage. So that's why it also made sense to me that we would both join here.

Researcher

Yes definitely yes That's another additional angle, isn't it? So that can also bring some nice information, because I heard that you guys do work activity related, right? You have a certain concept for that within (..).

Respondent 9

Well, ABW is actually the Actually the strategy to implement the workplace vision. Look, as housing we are not the core business of (..), they do something else. But we do want to like our housing from the same idea Rights and our core values are collaborate, Challenge and care and we have translated those with engage and connect. And to do that, the strategy is ABW and in that sense it's not a concept or a concrete concept. It's a thought of letting People do their jobs as best they can. That's one combined with workplace experience and associated services supported by data and also behaviour also paid attention to. But what that looks like can take different forms. It's the translation of how we think we can provide People with the safest possible work environment.

Researcher

What's that like right now? How do you think you can facilitate the employees as best Possible with workplaces?

Respondent 9

How we do that? (...) is a business where a lot has to be done based on data and numbers, and we actually noticed from the situation that we had some votes, right? So key figures so many chairs, and what else? We're actually all stepping away from that. We just want to move towards a space per employee. And what We have set up, is actually a research phase of gosh: What audience do we have here? what is their real question? What does their day pattern look like or what activities do they have? What is their external flexibility, what is their internal mobility? In order to get The Question

Clear that way through workshops, surveys. And to work from there and also collect feedback after that time, after 3 months anyway and (...) her team has the facility managers with the floor manager as we call them who are each responsible for the population allocated to a particular floor from which we also get feedback and We have all kinds of customer panels on how we can do that, so the preliminary phase is very important for us to look at, gosh, what is the right mix of facilities? Can we have an Office for 100 people or do they need 100? That means they need other facilities less, But that's not a coincidence. That's based on all the analysis we do for that, so and that involving the People also has to do with behaviour, namely gosh if People know they are involved in the development of their environment. Then you also have the change process set up in a good way. Then it's also not an imposed something of one size fits all, because if that is It, we are completely missing the point with activity-based working.

Researcher

Yes, yes, and the resistance I think also of the employees?

Respondent 9

Well, one size fits all, first of all because there is no one size fits all within (...) and that has been going on for a while. ABW has existed for a longer time within (...), that we work with it But in the initial phase it was ruled from a kind of voice, because when I started this job the first task was to reinforce in 15 worldwide locations, because People did not behave according to the concept, but it was the other way around. The concept had been rolled out without investing enough time in the preliminary phase, so actually it was always a misfit and then you have a full office with facilities, but then on the one hand you see all kinds of desks with facilities and on the other hand not enough meeting rooms or focus rooms or whatever the Club needs, so to speak. So then you can say, you Have to start behaving, the way the floor is laid out, but yes. The department (...), for example, does a lot of development of logarithms and so on, and if you go to the office floor, you can hear a pin drop. Yes, if you do that with us in sales, yes, it's completely different. Yes, so If you try to put that into a format. Yeah, that's not going to work. We're moving away from those traditional ratios. And the work of what we call Floor Design within the context that we made. Yes and the analysis phase and also occupancy measurements and the workshops, all those things make of gosh what can it look like in the end. And then you'll see that there are a lot of similarities between different departments, but precisely those things where it differs, those make the difference.

Researcher

Yes, yes, do you have many types of employees within the office of (...)? Are they many different personas, so to speak?

Respondent 9

Yes, We have a few years back within Research and development. That's the largest group of People involved in well, Research and development. The name says it all, 4 personas came out of that and we captured 98 Percent of the organization with that. There were two exotics, we set those apart. That's not the full Organization, But I think in terms of typology, That you could extend that to I think very (...).

Researcher

Yes, yes, so you are actually in a kind of transition phase now, to a new way of working and for that you just want to do a lot of analyses?

Respondent 9

For ourselves in particular, how well we are doing. Look ABW is ABW, only how do you get it as good as possible and on the other hand how do you get it as generic as possible, right? Because we sometimes have changing team compositions. Yes, you can't keep changing your office either. So that mix of how do you get it as Exchangeable as possible versus how far is optimal possible for a particular group? That's what It is but, but you also see it with hybrid working. What makes People come to the office? Working from home is also this part of activity-based working as far as That's concerned. It's just a workplace In the Netherlands in this case where you fill part of your working week, you just have to be well facilitated there too and In that sense, we're all kind of discovering. The whole world of gosh. How do People come back to the office? So what are the activities they do there huh? Well We're not the organization that immediately two years ago at the first month like a lot of People brought all the desks forward. We have followed much more the process of gosh look what's

happening, monitor well, listen to what's happening, see how People are behaving, see in what volume they are coming back. We now see that on the busiest days we used 60% of the offices. Yes who could have thought of it in advance?

Respondent 10

Yes, ABW working is also in my opinion a continuum huh, you are constantly analyzing, listening adjusting. So It's also not: you set it up once and I think it's a continuous process where you're constantly looking at: does anything change in the composition of departments, well in this case external factors like COVID have influence.

Respondent 10

So you're actually already continuously tweaking the concept, or at least tweaking the application of it.

Researcher

Yes and then to what extent has that changed since COVID went around? Has your workplace changed or has the scope of the workplace changed?

Respondent 10

No, I think we're going to have A different mix of facilities. What we saw before COVID mainly yes, you know what It was? Virtual meetings was basically a non activity. We didn't have teams 3 years either. But basically everything was onsite huh? So in the office. You saw that too. There were a few People who worked at home, But People who were in the office, they were sick, had vacation, study or some other reason for not being in the office. But otherwise If you were just in the office. That's one. Two is: There were still some people who worked at home once or at the customers' of course, But the scale on which People have had to work at home, And the fact that it hasn't been very disappointing, The productivity of those People. In some aspects it did, but let's say in a lot of aspects it didn't, has also learned that it can be done. And what's more, people really like working from home for part of the week. That's one and two is what We've had to do is instead of doing everything in one Room Together, is just like us, Meeting with each other virtually and People have also adapted to that. So what we see now that office is that the offices that we developed In the past: one Because not the full occupancy is there, people have the freedom of choice to use meeting rooms for things that they were not intended for in the first place, so to do calls. And that that amount of these kinds of calls has increased tremendously, This is really new in Our office environment. And There's almost no meeting that's organized in anymore, that consists of 100% of attendance. So to see each other, you have to start arranging things, so we see a couple of things. One: this activity, we really need to support it and find appropriate forms for it. We are now rolling that out on a number of properties where we don't have the best quality environment. And what we see is that our meeting rooms are too big. All the more so because people are staying home for part of it, so that actually, the meeting rooms of well 2, 3, 4 people are doing well, but everything that's big has incredibly low usage values. They do get occupied. So People don't have to make reservations, Because the pressure is not there. you do see some things. But the question is what's going to happen If we start allocating more offices to offices, that's going to increase the pressure on the offices. So suppose we now allocate 10,000 people to an office and on the busiest day there will be 6,000 and then we will still have 4,000 capacity. You can say a couple of things: I'm sitting pretty roomy. Or we go to a maximum capacity of 11,000, because if we get 60% of that, we have more occupancy, because they are in the office more. So that's increasing efficiency. But that we need a new facility that's acoustically good, that offers Privacy in every way and where you can do some focus work, but particularly also do your call. that's needed to a much greater extent than two years ago.

Researcher

Yes and besides meeting rooms for example, are there any other rooms that you think of: they are not being used as intended, or they are underutilized?

Respondent 9

Those focus booths are used reasonably well anyway, those desks are used, meeting rooms are used, they have break-out rooms and just for a power nap or playing rooms which are used a little less, maybe because they are new and have not been set up properly yet, I think. They were installed during the period that People were at home? Now that they are coming again, we might have to make an extra effort on how, what, where, we really see them being used a bit less in one building and in the other building we get a lot of positive feedback that they are good, so maybe it's also a bit audience-dependent



## Appendix G: Coding process

### Respondent 1

Respondent	Fragment	Text	Open code	Axial code	Selective code
1	1.1	Jurriaan van meel zegt: er zijn 3 elementen, een is variëteit aan werkplekken, twee is dat die werk	Diversity of space	Spatial dimension	Workplace management
	1.2	Waarbij dat laatste tegenwoordig ook heel vaak wordt uitgelegd. Van ja, dat gaat over binnen eer	Hybrid working	Digital dimension	Workplace management
	1.3	En Misschien nog een toevoeging op de definitie. Want ik heb ook heel vaak in presentaties dat ik	Open work environment	Spatial dimension	Workplace management
	1.4	Mensen associëren activity based working al heel snel met een kantoortuin of met een vooral het	Lack of knowledge	Resources	Management issues
	1.5	Maar In de praktijk zie je Natuurlijk projecten die daarin nogal variëren van hele scherpe werkplek	Lack of knowledge	Resources	Management issues
	1.6	Ja ja dat denk ik. Maar ik benoem het altijd omdat het wel in discussies de factoren zijn die belang	Activity-based workplaces	Optimization of space	Organisational goals
	1.7	maar op het moment dat je dat heel open maakt of heel krap qua plekken, dan wordt het een hee	Sufficient facilities	Spatial dimension	Management issues
	1.8	En nog een laatste trouwens: in diezelfde sfeer is de mate van identiteit of anonimiteit, zeker in d	Creating uniformity	Optimization of space	Organisational goals
	1.9	Exact ja, maar ook dit is weer een andere dimensie, hè? Van de mate van identiteit of anonimiteit	Creating uniformity	Optimization of space	Organisational goals
	1.10	Want die keuze is secundair. Nou ja, gevarieerde werkomgeving, niet persoonsgebonden. Dat is hi	Flexibility	Optimization of space	Organisational goals
	1.11	De vraag die je ook zou kunnen stellen daarbij is van: Ja maar, hoe maken mensen gebruik van die	Misusage of rooms	Spatial dimension	Management issues
	1.12	Je kunt zeggen van het concept moet, of de fysieke omgeving moet helemaal passen bij hoe mens	Persona's	Workers' fit	Management issues
	1.13	Om daar nog op door te gaan. In mijn onderzoek kwam ik erachter dat de mismatch aan de aan d	Sufficient facilities	Spatial dimension	Management issues
	1.14	En de andere kant die ik zag, is dat ook als die plekken er zijn, gaat het nog niet vanzelf dat Mens	Misusage of rooms	Spatial dimension	Management issues
	1.15	Dus Waarom doen ze dat dan? Nou, vandaar een onderzoek met interviews en het interessante v	Unconscious behaviour	Social dimension	Management issues
	1.16	Dus ook al zijn ze niet optimaal, dat wil niet zeggen dat Mensen dat gaan veranderen en als er dan	Shadowing behaviour	Social dimension	Management issues
	1.17	En de derde categorie waren vooral praktische dingen voor een deel reëel, hè? Ja dan moet ik mij	Insights into availability of space	Sensing technologies	Predicting room usage
	1.18	Ja inzicht real time hè? Van Goh, maar waar zijn die vrije plekken? Dan kan ik daar nu naar toe	Insights into availability of space	Sensing technologies	Predicting room usage
	1.19	Ja goeie vraag. Ja goeie vraag want dat is ook een reden Waarom ik zeg van ja: Big data is Natuuri	Insights into availability of space	Sensing technologies	Predicting room usage
	1.20	Maar eigenlijk is die vraag die je nu stelt, die zit daar al voor. Eigenlijk zie ik dat daar al veel	Prematurely inventorize	Workplace usage	Workplace management
	1.21	Ja mijn simpele beeld is dat er gewoon te lichtvaardig analyses worden gemaakt en misschien ook	Light-hearted thinking	Social dimension	Management issues
	1.22	Het is een techniek waarmee je Mensen een aantal keren per dag een aantal hele simpele vragen	Combining with qualitative measuring tools	User involvement	Side constraints
	1.23	Nou dat laatste niet heb ik niet zo gehoord.	User anonymity	Privacy	Side constraints
	1.24	Toen ik hiermee begon, was het werken met een app op je smartphone Had nog iets sexies van OI	Resistance from employees	Social dimension	Management issues
	1.25	Dus ook de tool an sich was leuk Omdat het een beetje bijzonder nog was. Het was Natuurlijk dat	User involvement	Workers' fit	Organisational goals
	1.26	En nou ja, We hebben hiervan kunnen afleiden van hé, kan ik dat nog slimmer doen hè? Dus Dat w	Combining with qualitative measuring tools	User involvement	Side constraints
	1.27	Elke dag is op 6 random momenten dat invullen. Dus je zag wel heel wisselend score, zeg maar hè	Willingness to cooperate	Social dimension	Management issues
	1.28	Maar goed, Ik ben benieuwd, want Measuremen heeft doorontwikkeld, heeft ook veel gedaan In l	Attractiveness of tools	User involvement	Side constraints
	1.29	Ja ja, een andere soort van data dan met sensoren, hè, dat doen zij ook, maar dit is meer de gebr	Combining with qualitative measuring tools	User involvement	Side constraints
	1.30	Dat voorbeeld van de Belastingdienst, Ik denk dat dat eerlijk gezegd dat dat veel meer voorkomt, l	Unreliable questioning	Workers' fit	Management issues
	1.31	Daarvan weten we, Dat is een hele lastige vraag, hè? Mensen houden dat niet bij, hebben daar eig	Unreliable questioning	Workers' fit	Management issues
	1.32	In dit specifieke voorbeeld zag ik een factor twee verschil precies voor dat concentratie werk, du	Sufficient facilities	Spatial dimension	Management issues
	1.33	Ja, Dat is dan wel een aanwijzing. Hè, van dat er gewoon echt een verkeerde verwachting was bij	Expectation management	Social dimension	Management issues

1.34	en Ik denk dat daar ook bij meespeelt, een soort van wens of opvatting dat het in kantoren voor	Expectation management	Social dimension	Management issues
1.35	Dus er zit ook iets bij, denk ik van een soort overdrijving van hoeveel tijd en plek er moet zijn voor	Inventorizing user needs	Workers' fit	Workplace management
1.36	Klopt, nee, dus Daarom is dat goed en Rework zit ook op dat spoor. Dat is dan weliswaar een vraag	Prematurely inventory	Workplace usage	Workplace management
1.37	En niet wat belangrijk is, hoeft niet te zeggen dat je er heel veel tijd aan besteedt, hè? Dus Dat	Lack of knowledge	Resources	Management issues
1.38	En wat ook kan, is Natuurlijk dat meten met sensoren. Alleen lastige daarbij is met observeren of	Measuring activities	Sensing technologies	Predicting room usage
1.39	Denk ik. Ja, denk ik, ja, Maar dat is ook in mijn ogen nog niet uitontwikkeld. Er zijn wat dingen gepe	Measuring activities	Sensing technologies	Predicting room usage
1.40	Ja, dat verschilt, verschilt. Er zit eigenlijk bijna altijd wel een drive in vanuit vastgoed. Tweeledig ee	Reducing real estate costs	Optimization of space	Organisational goals
1.41	En de andere die daar een beetje naast ligt is, is meer naar de toekomst toe. De flexibiliteit vergr	Flexibility	Optimization of space	Organisational goals
1.42	Maar ik kom altijd ook wel met een soort oprecht geloof dat het ook daadwerkelijk het werk goe	Activity-based workplaces	Optimization of space	Organisational goals
1.43	Ja ja precies, maar dus je stelt van, je mag kiezen en dat past goed bij het moderne idee van kenni	COVID-19 pandemic	Optimization of space	Organisational goals
1.44	We zijn al wat verder en We kunnen ook al ja iets beter zien ook voor een deel wel In de praktijk t	COVID-19 pandemic	Optimization of space	Organisational goals
1.45	A: bezetting van kantoor is afgenomen, hè? Dat zie je toch echt wel als het gemiddelde beeld is da	Occupancy	Optimization of space	Organisational goals
1.46	Exact, exact ja dus die drijfveren. Je vroeg ook: waarom doen organisaties dit nou? Die drijfveer v	Occupancy; Reducing real estate costs	Optimization of space	Organisational goals
1.47	En het andere is dat, Als ik kijk naar mijn uitkomsten, Mensen die goed gedijen in die activiteit ger	Flexibility	Optimization of space	Organisational goals
1.48	Ja daar raak je trouwens nog een punt, wat ik ook wel heel belangrijk vind om nog mee te geven. 'Perso	na's	Workers' fit	Management issues
1.49	Het concept heet activiteit gerelateerd werken. Ik zou liever willen dat het zou heten: behoefte g	Persona's	Workers' fit	Management issues
1.50	Nou ja. Ja zeker nog verbeterd stap, Ik denk dat we nog meer kunnen leren. In eerste plaats over l	Persona's	Workers' fit	Management issues
1.51	Nee te weinig denk ik, te weinig. Ik denk dat In het algemeen, dus te klinisch wordt gekeken naar z	User involvement	Workers' fit	Management issues
1.52	En eigenlijk moet je daarvoor dus ook meer psychologische kenmerken van Mensen erbij gaan be	Unreliable questioning	Workers' fit	Management issues
1.53	Het zegt ook iets over cultuur, geef je elkaar ook de ruimte om dat verschillend te doen, hè? Wat	Resistance from employees	Social dimension	Management issues
1.54	Ja. Er zijn ook, om over die backoffice door te gaan of callcenters past ook goed in dat plaatje, hè	Lack of knowledge	Resources	Management issues
1.55	Nou, met een gebouw kom je over het algemeen wel uit. Je kunt in behoorlijk verschillende gebou	Building characteristics	Resources	Management issues
1.56	Dat is eerder zoals je zegt Van we willen cellenkantoor en je hebt bijvoorbeeld een heel diep gebou	Building characteristics	Resources	Management issues
1.57	technologie toepassen is vaak toch wel dat je dat op het moment van nieuwbouw of verbouw ka	Investments	Building characteristics	Side constraints
1.58	Ik heb nu een project bij een ziekenhuis waar ze echt de eerste stappen nu zetten op dit gebied. E	Uncertainty about the future	Added value of Big Data	Side constraints
1.59	Als het gaat om energiezuinigheid, dan kan je vaak best wel wat dingen nu al verzinnen. Daarmee	Lack of knowledge	Added value of Big Data	Side constraints
1.60	Ja ja zeker, ja nee, dus volgens mij is daar nog redelijk veel onderzoek voor nodig. Er zijn een paar	Lack of knowledge	Added value of Big Data	Side constraints
1.61	Ja nou soms ook het simpel. Ik sprak een tijdje terug iemand van Measuremen, daar kan je eventu	Measuring occupancy	Sensing technologies	Predicting room usage
1.62	Nee, volgens mij was dit een kit met sensoren die je dan op de bureaus plakt en weer kan verplaat	Measuring occupancy	Sensing technologies	Predicting room usage
1.63	Ja goeie vraag, daar heb ik eigenlijk niet zo'n beeld van. Er wordt vaak wel een soort samenwerki	Responsibilities	Added value of Big Data	Side constraints
1.64	Ja Misschien nog even door op. Wat je net vroeg, want dat is denk ik één van de kernvragen. Hoe	Measuring occupancy	Sensing technologies	Predicting room usage
1.65	Ik denk wel, die hint gaf je net zelf eigenlijk al, dat het goed zou zijn om dat te combineren met kv	Combining with qualitative measuring tools	User involvement	Side constraints
1.66	En het hetzelfde trouwens, dit schiet me nu ook even te binnen. Veel organisaties zien dat Mense	Functionality of the office	Spatial dimension	Management issues
1.67	En hetzelfde kan je zeggen, binnen kantoor kan op verschillende plekken die in hoeverre ze gebrui	Combining with qualitative measuring tools	User involvement	Side constraints

## Respondent 2

Respondent	Fragment	Text	Open code	Axial code	Selective code
2	2.1	Organisaties kiezen denk ik niet zozeer voor een concept activiteit geeft dit werken, maar kiezen v	stimulating coöperation	Workers' fit	Organisational goals
	2.2	Soms is er ook een praktische aanleiding, hè? De huur verloopt, ze gaan naar een nieuw pand. Ze	Reducing real estate costs	Optimization of space	Organisational goals
	2.3	maar over het algemeen zit er ook wel een wat groter gedachtegoed achter In de vorm van: We v	Autonomy of employees	Workers' fit	Organisational goals
	2.4	Ja, ik denk dat dat destijds wel geweest is. En ja, je merkt dat activiteit gerelateerd werken heel la	Hybrid working	Digital dimension	Workplace management
	2.5	Want activiteit gerelateerd werken is volgens mij, je kijkt waar je gaat werken en eerder was dat	Activity-based workplaces	Optimization of space	Organisational goals
	2.6	Maar nu met hybride werken werk je nog steeds activiteit gerelateerd. Alleen je bedenkt ook goe	Hybrid working	Digital dimension	Workplace management
	2.7	En hybride werken gaat nog wel iets verder over de afspraken die je erover moet maken om ook v	Hybrid working; Well-being	Digital dimension; Workers' fit	Organisational goals; Workplace manage
	2.8	Activiteit gericht werk of gerelateerd werken is altijd maar een middel om je doel te halen, dus Als	Innovation; Flexibility; Well-being	Optimization of space; Workers' fit	Organisational goals
	2.9	Waar veel de valkuilen zitten, Wat mij betreft, is de uitvoering daarvan en Dat is inderdaad heel pl	Diversity of space	Spatial dimension	Management issues
	2.10	Maar ja, ik neem vaak ook ons kantoor als voorbeeld. Ja, wij werken hier ook in die zin activiteit g	Activity-based workplaces	Optimization of space	Organisational goals
	2.11	Ja mijn profiel is daar ook lekker makkelijk voor. Ik werk met veel verschillende Mensen Samen en	Persona's	Workers fit	Organisational goals
	2.12	Ja iedereen heeft zijn eigen concept, dus We hebben boxen en Wij zijn dan In de box van (...) en eig	Flexibility	Optimization of space	Organisational goals
	2.13	Dus Omdat het allemaal relatief kleine bedrijven zijn, een beetje tussen de Laten we zeggen, 10 en	Flexibility	Optimization of space	Organisational goals
	2.14	ten opzichte van een 1 grote corporate of menig organisatie waar wij voor werken (...), (...), dat zijr	Flexibility	Optimization of space	Organisational goals
	2.15	En jij net zei over die profielen inderdaad dat ik als adviseur nieuwe manieren van werken, dat je s	Persona's	Workers fit	Organisational goals
	2.16	En, ze hebben het altijd al gedaan, dus Laten we alsjeblieft zo doen, dus Er zijn veranderingen, bijv	Persona's	Workers' fit	Management issues
	2.17	dus daar zou of veel meer begeleiding in nodig zijn, Of die stap moeten we kleiner maken.	Change management	Social dimension	Management issues
	2.18	Ik mag het hopen van niet. Nou, eigenlijk ons bedrijf, (...) in het Nederlands. Jij weet hoe jouw werl	Lack of knowledge	Resources	Management issues
	2.19	en wij vragen Alleen maar hoe die manier van werken zich ontwikkelt. Daar prikken we je ook op	Innovation	Optimization of goals	Organisational goals
	2.20	Nou een trend die momenteel Mensen heel veel benoemen is Natuurlijk: Door corona heb ik een	Hybrid working	Digital dimension	Management issues
	2.21	En eigenlijk al die informatie verzamelen wij en vertalen wij soms expert matig, soms ook weer Sa	Activity-based workplaces	Optimization of space	Organisational goals
	2.22	En werkplekconcept doorvoeren wat niet zou passen bij de medewerker. Ja, dan kan je het eigenl	Expectation management	Social dimension	Management issues
	2.23	Verschildt. Bij voorkeur wel. Wij hebben verschillende fases waarin wij organisaties ondersteunen.	Sustainable business operations	Optimization of space	Organisational goals
	2.24	kom eens tot een aantal mogelijkheden en ook als er een scenario gekozen is, werk dat helemaal	Correctly using workplaces	Social dimension	Workplace management
	2.25	Ook vaak wordt het dan daarna ontworpen, dus bijvoorbeeld Als het over de fysieke werkomgeving	User involvement	Workers' fit	Management issues
	2.26	en bij voorkeur zeggen we ook niet, hier is een sleutel van je nieuwe werkomgeving. Veel plezier, s	Performance evaluation	Workers' fit	Organisational goals
	2.27	Maar ja, Het is aan de organisatie om te bepalen in welk van de fases, hoeveel ze van een externe	Consulting experts	Optimization of space	Organisational goals
	2.28	Nou wat wel eens voorkomt, is dat dat niet alle doelen behaald worden In de mate wat je verwac	Expectation management	Social dimension	Management issues
	2.29	De hele werkomgeving wordt getransformeerd naar een activiteit gerelateerde werkomgeving. D	Change management	Social dimension	Management issues
	2.30	Dus je laat Mensen echt daadwerkelijk ervaring op doen en vanuit daar wordt het weer gemeten.	Resistance from employees	Social dimension	Management issues
	2.31	Ja, Dat ze van tevoren zeiden: de samenwerking scoorde eerst een 4 en We hadden verwacht dat	Expectation management	Social dimension	Management issues
	2.32	Ja bij voorkeur begin je eigenlijk gewoon weer van voor af aan weer. Het verkennen. Alleen dan g;	Performance evaluation	Workers' fit	Organisational goals
	2.33	Hoe kunnen we het nu nog met kleine tweaks aanpassen? Dan ga je weer verkennen, welke scena	Performance evaluation	Workers' fit	Organisational goals
	2.34	Alleen denk ik wat ook steeds belangrijker wordt, is het gedrag van Mensen. Want soms kan je oc	User involvement	Workers' fit	Management issues
	2.35	dat als bijvoorbeeld een collega zegt waar we het net over hadden, een persoon naar die gewoon	Resistance from employees	Social dimension	Management issues
	2.36	en je gaat daar heel erg op pushen met nee, jij moet je werkplek delen. Ja, Als de rest van het tea	Persona's	Workers' fit	Management issues
	2.37	en Dat is wat ik bedoel met dat activiteit gerelateerd werken geen doel is. Het is een middel om te	Productivity	Workers' fit	Organisational goals
	2.38	Ja, dat activiteit gerelateerd werken, dat kwam natuurlijk op met: We moeten meer gaan samenw	Flex factor	Spatial dimension	Management issues
	2.39	Maar er werd eigenlijk Alleen maar gekeken naar functie en naar profielen en even heel plat gezeg	Flex factor	Spatial dimension	Management issues
	2.40	En wat wil je Bereiken met activiteit gerelateerd werken, ook naar die persoonskenmerken. Wij g	Personality tools	Social dimension	Workplace management
	2.41	En zo kan je ook best wel zien dat soms Mensen wel dezelfde rol hebben, maar een compleet And	Change management	Social dimension	Management issues
	2.42	Ja, ja, Dat is even mijn collega (...) bijvoorbeeld die je de vorige keer gesproken had. Eigenlijk hebb	Autonomy of employees	Social dimension	Management issues
	2.43	En de ene is wat meer extrovert, anders wat meer introvert. Ja, dat zijn best wel eigenlijk hele we;	Persona's	Workers' fit	Organisational goals
	2.44	Ja, Heb je wat veel organisaties zeggen de bits, bricks, brains, of de een noemt het bits anders bric	Integration of buildings, systems and behaviour	Optimization of space	Organisational goals

2.45	En je merkt wel, dat vind ik nog wel een belangrijke shift denk ik ook om aan te tonen of aa	Reducing real estate costs	Optimization of space	Organisational goals
2.46	Maar het gedrag van Mensen dat werd dan aan het einde een soort van erbij gevoegd. Van oh ja, r	Light-hearted thinking	Social dimension	Management issues
2.47	En je merkt wel dat dat gedrag eigenlijk steeds meer Centraal en ook primair komt te staan. Dat w	Persona's	Workers' fit	Organisational goals
2.48	We gaan ze dat ook echt bevragen. Hoe ziet jouw ideale werkdag er In de toekomst uit? En dan g	Change management	Social dimension	Management issues
2.49	Het heeft ook wel heel veel relatie met inderdaad het management van de activiteiten. Maar, jou	Digital tools	Digital dimension	Workplace management
2.50	En sommige organisaties gaan net een stapje verder Als het gaat om reserveringssyste	men en sor	Innovation	Organisational goals
2.51	en ja, ik gebruik veel de term smart building. En wat men eronder verstaat is heel divers. Ja dus Da	Lack of knowledge	Added value of Big Data	Side constraints
2.52	Is In de projecten die ik gedaan heb, nog niet dermate toegepast, nee. Vaak Ook merk je dat als M	Popularity	Added value of Big Data	Side constraints
2.53	maar om het vervolgens ook echt weer toe te passen, genoeg data te hebben om een nieuw werk	Technological advancement	Building characteristics	Side constraints
2.54	Wij hebben Natuurlijk wel de integraliteit in huis wat ik net heb beschreven aan huisvesting, digita	Integration of buildings, systems and behaviour	Optimization of space	Organisational goals
2.55	Maar echt het organiseren van het verzamelen van big data en daar Toch ook wel je je facilitaire	t	Popularity	Side constraints
2.56	Maar is het dan de noodzaak om te meten hoe vaak Mensen op kantoor zijn en wat ze doen, en d	Functionality of the office	Spatial dimension	Management issues
2.57	hun (...), zo heet hun werkplek concept dan je kan eigenlijk vanuit overal vandaan werken, dus thui	Autonomy of employees	Workers' fit	Organisational goals
2.58	En als dat niet kan, Helemaal prima, want Het is effectiever of Het is gezelliger of leuker of duurza	Productivity	Workers' fit	Organisational goals
2.59	Maar gewoon even de vraag hè? Internationals met best wel wat respondenten, 50.000, hoeveel	Functionality of the office	Spatial dimension	Management issues
2.60	Veel van die gevoelens die Mensen al hebben worden, ook wel door grote internationale onderzo	Functionality of the office	Spatial dimension	Management issues
2.61	en dan zie je dit zijn een stuk of 20 punten die men het liefst thuis doet en Er zijn eigenlijk maar 4	Functionality of the office	Spatial dimension	Management issues
2.62	Dat is eigenlijk best wel raar, want waar we miljoenen investeren om het zo goed mogelijk te ond	Functionality of the office	Spatial dimension	Management issues
2.63	maar wat ik nu nog mega belangrijker vond? Dit is dan voor een gemiddeld kantoor, maar Leesm	Functionality of the office	Spatial dimension	Management issues
2.64	Dus Waarom werken Mensen nou zo lief thuis? Omdat het thuis zo goed is of Omdat het op kanto	Functionality of the office	Spatial dimension	Management issues
2.65	Ja ze hebben een eigenlijk een hele scorelijst waar een kantoor aan moet voldoen. Die kan je den	Functionality of the office	Spatial dimension	Management issues
2.66	Maar in ieder geval, de essentie ook, waar Jan Gerard Hoendervanger in zijn scriptie het ook over	Expectation management	Social dimension	Management issues
2.67	Individual, team tasks, individual focus work, Reading, dus eigenlijk alle werkzaamheden waar Mei	Expectation management	Social dimension	Management issues
2.68	En Natuurlijk ook dit verschilt weer per thuissituatie, per rol ook weer qua persoonlijke voorkeure	Home situation	Workers' fit	Management issues
2.69	Dus ja, Er is best wel wat significanten over te zeggen en ook dit zal naarmate de tijd vordert veran	Functionality of the office	Spatial dimension	Management issues
2.70	Ja, ja. En Aan het begin ook hè? Als je weer 30 jaar terugdenkt, je begon een business. Ja, het eers	Functionality of the office	Spatial dimension	Management issues
2.71	En ja, Dat is dan even heel plat voorbeeld, maar ook voor grotere gemeentes, eigenlijk gemeente	Hybrid working	Digital dimension	Workplace management
2.72	Maar ik vind wel inderdaad het doel van: wij werken voor de burger en Daarom dus zo goed mog	Activity-based workplaces	Optimization of space	Organisational goals
2.73	Ja ja, en die kwantitatieve data wat het ook vaak oplevert, is wel heel behulpzaam om ook weer v	Future-proof office	Workplace usage	Workplace management
2.74	Want vaak merk je dat er ook wordt gestuurd op wat meer onderbuikgevoelens of eigen ervaring	t	Useability	Side constraints
2.75	We zien inderdaad dat stel, er zou hier Smart sensing in deze huiskamer zitten en we zien dat di	Measuring occupancy	Sensing technologies	Predicting room usage
2.76	Ja ja, en daarin ook altijd verrijken met kwalitatieve informatie, want ik bespeur ook wel eens dat	Combining with qualitative measuring tools	User involvement	Side constraints
2.77	Als je zegt he, Alle 10 persoons vergaderruimtes zitten iedere dag van 9 tot 5 vol. Ze hebben er me	Misusage of rooms	Spatial dimension	Management issues
2.78	Ja, Het is nu toevallig ook een vraag bij de (...), waar ik nu een opdracht doe. Even heel plat gezegd	stimulating coöperation	Workers' fit	Organisational goals
2.79	Nou op alle 11 locaties willen ze een verdieping aanpassen, zodat ook Iedereen daarmee kan exp	Productivity	Workers' fit	Organisational goals
2.80	Nou dan op de vierde verdieping komen daar hele luxe faciliteiten voor, die er op de derde niet zij	Combining with qualitative measuring tools	User involvement	Side constraints
2.81	Gaan we zien, weet ik nog niet. Ja hier en daar enigszins hebben we het wel eens toegepast. Ik m	User anonymity	Privacy	Side constraints
2.82	Maar dat precies hetzelfde, want of zoals je het vroeger deed, je laat een student of een stagiair r	Measuring occupancy	Sensing technologies	Predicting room usage
2.83	maar (...) doet ook nog eens een keer met die kwalitatieve Informatie. dan wordt Het voor mij pas	Combining with qualitative measuring tools	User involvement	Side constraints
2.84	Ja, dat vind ik eigenlijk ook altijd wel mooier dat qua smart building ook wordt altijd wel als voorb	Investments	Building characteristics	Side constraints
2.85	Wij geven wel eens bij organisaties open en eerlijk aan, Als het bijvoorbeeld gaat om klimaatinstal	Investments	Building characteristics	Side constraints
2.86	fMaar dat soort keuzes zijn denk ik best wel belangrijk en daarin ook met big data of grote investe	Integration of buildings, systems and behaviour	Optimization of space	Organisational goals
2.87	En welk doel ga je daarmee halen? En is die investering dan gerechtvaardigd?	Useability	Added value of Big Data	Side constraints
2.88	Dan is het heel mooi als er een app is en die zegt bij de deur: Goedemorgen (...) en hij weet dat ik h	Useability	Added value of Big Data	Side constraints

## Respondent 3

Respondent	Fragment	Text	Open code	Axial code	Selective code
3	3.1	Ja nou, Ik denk dat het heel vaak geassocieerd wordt met het werken, waarbij je geen vaste werk	Activity-based workplaces	Optimization of space	Organisational goals
	3.2	Het combi kantoor van vroeger was Natuurlijk ook al het uitgangspunt, maar had wel iedereen ee	Flexibility	Optimization of space	Organisational goals
	3.3	Ja nou, Ik denk vanuit de definitie zoals ik het In de In de literatuur heb gezien, hè? En In de scripti	Hybrid working	Digital dimension	Workplace management
	3.4	Maar dat dat meer ook gewoon was van nou hè? Je mag ook thuis werken, want We hebben toc	Sufficient facilities	Spatial dimension	Management issues
	3.5	maar als je nu kijkt, Ja, Ik heb het nog nooit ergens echt gelezen, maar op zich valt dat hybride we	Hybrid working	Digital dimension	Workplace management
	3.6	maar de inhoud van nou, Je moet maandag en dinsdag thuis, want dan is er geen plek voor jou. En	Sufficient facilities	Spatial dimension	Management issues
	3.7	Ja, dat klopt, maar niet iedereen kan zich Natuurlijk thuis concentreren, hè? Wij hebben ook onde	Home situation	Workers' fit	Management issues
	3.8	Ja nou jou aannemen dat de behoefte is veranderd, Ben ik het al niet zo mee eens in die zin hè? Ik	COVID-19 pandemic	Optimization of space	Organisational goals
	3.9	Ja want de behoefte om concentratie werk te doen ligt Natuurlijk gewoon in een plek waar je Je k	Sufficient facilities	Spatial dimension	Management issues
	3.10	Maar dat is wel, vind ik de gedachten van activiteit gerelateerd. Werken. Dat je Op kantoor voor a	Diversity of space	Spatial dimension	Workplace management
	3.11	Ja, nou goed, dat kun je Natuurlijk beter aan dan consultants vragen, want die doen dat met hun h	Change management	Social dimension	Management issues
	3.12	En Als je dus over gaat naar activiteiten, het werken, dat je ook Mensen helpt om dat op de juiste	Resistance from employees	Social dimension	Management issues
	3.13	Ja, dat zie je In de wetenschappelijke publicaties over dit thema ook. Net als in Zweden is iemand	User involvement	Workers' fit	Management issues
	3.14	Ja, ja, Ik ben er van overtuigd dat dat zo is. Ja, als Mensen gewoon niet doorhebben wat de bedoe	Unclear instructions	Workers' fit	Management issues
	3.15	En in zo'n veranderproces en zo'n besluitvormingsproces kan je Mensen daar Natuurlijk in mee ne	Change management	Social dimension	Management issues
	3.16	Het wordt heel vaak gezien als een kosten besparingsactiviteit, Ook soms vanuit duurzaamheid zo	Sustainable business operations	Optimization of space	Organisational goals
	3.17	Ja, ja, Ik weet niet of jij de scriptie scriptie van Van de water hebt gelezen, die is 1,5 jaar geleden	Sufficient facilities	Spatial dimension	Management issues
	3.18	Ja goed, kijk, nudging is Natuurlijk bedoeld om bepaald gedrag te stimuleren Zonder dat ze dat hee	Nudging	Social dimension	Management issues
	3.19	Ik denk dat het bij de activiteit gerelateerde kantoor toch veel meer zit in kennis delen van en ze v	Nudging	Social dimension	Management issues
	3.20	Helpt ook zeker goed en ook: pilots zijn Natuurlijk een goed iets. Kijk, als een pilot vrijwillig is krijg	Willingness to coöperate	Social dimension	Management issues
	3.21	Nou dat gedrag daar een belangrijke uitkomst van kan zijn. Als je dat proces begeleidt, dat je dan f	User involvement	Workers' fit	Management issues
	3.22	Ja, ook hier zit ik Natuurlijk weer niet bij die bedrijven aan tafel hè? Dus hoe die bedrijven hun perf	Performance evaluation	Workers' fit	Organisational goals
	3.23	Ja, Ik ben van mening dat je qua performance eigenlijk verder zou moeten doorvragen dan tevred	Unreliable questioning	Workers' fit	Management issues
	3.24	Dat zeker, Dat is zeker. Ja, Daarom vind ik altijd onderzoeken Interessant. Wij proberen het ook w	Performance evaluation	Workers' fit	Organisational goals
	3.25	maar het geeft de wetenschapper wel meer inzicht Natuurlijk in hoe wordt deze werkomgeving ne	Performance evaluation	Workers' fit	Organisational goals
	3.26	Nou voor een wetenschapper in ieder geval wel, denk ik dan. Ik denk dat een corporate real estat	Feeling of privacy	Workers' fit	Management issues
	3.27	Dat kan ja, ik zeg wel, dat wordt nauwelijks gedaan, hoor, Maar ik denk wel dat je zo een beter be	Combining with qualitative measuring tools	User involvement	Side constraints
	3.28	Nou, kijk, We hebben wel eens gekeken van: Wat is dan een smart Office? Maar eigenlijk, de pure	Automization of the workplace	Sensoring technologies	Predicting room usage
	3.29	Ja, er worden al heel veel smart offices in Nederland opgeleverd, Maar ik denk dat er nauwelijks t	Self-control	Workplace usage	Workplace management
	3.30	Ja want het nadeel met individuele controle daar houden we allemaal heel erg van dat we allema	Self-control	Workplace usage	Workplace management
	3.31	Nee klopt.. Je hebt tegenwoordig al veel van die smart dingen die kunnen zien wie waar zit, hè. Of	Insights into availability of space	Sensoring technologies	Predicting room usage
	3.32	Ik bedoel bij Philips Lighting, bijvoorbeeld in Eindhoven. Ik heb ik wel eens applicaties gezien dat	Self-control	Workplace usage	Workplace management
	3.33	Dat is Natuurlijk een hele lastige, hè? Die businesscase Is ook iets waar ik me wel mee bezig houd	Lack of knowledge	Added value of Big Data	Side constraints
	3.34	Nou Daarom, Ik denk dat de kantoren die dat al hebben, hè? Daar spelen al dat soort aspecten he	Lack of knowledge	Added value of Big Data	Side constraints
	3.35	Nou weinig, want ja.. smart offices in de brede zin van het woord, er zijn er natuurlijk best wel wa	Insights into room usage	Workplace usage	Workplace management
	3.36	Ja ja nee, Dat is Natuurlijk absoluut het idee daarvan. Ja. Je ontdekt zo plekken die niet zo in trek	Insights into room usage	Workplace usage	Workplace management
	3.37	Heb je ook gesproken met Mensen van de (...)? Wel een interessante denk ik. We hebben hier op c	Insights into room usage	Workplace usage	Workplace management
	3.38	Hij is ook heel veel In de pers, Want ze proberen daar Natuurlijk overal aandacht voor te krijgen. f	Popularity	Added value of Big Data	Side constraints
	3.39	Ja ik ben er later ingestapt, dus Ik ben er nog niet zo heel lang bij betrokken, maar sinds een aantal	Popularity	Added value of Big Data	Side constraints
	3.40	Het gaat Natuurlijk om Gezondheid, om vitality, he? Dus Wat kun je In de kantoren en werkplekke	Vitality	Workers' fit	Workplace management
	3.41	Ja dus, ze hebben daar allerlei technologiebedrijven als partners Natuurlijk die al die dingen levere	User involvement	Workers' fit	Workplace management
	3.42	Dat is ook zo, dus dat dat maakt het ook gewoon heel moeilijk met die smart offices. Nou, Je moe	Optimizing user experience	Workers' fit	Workplace management
	3.43	Ik bedoel daarmee even. Wat dat betreft geven we met zijn allen met onze mobiel in een handom	Sharing data with coworkers	Privacy	Side constraints
	3.44	Ja, Maar ik denk wel. Ik ben zelf lang geleden alweer gepromoveerd op kennis delen en de kantoo	Sharing data with coworkers	Privacy	Side constraints
	3.45	Ik denk het ook wel, maar ja, ik doe daar helemaal geen onderzoek naar, dus daar kan ik niks over	User anonymity	Privacy	Side constraints
	3.46	Ja, als in whatsapp kan je zelf beslissen van geef ik aan dat Mensen kunnen zien wanneer ik online	Sharing data with coworkers	Privacy	Side constraints
	3.47	Ik ben zelf van mening dat je met alleen sensoren het volledige inzicht krijgt. Want je ziet mischie	Combining with qualitative measuring tools; Unconscious behaviour	User involvement; social dimension	Side constraints; Management issues
	3.48	Ja en ook hoe je voelt en ik ken de app wel, want Ik heb met (...) gesprekken daarover om met die	Attractiveness of tools	User involvement	Side constraints
	3.49	Ja, Ik denk altijd voor wat hoort wat hè? Je moet daar Mensen wat voor teruggeven. Kijk dat zag j	Attractiveness of tools	User involvement	Side constraints
	3.50	Ja nee, dat dat klopt ja, Maar dat zijn ook moeilijke dingen hè? Zeker met die privacywetgeving, da	Privacy regulations	Privacy	Side constraints

## Respondent 4

Respondent	Fragment	Text	Open code	Axial code	Selective code
4	4.1	Nou ja, We hebben. Ik denk 10 jaar geleden zijn we daarmee gestart. Ongeveer. Ik denk zoiets	Mix Diversity of space	Spatial dimension	Organisational goals
	4.2	Iedere (...) heeft dat wel op zijn eigen manier lokale invulling gegeven, dus Het was niet een one si	Diversity of space	Spatial dimension	Organisational goals
	4.3	Sinds corona en Iedereen thuis moest werken, heeft (...) dat nogal geadopteerd en. Is er een nieuw Covid-19 pandemic		Optimization of space	Organisational goals
	4.4	En eigenlijk ligt Activiteit gebaseerd werken aan ten grondslag, want het krijgt een meer kosteneff	Hybrid working	Digital dimension	Workplace management
	4.5	Kijk, en dan geldt nog steeds dat op kantoor, dat we daar gaan voor een enorme variatie aan type	Flexibility	Workers' fit	Organisational goals
	4.6	En daar komt bij dat In het begin had (...) nog het idee van, oh, We gaan echt Alleen maar ontmoet	Productivity	Workers' fit	Organisational goals
	4.7	Alleen dan wel met de afspraak dat dat eigenlijk maar één keer In de week is, ongeveer of maxim	Hybrid working	Digital dimension	Workplace management
	4.8	Ja elk kantoor heeft een mix van allerlei type functies en medewerkers en iedere functie vraagt of	Flexibility	Workers' fit	Organisational goals
	4.9	En (...) is op dit moment heel hard aan het nadenken over goh, wat moet er dan precies zijn? Op w	Performance evaluation	Workers' fit	Organisational goals
	4.10	Het speelt natuurlijk ook dat wij op dit moment binnen (...) nog veel te veel huisvesting hebben. W	Reducing real estate costs; occupancy	Optimization of space	Organisational goals
	4.11	Ja nog steeds. Want we zien In de praktijk dat op een of andere manier het kantoor helemaal niet	Autonomy of employees	Social dimension	Management issues
	4.12	En Wat zien we dus In de praktijk? Met uitzondering van Utrecht, waar nog wel relatief wat Mens	Functionality of the office	Spatial dimension	management issues
	4.13	Verder ook, want ik zit bijvoorbeeld zelf in een klankbordgroep (...). Ik ga trouwens weg, hè? Bij d	Involving users	Workers' fit	Organisational goals
	4.14	Ja, heel erg en HR en IT zitten eigenlijk een beetje in de lead hè voor het ontwikkelen van zaken. N	Involving users	Workers' fit	Organisational goals
	4.15	Nou, het werkt redelijk efficiënt met zon klankbordgroep hè? daar zit gewoon een modus in. Van	Involving users	Workers' fit	Organisational goals
	4.16	De meeste tijd zit hem in het afstemmen met de lokale directies over hun huisvesting strategie. N	Resistance from managers	Resources	Management issues
	4.17	En ik, ik vind het fijn dat ze daar in shiften, hè? Dus Dat is ook waar ze eerst bang waren dat Ieder	Expectation management	Social dimension	Management issues
	4.18	Ik heb niet de indruk dat er op het hele activiteiten gebaseerd werken een heleboel weerstand zit. Resistance from employees		Social dimension	Management issues
	4.19	Ja het verminderen van huisvesting is meer een gevolg van het feit dat men het thuis heel goed ka	Reducing real estate costs	Optimization of space	Organisational goals
	4.20	één grote drijfveer is om te zorgen dat er goede werkplekken zijn op kantoor passend bij de werk	Functionality of the office	Spatial dimension	Management issues
	4.21	Het speelt al, want De (...) valt onder (...) en zijn In de afgelopen jaren door een reorganisatie al on	Reducing real estate costs	Optimization of space	Organisational goals
	4.22	Dat durf ik niet helemaal met zekerheid te zeggen, Maar ik schat dat het er nog een stuk of 90 zijn	Reducing real estate costs	Optimization of space	Organisational goals
	4.23	En, Ik weet dat ik het in Zutphen al geïntroduceerd heb nou dus dat ja Ik denk echt wel 15 jaar gek	Digital tools	Digital dimension	Workplace management
	4.24	Ik denk dat Mensen het helemaal prima vonden, Maar dat kwam ook Omdat wij nooit hebben ing	Sufficient facilities	Spatial dimension	Management issues
	4.25	Ja, dat vind ik wel en dat gebeurt dus ook Alleen die gevoeligheid van welk kantoor kan je sluiten	Reducing real estate costs	Optimization of space	Organisational goals
	4.26	Ja, Er zijn wel heel veel gebouwen destijds van binnen soort van gestript en opnieuw opgebouwd. Building characteristics		Resources	Management issues
	4.27	Nee, dat hield ons niet veel tegen. Ik heb meerdere panden verbouwd in mijn loopbaan. En daar n	Creating uniformity	Optimization of space	Organisational goals
	4.28	Ja is er een pilot. Binnen nu en een half jaar gaan ze op een aantal locaties een pilot doen, dus dar	Creating uniformity	Optimization of space	Organisational goals
	4.29	Ja, dat doen ze wel, dan gaan ze altijd de boel inrichten en daar checken op locatie van: Nou, hoe	Occupancy	Optimization of space	Organisational goals
	4.30	Je kunt Alleen niet meten hoe lang men op kantoor is geweest, dus als iemand binnenkomt om All	Occupancy	Optimization of space	Organisational goals
	4.31	Ik moet even denken, hoor hoe ze dat nou wilde. Er moest in ieder geval een goede koppeling zijn	Lack of knowledge	Resources	Management issues
	4.32	Maar als jij mij vraagt van, wat heb je eraan door een sensor onder hun bureau te doen om daarm	Autonomy of employees; Useability	Social dimension; Added value of Big Data	Management issues; Side constraints
	4.33	Maar Natuurlijk willen we sturen op, Als je naar kantoor komt: Kom op, kom een woensdag of eer	Useability	Added value of Big Data	Side constraints
	4.34	Ja, hoe meer schaarste, hoe belangrijker het wordt. Oh ja ik weet het al, waar we het net over ha	Workplace reservation systems	Sensing technologies	Prediction of room usage
	4.35	En Ik ga heel ver kijken of ik daar nog iets over kan vinden. Het zal wel een tijdje terug zijn. Ja hier:	Useability	Added value of Big Data	Side constraints
	4.36	Even kijken of ik daar nog iets anders over vindt. Nou en hier heb ik nog staan: meten is weten. Er	Combining with qualitative measuring tools	User involvement	Side constraints
	4.37	k ben nog even aan het zoeken hoor naar iets over die reserverings app, want Ik weet zeker dat d	Useability	Added value of Big Data	Side constraints
	4.38	Ja nou ja, het zijn best wel grote groepen met deze pilot en om inderdaad echt hr en fm echt wel	User involvement	Workers' fit	Workplace management
	4.39	Ja, daar is wel budget voor vrijgemaakt in ieder geval. Het moet nog gaan gebeuren, Maar daar is	Investments	Building characteristics	Constraints
	4.40	Ja eigenlijk toch ook wel weer vergelijkbaar met dit kantoor vroeger, toch wel weer wandjes eruit	Investments	Building characteristics	Constraints
	4.41	hier achter staat: creatief samenwerken, bijvoorbeeld deze, dan wordt hierachter uitgelegd wat h	Activity-based workplaces	Optimization of space	Organisational goals
	4.42	Heel veel ruimtes zijn voor Alleen maar voor 8 Mensen. Ja, dan willen ze straks Misschien op basis	Digital tools	Digital dimension	Workplace management
	4.43	En dat je dus Misschien naar minder kantoren gaat, maar op die kantoren wil je wel alles kunnen	Diversity of space	Spatial dimension	Workplace management



## Respondent 5

Respondent	Fragment	Text	Open code	Axial code	Selective code
5	5.1	Ja nou, Ik denk goed om aan te geven dat we denk ik inderdaad een jaar of 3 geleden of zo rond de COVID-19 pandemic	COVID-19 pandemic	Optimization of space	Organisational goals
	5.3	en is dat wat meer van activity based working eigenlijk naar een clubhuis concept omgetoverd en Aligned with organisational identity	Aligned with organisational identity	Optimization of space	Organisational goals
	5.4	En nu in juli deze maand in Eindhoven en nou een locatie in Groningen, dus steeds meer panden g Diversity of space	Diversity of space	Spatial dimension	Workplace management
	5.5	Dus op die manier hebben we eigenlijk het activity based werken nu uitgerold en proberen we doc Nudging	Nudging	Social dimension	Workplace management
	5.6	Nee, Er zijn ding waren we al meteen mee begonnen in Amstelveen, eigenlijk. Het sociologisch Coi Diversity of space	Diversity of space	Spatial dimension	Workplace management
	5.7	Ja, dit is dus een bovenaanzicht van kantoor Eindhoven. Hier kom je vanuit de lift kern binnen en v Nudging	Nudging	Social dimension	Workplace management
	5.8	dan heb je hier eigenlijk een nou ja bar en allerlei zitjes eromheen. Hier heb je een game area met Diversity of space	Diversity of space	Spatial dimension	Workplace management
	5.9	En dan hier eigenlijk aan de buitenranden wat project Kamers. nou waar je die positioneert, Dat n Aligned with organisational identity	Aligned with organisational identity	Optimization of space	Organisational goals
	5.10	Ja exact ja nou, Volgens mij is een beetje vaag Omdat het nu wat uitgezoomd is. Dit is een nieuw z Digital tools	Digital tools	Digital dimension	Workplace management
	5.11	Dit is bijvoorbeeld Eindhoven redelijk kaal hoor, Maar wel even qua sfeer, zeg maar wat met nam Blending home and office environments	Blending home and office environments	Workers' fit	Organisational goals
	5.12	We zeggen ook wel eens van: thuiskomen bij (...) ofzo. Dat is een beetje de quote die we er dus so Aligned with organisational identity	Aligned with organisational identity	Optimization of space	Organisational goals
	5.13	Ja, zo zou je het wel kunnen zeggen en met name eigenlijk nog wel meer, van: wat is de behoefte Involve users	Involving users	Workers' fit	Organisational goals
	5.14	En, Dat is in een pand als Eindhoven nog weer wat makkelijker te bepalen, want daar hebben we t Diversity of the workforce	Diversity of the workforce	Workers' fit	Organisational goals
	5.15	Dus Omdat we daar nog best een beetje zoekende zijn in, van: wat is nou zoiets verhouding of Change management	Change management	Social dimension	Management issues
	5.16	Nee voor die regiokantoren, dan kijken we eigenlijk altijd wel met een klankbordgroep, dus een aa Consulting experts	Consulting experts	Optimization of space	Organisational goals
	5.17	Maar het is zo een verschil met vroeger. Dus wat wij vooral nu doen, in tegenstelling tot ook wat Flexibility	Flexibility	Workers' fit	Organisational goals
	5.18	Maar ook heel belangrijk Daarin is dat je ze ook uniform maakt, dus dat de voorzieningen op de b Creating uniformity	Creating uniformity	Optimization of space	Organisational goals
	5.19	En nou, We willen heel erg die relatie houden Gedurende de dag, dus dat betekent dat Als je 's oc Activity-based workplaces	Activity-based workplaces	Optimization of space	Organisational goals
	5.20	Jazeker, en helemaal met de verbouwingen die we nu verder al landelijk doen. En dus ook nu stap Change management	Change management	Social dimension	Management issues
	5.21	Een aantal kamers hebben we op de plek gelaten, Omdat dat ook eigenlijk gewoon prima was en Building layout	Building layout	Spatial dimension	Management issues
	5.22	Nou ja zeker wel, want een hele hoop afdelingen die zijn hier niet echt een voorstander van gewo COVID-19 pandemic	COVID-19 pandemic	Optimization of space	Organisational goals
	5.23	Nou, Dat is nu Natuurlijk in één keer wel zo gegaan met de thuiswerkplek, ook als voorziening die Resistance from employees	Resistance from employees	Social dimension	Organisational goals
	5.24	Je houdt nog steeds afdelingen die nou een beetje hun eigen grenzen graag bepalen en daar zou de Change management	Change management	Social dimension	Organisational goals
	5.25	Nou, We hebben nu dus ook de vijfde, dus eigenlijk zijn alle atrium gebieden nu allemaal verbouwd Diversity of space	Diversity of space	Spatial dimension	Workplace management
	5.26	We proberen ook bijvoorbeeld de naambordjes weg te halen bij kamers, waardoor we ook daarin Creating uniformity	Creating uniformity	Optimization of space	Organisational goals
	5.27	We hebben niet echt een vierkante meters vermindert, dus die zijn wel redelijk gelijk gebleven. W Diversity of space	Diversity of space	Spatial dimension	Workplace management
	5.28	Ja ja zeker en hè, ik sluit niet uit dat we niet minder vierkante meters gaan huren, want logischerv Reducing real estate costs	Reducing real estate costs	Optimization of space	Organisational goals
	5.29	Ja, Ik denk het wel, Maar ik denk ook dat in tegenstelling tot vroeger, dan hadden wij gewoon pan Reducing real estate costs	Reducing real estate costs	Optimization of space	Organisational goals
	5.30	Ja ook wel. Dat doen we met name door gewoon in gesprek te gaan met de afdelingen en daarin Involve users	Involving users	Workers' fit	Organisational goals
	5.31	Zoals Zwolle die we afgelopen jaar hebben geopend. Nou ja, Ik ben er toevallig gister bij geweest Performance evaluation	Performance evaluation	Workers' fit	Organisational goals
	5.32	Ja, We hebben gedeeltelijk data inderdaad, Maar dat is voor nu iets minder van toepassing, want Measuring occupancy	Measuring occupancy	Sensing technologies	Predicting room usage
	5.33	Ja inderdaad aan de hand van de poortjes, Maar we hebben ook sensoren In het pand. Dat is ons Measuring occupancy	Measuring occupancy	Sensing technologies	Predicting room usage
	5.34	Nee, dat doen wij zelf. Maar wat ik zeg, op dit moment doen we dat iets minder data gestuurd en Measuring occupancy	Measuring occupancy	Sensing technologies	Predicting room usage
	5.35	Ik denk dat de noodzaak meer zit in: hoe krijgen we Mensen weer naar kantoor? Want dat gebeu Functionality of the office	Functionality of the office	Spatial dimension	Management issues
	5.36	Nou, Het is wel iets aangepast hoor, maar opzich niet op basis van dat het nu rustig is. We gaan of Functionality of the office	Functionality of the office	Spatial dimension	Management issues
	5.37	Ja zeker, dus in zulke hokjes waar ik nu in zit, Nou ja, daar kun je perfect eigenlijk in teams bellen. Correctly using workplaces	Correctly using workplaces	Social dimension	Workplace management
	5.38	Ja, Maar ik denk dat dat meestal niet zozeer wordt gedaan, dus vanuit op dit moment nog met dat Workplace reservation system	Workplace reservation system	Sensing technologies	Predicting room usage
	5.39	maar dit moment halen we dat met name nog vanuit het gedrag wat we gewoon bij Mensen zien. Involving users	Involving users	Workers' fit	Organisational goals
	5.40	Jazeker, Sorry hoor ik wordt hele tijd gebeld, Maar ik meen het vragen van mening is af en toe wel Performance evaluation	Performance evaluation	Workers' fit	Organisational goals
	5.41	Maar Als we het hebben over het strippen van een hele verdieping en het opnieuw herindelen voc Involve users	Involving users	Workers' fit	Organisational goals
	5.42	Nee, maar uiteindelijk kijk. Wij zijn Natuurlijk ook daarin de specialisten tenminste zo zien wij ons User involvement	User involvement	Workers' fit	Management issues
	5.43	Ja zeker, ja Dat is ook zo, hè? Maar ja, wij zijn gewoon best wel een politiek bedrijf. Natuurlijk met Resistance from employees	Resistance from employees	Social dimension	Management issues
	5.44	Ja, nou ja, Daarom, en wij weten Natuurlijk welke lijnen we op een gegeven moment moeten volg Aligned with organisational identity	Aligned with organisational identity	Optimization of space	Organisational goals
	5.45	Nou, op zich valt het mee, want We hebben een dus een eigen gemaakt systeem, (...) en dat hebbe Measuring occupancy	Measuring occupancy	Sensing technologies	Predicting room usage
	5.46	Dus de aanpassing is vrij minimaal geweest en wel iets zeker wat we de afgelopen jaren heel erg Investments	Investments	Building characteristics	Side constraints
	5.47	zeg maar om aan te tonen van nou ja, geen plek? Deze ruimte wordt 30% van de tijd benut Measuring occupancy	Measuring occupancy	Sensing technologies	Predicting room usage
	5.48	Dus dat ontcrachten wij gewoon met feitelijke informatie. En Dat is niet meer hoe we het willen g Optimizing user experience	Optimizing user experience	Workers' fit	Workplace management
	5.49	Nee, voor het reservering systeem gaan we in principe vanaf de pilot fase nog niet meteen starter Useability	Useability	Added value of Big Data	Side constraints
	5.50	Waar we Voornamelijk moeite mee hebben is gedrag van Mensen en dat zit hem in: Je kan de bes Misusage of rooms	Misusage of rooms	Spatial dimension	Management issues
	5.51	We hebben een pand dus in Zwolle, waar er wordt geklaagd over dat er toch te weinig bel ruimte Willingness to cooperate	Willingness to cooperate	Social dimension	Management issues
	5.52	Ja nou ja, dat zou wel. Daar ben ik wel heel erg benieuwd naar of dat inderdaad één van de voord Resistance from employees	Resistance from employees	Social dimension	Management issues
	5.53	Ja heel erg en daar zit gewoon ons specialisme niet. Wij weten gewoon wat goed is voor de mede Change management	Change management	Social dimension	Management issues
	5.54	Ja, nou ja, zeker, en dus het zit hem in het gedrag van Mensen zelf. Maar ik denk dus ook echt wel Responsibilities	Responsibilities	Added value of Big Data	Side constraints
	5.55	Ja nou mooi, Ik denk dat dat echt, ondanks dat wij nog niet zo heel veelvuldig toepassen ook we Useability	Useability	Added value of Big Data	Side constraints
	5.56	Zeker, nee, maar Wij hebben gewoon de lastigheid dat we wel een gemiddelde leeftijd van 33 jaar Diversity of the workforce	Diversity of the workforce	Workers' fit	Organisational goals

## Respondent 6

Respondent	Fragment	Text	Open code	Axial code	Selective code
6	6.1	Nou ja, ik zit dus 3 jaar bij het team en het team was voor mij al wel begonnen, Maar ik denk dat c	Accessibility	Added value of Big Data	Side constraints
	6.2	Ja ja, en We hebben ook veel meer data nu, wat we gewoon automatisch gerefreshed krijgt, bijvo	Automatic data delivery	Sensing technologies	Predicting room usage
	6.3	Ja we zien namelijk dat onze panden nog gewoon heel erg leeg zijn. Het idee was hè, corona was i	Occupancy	Optimization of space	Organisational goals
	6.4	Dus We hadden al wel een deel van de kantoren onder handen genomen. Het kantoor op Zuidoos	Occupancy	Optimization of space	Organisational goals
	6.5	Maar ja, Het is nu nog Misschien van: gaan we dan nu al nog meer panden afstoten of zeggen we:	Reducing real estate costs	Optimization of space	Organisational goals
	6.6	Ja wacht, ik zal ook even mijn scherm delen dan. Ik had wel even wat klaar gezet, namelijk wat we	Functionality of an office	Spatial dimension	Management issues
	6.7	Maar het idee is dat dat kan. Het kantoor is ingericht met allemaal verschillende plekken. Dus je h	Diversity of space	Spatial dimension	Workplace management
	6.8	Nou, je ziet dat sommige Mensen het wel goed gebruiken, maar sommige Mensen dat ook niet. Di	Misusage of rooms	Spatial dimension	Management issues
	6.9	Nou nog een gewone, normale formele meeting ruimte zoals vroeger. We hebben hier dan wel wi	Digital tools	Digital dimension	Workplace management
	6.10	Ja, die zijn ze nu eigenlijk weer opnieuw aan het inrichten, want je merkt gewoon dat Mensen dat	Expectation management	Social dimension	Management issues
	6.11	Ja en het idee was dus of er al Mensen die kwamen om te ontmoeten, dus ze hadden dus ook hee	Misusage of rooms	Spatial dimension	Management issues
	6.12	Ja hier ook weer van die community werkplekken, dat je dan dus met een projectteam even aan e	Misusage of rooms	Spatial dimension	Management issues
	6.13	Nou eigenlijk al het meubilair, want er staat dat hadden we al wel, dus Er zijn net wat meer burea	Expectation management	Social dimension	Management issues
	6.14	Ja je ziet nu Alleen dat agenda s worden even goed volgestopt met teams meetings en Als je dan i	Change management	Social dimension	Management issues
	6.15	En Misschien dat daar ook niet per se alle rollen altijd helemaal voor geschikt zijn, kan ik me voors	Personas	Workers' fit	Management issues
	6.16	Ja, want We hebben (...) destijds als architect. Die heeft dat nieuwe (concept) voor ons gemaakt	Consulting experts	Optimization of space	Organisational goals
	6.17	zeg maar goed wat je zei, bij de meeste organisaties was dit de verwachting. Het werkt Alleen ni	Expectation management	Social dimension	Management issues
	6.18	Dat is nog wel een beetje een ding, want gaan we Nu dus Het gedrag van Mensen proberen aan te	Change management	Social dimension	Management issues
	6.19	We gaan In ieder geval wel wat meer bel cellen neerzetten, want je merkt dat Mensen het gewoo	Sufficient facilities	Spatial dimension	Management issues
	6.20	Dus dan gaan ze nu zo een hele grote vergaderkamer in hun eentje de hele dag claimen om te Tea	Misusage of rooms	Spatial dimension	Management issues
	6.21	En, Het is dan wel ook het idee dat je meetings dus dan fysiek plant, hè? Dat je dan ook je meeting	Stimulating cooperation	Workers' fit	Organisational goals
	6.22	Ja, of inderdaad gewoon Samen aan zo'n werkblok zitten. Daarom waren die work together block	Stimulating cooperation	Workers' fit	Organisational goals
	6.23	Ja, We hebben (...)toen ingehuurd als architecten, dus zij hebben het grotendeels bedacht. Samen	Consulting experts	Optimization of space	Organisational goals
	6.24	Het is nu meer dat de input opgehaald wordt van: wat vind je daar vervelend aan? Of wat vind je v	Involving users	Workers' fit	Organisational goals
	6.25	Ja, het moest Natuurlijk best wel snel gebeuren, want je wist Natuurlijk helemaal niet precies wan	COVID-19 pandemic	Optimization of space	Organisational goals
	6.26	Nee, We hadden helemaal In het begin, toen het net kwam, toen hadden ze bedacht dat we in tw	Occupancy	Optimization of space	Organisational goals
	6.27	Nee niet zo direct, want het afstoten van kantoor.. Je hebt gewoon vaak huurcontracten die 5 ja	Reducing real estate costs	Optimization of space	Organisational goals
	6.28	terwijl er wel 4000 medewerkers op dat pand zaten. Het pand op de (...), Daar zaten eerst 5500 M	Occupancy	Optimization of space	Organisational goals
	6.29	Het staat ook ergens achter opgeslagen Als het nodig hebben, maar hij zit in ieder geval hier in j	an Occupancy	Optimization of space	Organisational goals
	6.30	Ja, We hebben dit Alleen voor de 10 panden waar we inderdaad toegangspoortjes hebben, dus je i	Measuring occupancy	Sensing technologies	Predicting room usage
	6.31	bij de (...) heb je heel veel 36 uur contracten, ook 36 uur is fulltime en dat verschilt een beetje per	Hybrid working	Digital dimension	Management issues
	6.32	Ja ja, hier kun je dat zien. We hebben daar nu twee panden op aangesloten, Maar dat gaan er mee	Measuring occupancy	Sensing technologies	Predicting room usage
	6.33	Maar we hebben op een vloer een pilot en daar staan sensoren. Hier zitten echt onder het Bureau	Insights into availability of space	Sensing technologies	Predicting room usage
	6.34	Nou met die wifi sensoren kan het sowieso niet en met de werkplek sensoren durf ik het eigenlijk	Investments	Building characteristics	Side constraints
	6.35	Nee, dat denk ik niet. We hadden in ieder geval die data die hier in zit, hebben we ook ergens nog	Measuring occupancy	Sensing technologies	Predicting room usage
	6.36	hier hebben we ook zeg Maar het aantal werkplekken dat we halen uit tekeningen, dus We hebbei	Consulting experts	Optimization of space	Organisational goals
	6.37	Daardoor weten we bijvoorbeeld het aantal werkplekken en je hebt dus het aantal arbo werkplek	Measuring occupancy	Sensing technologies	Predicting room usage
	6.38	Nee, We hebben daar ook wel targets voor inderdaad. We hebben een een target voor hoe veel vv	Expectation management	Social dimension	Management issues
	6.39	En Als jij een hele slechte thuissituatie hebt en niet thuis kan werken, dan mag je dus wel 5 da	en j Home situation	Workers' fit	Management issues
	6.40	Maar We hebben het idee dat een maximum aantal mensen een maximum aantal dagen naar kan	Occupancy	Optimization of space	Organisational goals
	6.41	Nee dus Daarom zien we ook die verspreiding In de week dat hij dus niet gelijk is, want Mensen m	Autonomy of employees	Workers' fit	Organisational goals
	6.42	Dus ja, dan krijg je de dinsdag en donderdag als de meest populaire dagen waarbij je dan ziet dat	Change management	Social dimension	Management issues
	6.43	Ja zeker ja ja, want We zijn ook nog bezig met een smart buildings programma, Maar dat is nog ze	Workplace reservation systems	Sensing technologies	Predicting room usage
	6.44	Maar Dat je dan ook bijvoorbeeld op een vrijdag bijvoorbeeld maar een deel van je gebouw opens	Historical data	Future decision-making	Predicting room usage
	6.45	Maar goed, Dat is een idee, maar dan kom je weer met het gedrag van Mensen, want Het was In f	Resistance from employees	Social dimension	Management issues
	6.46	Nee, althans niet wat ik heb meegekregen. Ook Omdat die dingen op wifi werken en het wordt al l	User anonymity	Privacy	Side constraints
	6.47	Het is daarbij ook: zorg er inderdaad wel voor dat je niet in te kleine groepjes kan kijken vanwe	Sharing data with coworkers	Privacy	Side constraints
	6.48	Ja zeker, en Wij zijn als workplace management eigenlijk de ene afdeling die deze data ontvange	privacy regulations	Privacy	Side constraints
	6.49	Ja, We hadden eerst, maar we zijn daar wel mee gestopt, een reserveringssysteem, Maar dat was	Workplace reservation systems	Sensing technologies	Predicting room usage
	6.50	Ja, en daar zitten Nog wat meer features in, dat je dus kan zien, ook als persoon hoe druk is het In	Insights into availability of space	Sensing technologies	Predicting room usage
	6.51	Ja, We willen Natuurlijk dat Mensen naar kantoor komen voor de juiste dingen. En dat ze daar da	Autonomy of employees	Workers' fit	Organisational goals
	6.52	Ja precies en Daarom willen we ook nog niet per se nu alle panden afstoten, Omdat we dus nog ni	Reducing real estate costs	Optimization of space	Organisational goals
	6.53	Oké ja, terwijl wij juist het idee hebben dat we ook bij sommige dingen nog best wel achter lopen	Investments	Building characteristics	Side constraints

## Respondent 7

Respondent	Fragment	Text	Open code	Axial code	Selective code
7	7.1	Ja kijk, Dat is een beetje het punt, dus wij verzamelen dus objectieve data. En, wij adviseren, nou v	Inventorizing user needs	Workers' fit	Workplace management
	7.2	Dus Als het aan ons ligt, Ga je dus juist dit soort diensten inzetten voordat je überhaupt een nieuw	Prematurely inventori	Workplace usage	Workplace management
	7.3	Nou, dat ligt eraan. Dat ligt geheel aan de situatie Natuurlijk, Maar dat is wel iets wat wij nastre	Prematurely inventori	Workplace usage	Workplace management
	7.4	Maar de ervaring leert dat het ook vaak Gaandeweg gebeurt, dus op het moment dat ze dan een v	Misusage of rooms	Spatial dimension	Management issues
	7.5	Dus Het is vaak dat bedrijven, organisaties die willen het gewoon graag zelf uitvoeren. Nou dat sn	User involvement	Workers' fit	Management issues
	7.6	Beide, beide ja dus als wij metingen uitvoeren, dan worden de medewerkers automatisch betrokk	Consulting experts	Optimization of space	Organisational goals
	7.7	Dus nee, wij verzamelen dus objectieve data en die presenteren we in een online dashboard en w	Measuring occupancy	Sensing technologies	Predicting room usage
	7.8	proberen we ook inzicht te Laten zien waar we bijvoorbeeld de match of de mismatch Laten zien	Misusage of rooms	Spatial dimension	Management issues
	7.9	Jazeker, ja, We hebben best wel wat verschillende diensten en naast de objectieve data die verza	Inventorizing user needs	Workers' fit	Workplace management
	7.10	We hebben verschillende diensten, dus Dat is best wel een open vraag, zeg maar In de zin van ied	Inventorizing workplace facilities	Workplace usage	Workplace management
	7.11	We doen bezettingsgraad metingen. Dat is het meten van bezetting en benutting en activiteiten. D	Measuring occupancy	Sensing technologies	Predicting room usage
	7.12	Ja Alleen kan (...) Natuurlijk ingezet worden op verschillende momenten, dus Dat is niet per se een	Inventorizing user needs	Workers' fit	Workplace management
	7.13	We bieden geen pakketten aan, Maar het wordt zo wel apart afgenomen. Dus als losse dienst, als C	Combining with qualitative measuring tools	User involvement	Side constraints
	7.14	Ik denk dat het ook een stukje behoefte is vanuit de markt, want voor corona ging het Alleen maa	Occupancy	Optimization of space	Organisational goals
	7.15	Dus Het is helemaal niet meer zo interessant om te zeggen, ja, We hebben 20% bezetting, want ja, W	ell-being	Workers' fit	Organisational goals
	7.16	Dus Dat is een beetje een shift geweest van behoefte vanuit de markt en ook medewerkers hebbe	Functionality of the office	Spatial dimension	Management issues
	7.17	En Daarom is het ook steeds interessanter om naar de meningen van medewerkers te kijken en de	Insights into availability of space	Sensing technologies	Predicting room usage
	7.18	en tegelijkertijd kun je de behoefte van de medewerkers ophalen en uitvaren. Oké, hè, waar heb j	i Combining with qualitative measuring tools	User involvement	Side constraints
	7.19	Nou ja, Ik denk dat de investering men ergens inderdaad wel tegenhoudt om in sensoren te invest	Investments	Building characteristics	Side constraints
	7.20	Maar ik denk dat het momenteel vooral zoekende is van oké: Welke sensor oplossing past nou bij	Lack of knowledge	Added value of Big Data	Side constraints
	7.21	Ik denk dat het corona uiteindelijk wel weer een katalysator is geweest om nog meer data te ga	COVID-19 pandemic	Optimization of space	Organisational goals
	7.22	en Ik denk dat zoals ik zei, hè, bezetting, ja, Iedereen weet wel dat een kantoorpand tegenwoordi	Occupancy	Optimization of space	Organisational goals
	7.23	maar wat ook steeds belangrijker wordt of interessanter is, is om te kijken naar activiteiten. D	Measuring activities	Sensing technologies	Predicting room usage
	7.24	Zeker? Ja, We hebben daar een blog over gepubliceerd. Misschien interessant voor je om te lezen	Functionality of the office	Spatial dimension	Management issues
	7.25	Nee, nou wat ik gewoon merk in gesprekken met klanten is dat zij een heel nieuw werkplek strat	Expectation management	Social dimension	Management issues
	7.26	Ja zeker ja dat er andere activiteiten worden uitgevoerd dan waar die ruimtes voor bestemd zijn, j	Misusage of rooms	Spatial dimension	Management issues
	7.27	Ja, Dat is lastig om te zeggen, ik bedoel, Ik heb niet iedere alle resultaten nu voor mijn neus. Ik	bed Misusage of rooms	Spatial dimension	Management issues
	7.28	Ja bijvoorbeeld, ja Alleen Als je dus hele lage bezetting hebt, dan zijn er zo weinig Mensen op k	ant Occupancy	Optimization of space	Organisational goals
	7.29	Ja, Dat is weer meer (...), waarbij je dan ook de mogelijkheid hebt om een eigen pagina in te	zien In Personal awareness	Workers' fit	Workplace management
	7.30	Euh, nou ja, wat ik zeg hè, Het gaat dus steeds meer om de ervaring van medewerkers en de mede	Personal awareness	Workers' fit	Workplace management
	7.31	Ja, Het is belangrij, Maar het is ook wel weer Misschien een beetje tricky, want bewustwording c	i Optimizing user experience	Workers' fit	Workplace management
	7.32	Dat zal vast wel eens voorkomen, Maar ik denk dat het heel erg gaat om een stukje draagvlak cre	i Creating a support base	Workers' fit	Workplace management
	7.33	En dan is het ook nog eens zo dat alle data anoniem wordt bewaard, niet gekoppeld aan namen. I	User anonymity	Privacy	Side constraints
	7.34	Ja, Het gaat ook om een stukje, well being, dus van: Ik voel me niet fijn vandaag. Als je dat de	hele User anonymity	Privacy	Side constraints
	7.35	Nou, ja, Ik denk niet dat Het gaat om dat zij het gevoel krijgen dat zij betrokken worden, Maar	het User involvement	Workers' fit	Workplace management
	7.36	Ja flexibel werken en wat ook langzaam, maar nog niet helemaal is of wat nu speelt, maar wel st	e Autonomy of employees	Social dimension	Workplace management
	7.37	Nee met het kwalitatieve onderzoek kijken we inderdaad naar iedere locatie waar men werkt, d	us Integration of buildings, systems and behaviour	Optimization of space	Organisational goals
	7.38	Nou, dat begint met gewoon duidelijke vraagstelling op te stellen aan het begin en Dat is dus	hele Combining with qualitative measuring tools	Workers' fit	Side constraints
	7.39	Ja, bieden we ook aan en dat kunnen we koppelen aan onze sensor oplossingen ook weer. W	orkplace reservation system	Sensing technologies	Predicting room usage
	7.40	Meer dan voor corona. Tijdens corona nog meer en nu weer iets minder, dus Het is meer dan e	ers COVID-19 pandemic	Optimization of space	Organisational goals
	7.41	Ja voornamelijk in combinatie met sensor techniek.	Insights into availability of space	Sensing technologies	Predicting room usage
	7.42	Ja, We hebben eigenlijk altijd een soort van onboarding waar we gewoon een sessie hebben wa	ar Accessibility	Added value of Big Data	Side constraints
	7.43	Verschillend. Huisvesting, real estate.	Responsibilities	Added value of Big Data	Side constraints
	7.44	Ja, en per organisatie verschilt het vraagstuk ook weer qua timing, zeg maar hè, is de werkelij	ke st Timing of implementation	Future decision-making	Predicting room usage
	7.45	Ja zeker nou, Het is handig om je werkplek te reserveren als er minder werkplekken beschikbaar	zi Workplace reservation system	Sensing technologies	Predicting room usage
	7.46	En ook om je collega's te zoeken of in te zien wanneer je collega's op kantoor zijn, zodat je	Samer Sharing data with coworkers	Privacy	Side constraints
	7.47	Ja, Als je gebruik maakt van die tool en ervoor kiest om jouw aanwezigheid te delen met ander	e r Sharing data with coworkers	Privacy	Side constraints
	7.48	Ja, ja, Ik denk dat dat echt wel typerend is. Inderdaad, ook voor de ja voor medewerkers gewo	on Sharing data with coworkers	Privacy	Side constraints
	7.49	Het is heel erg flexibel, we hebben geen vaste afspraken	Autonomy of employees	Social dimension	Workplace management
	7.50	Ja voor corona was het gewoon de verwachting dat je in principe iedere dag naar kantoor ging.	E r Expectation management	Social dimension	Management issues
	7.51	Ja ja zeker en Daarom dus inderdaad ook een flexibele werktijd en plaats onafhankelijk werken.	Autonomy of employees	Social dimension	Workplace management
	7.52	10%, 20%, zo iets.	Occupancy	Optimization of space	Organisational goals
	7.53	We hebben wel één van de twee verdieping afgesloten, ja.	Reducing real estate costs	Optimization of space	Organisational goals
	7.54	Ja eigen sensor de eigen werkplek reservering systeem. Ja plattegronden zijn beschikbaar in on	ze t Workplace reservation system	Sensing technologies	Predicting room usage

## Respondent 8

Respondent	Fragment	Text	Open code	Axial code	Selective code
8	8.1	Ja dus dan hebben ze wel die data, maar dan weten ze niet wat ze wat ze daar dan nou mee kunnn	Lack of knowledge	Added value of Big Data	Side constraints
	8.2	Ja, wat ik hier ook al zei aan de telefoon is, is dat wij zeg maar die data leveren en Ik weet daarvoor	Measuring occupancy	Sensing technologies	Predicting room usage
	8.3	Want het ze willen het aan de ene kant, maar je ziet dat het andere gebeurd, maar ook wat jij zegl	Change management	Social dimension	Management issues
	8.4	Ja, dat ligt echt aan het bedrijf. Ik vind een (...) niet per se heel anders dan een normaal bedrijf, zeg	Diversity of space	Spatial dimension	Workplace management
	8.5	Ja zeker ja dat zie ik op heel veel bij scholen wel terug komen inderdaad en je merkt ook dat doe	Activity-based workplaces	Optimization of space	Organisational goals
	8.6	Ja, (...) die haalt de deal binnen even heel simpel gezegd. En dan vertelt hij mij, Dit is het, Dit is de k	Measuring occupancy	Sensing technologies	Predicting room usage
	8.7	en de laatste stap voor mij is eigenlijk om Samen met de klant naar de data te gaan kijken en uit te	Evaluating	User involvement	Side constraints
	8.8	Hoe reageren ze op die laag lage bezetting? Ja. Op zich 40% bezetting nu in coronatijd is helemaal	Occupancy	Optimization of space	Organisational goals
	8.9	Ja om zo de meest eerlijke data te leveren, zodat je ook niet terugkrijgt van ja, maar jullie hebben	Reliability of results	Added value of Big Data	Side constraints
	8.10	Nee, dat hoeft totaal niet zo te zijn, daar geloof ik ook niet in, maar voor de klant kan het zo overl	Reliability of results	Added value of Big Data	Side constraints
	8.11	Ja, ja, ik moet je wel eerlijk zeggen. Ik ben tijdens corona fulltime bij (...) met begonnen met werke	Hybrid working	Digital dimension	Workplace management
	8.12	Ja, dat gebeurt wel. Ik vind dat altijd lastig, want bijvoorbeeld, dit zie je ook vaker, bijvoorbeeld M	Misusage of rooms	Spatial dimension	Management issues
	8.13	Maar waar ga je anders bellen? Want op je werkplek Stoor je andere Mensen. Misschien hebben z	Sufficient facilities	Spatial dimension	Management issues
	8.14	En een concentratie plek; is die Alleen maar bedoeld om geconcentreerd te werken, of is hij ook t	Unclear insutions	Workers' fit	Management issues
	8.15	Ja, dat kan. Ik zie ook wel dat er wel organisaties zijn die dat wel heel duidelijk doen, dat het zelfs	Change management	Social dimension	Management issues
	8.16	Nee nee. En inderdaad, stel: die bedrijfscultuur. Als je erop wordt aangesproken door je collega's,	Resistance from employees	Social dimension	Management issues
	8.17	maar eigenlijk onderzoekt dat de beleving van de werkomgeving, dus Je krijgt dan de vraag vanuit	Inventorizing user needs	Workers' fit	Workplace management
	8.18	Ja ja precies en dat kun je ook dan Samen nemen, dus inderdaad en de bezettingsgraad meting en	Combining with qualitative data tools	User involvement	Side constraints
	8.19	Wel wat, want We hebben het nu vaker verkocht dan voor Corona, Maar het is nog steeds niet ve	popularity	Added value of Big Data	Side constraints
	8.21	Ja, ik denk dat zeg maar die cijfers van de bezettingsgraad meting, Dat heb je binnen twee weke	n	User involvement	Workers' fit
	8.22	Het kost moeite. En, Het is eigenlijk helemaal niet zoveel moeite, hè? Maar Het is toch weer iets e	Attractiveness of tools	User involvement	Side constraints
	8.23	Ja klopt ja Ik denk. Bij Mij zit er dan een hele psychologische gedachten achter. Ook van wanneer	Attractiveness of tools	User involvement	Side constraints
	8.24	En dus ze zijn wel geïnteresseerd in die harde data van de bezetting.	Measuring occupancy	Sensing technologies	Predicting room usage
	8.25	En dan daarna komt eigenlijk pas Wat, vindt mijn medewerker van de werkomgeving. Maar dat m	Combining with qualitative data tools	User involvement	Workplace management
	8.26	Ja zeker, je kan het eigenlijk bijvoorbeeld twee keer doen. Inderdaad dat je het vooraf doet, dan g	Inventorizing user needs	Workers' fit	Workplace management
	8.27	Ja, want Dat is volgens mij ook gewoon een vraag van: waar zit je, is dat in een open werkomgevi	Useability	Added value of Big Data	Side constraints
	8.28	Ja, Dat ze te veel moeten lopen, dus dan denken ze, ik blijf wel zitten.	Willingness to coöperate	Social dimension	Management issues
	8.29	En zeker dan de bezettingsgraad van die concentratie ruimte, dus Als je zeg maar alles In het dashl	Useability	Added value of Big Data	Side constraints
	8.30	Ja, kijk, je hebt altijd wel dat je advies of, ik wil het niet advies noemen. Maar dat we zeggen van:	Measuring occupancy	Sensing technologies	Predicting room usage
	8.31	Activiteit gerelateerd werken hebben we wel. We hebben zeg maar open werkomgeving met een	Misusage of rooms	Spatial dimension	Management issues
	8.32	Cultuur 100% ja.	Resistance from employees	Social dimension	Management issues
	8.33	Jong wel, de bazen die zijn In de 40. En Niemand is ouder dan zij. En mijn collega's, zeg maar In	het Diversity of the workforce	Workers' fit	Organisational goals
	8.34	Ja ja, het ligt er echt aan. Als ik druk ben met projecten, dan ben ik bijna Alleen maar op locatie va	Hybrid working	Digital dimension	Workplace management
	8.35	Voor corona werd eigenlijk wel verwacht dat je gewoon naar kantoor kwam om te werken. Maar	Autonomy of employees	Workers' fit	Organisational goals
	8.36	Zeker ja ik woonde wel eerst in Amsterdam, dus echt op 6 minuten fietsen van kantoor en toen g	Productivity	Workers' fit	Organisational goals
	8.37	Dat is een nieuw Onderdeel van ons eigenlijk. Dat is een sensor Systeem en dat is dus een soort v	Workplace reservation systems	Sensing technologies	Predicting room usage
	8.38	Dus dat hebben wij, dat gebruiken we ook. Je kunt dan werkplekken reserveren of een meeting ro	Insights into availability of space	Sensing technologies	Predicting room usage
	8.39	Ja, dat kan, Wij hebben dat allemaal zichtbaar, maar je kan ook daarvoor kiezen dat Mensen niet i	Sharing data with coworkers	Privacy	Side constraints
	8.40	En dan heb ik bijvoorbeeld morgen overwerk, dus dan wordt het lekker druk zoals je ziet, dus ik d	Workplace reservation systems	Sensing technologies	Predicting room usage
	8.41	Ja, dat doen we ook. Dat is weer een los iets wat we hebben. maar dit systeem, dit (...) kan dus o	Measuring occupancy	Sensing technologies	Predicting room usage
	8.42	Nee, wij doen daar zelf niks mee. Maar de klant kan Natuurlijk wel zelf terugkijken of in die histori	Historical data	Future decision-making	Predicting room usage
	8.43	Ja, We hebben er twee, Maar we verhuren er dan nu een beetje, omdat zoveel mensen ook thuis en o	Reducing real estate costs	Optimization of space	Organisational goals
	8.44	Ja je ziet gewoon dat je halve kantoor leeg is, en het moet ook betaald worden. Dus ja, dan kun je	Reducing real estate costs	Optimization of space	Organisational goals
	8.45	Dat vind ik echt wat voor mijn collega (...), daarom heb ik hem ook aan jou gekoppeld, want dat vi	Hybrid working	Digital dimension	Workplace management
	8.46	Ja, ik heb de laatste tijd heel veel onderwys metingen gedaan en Dat is echt weer dat hybride. Dat	Measuring activities	Sensing technologies	Predicting room usage
	8.47	Dat is eigenlijk gewoon een sensor die de hele dag data verzamelt, die versturen elke 6 minuten e	Automatic data delivery	Sensing technologies	Predicting room usage
	8.48	Dat kan ook bij grote bedrijven met de meeting rooms. Maar dat je gewoon inzicht krijgt In de res	Workplace reservation systems	Sensing technologies	Predicting room usage
	8.49	Ja, dat kan dus aan de hand van die sensoren. Dat je zegt van: Na een half uur zien we nog geen b	Insights into availability of space	Sensing technologies	Predicting room usage
	8.50	Ja op zich Hebben ze dat idee wel, want in die sensoren zit een oogje. Dat oogje lijkt op een came	User anonymity	Privacy	Side constraints
	8.51	Ja, maar dat is ook weer een vraagstuk voor de Werkgever, zeg Maar de Mensen die die sensoren	Useability	Added value of Big Data	Side constraints
	8.52	Dat je gewoon kan kijken van nou, Ik wil een meeting. Was er nog één vrij of ook in ons dashboar	Insights into availability of space	Sensing technologies	Predicting room usage
	8.53	Eigenlijk niet veel, want het zijn gewoon draadloze sensoren die op batterijen lopen. En Dat is we	Investments	Building characteristics	Side constraints
	8.54	Ja. Ik heb wel eens meegemaakt dan de klant zegt: ja, Ik ben niet zo fan van dashboards, doe mij z	Lack of knowledge	Added value of Big Data	Side constraints
	8.55	Het ligt aan de klant. We proberen zoveel mogelijk gewoon de template te volgen, dat is het stan	d	Accessibility	Side constraints
	8.56	Ja je merkt gewoon dat jongere Mensen het beter en sneller snappen. Want Als je een filter aan h	Lack of knowledge	Added value of Big Data	Side constraints

## Respondent 9 and 10

Respondent	Fragment	Text	Open code	Axial code	Selective code
9 & 10	9.1	Dus wij stellen ons Ook voor denk ik. Ik werk zelf nu 3,5 jaar bij (...), waarvan de laatste 1,5 jaar op	Sufficient facilities	Spatial dimension	Management issues
	9.2	Nou ja, ABW is eigenlijk de Eigenlijk de strategie om de werkplek visie in te voeren. Kijk, als huisve	Aligned with organisational identity	Optimization of space	organisational goals
	9.3	Hoe we dat doen? (...) is een bedrijf waar veel gebaseerd op data en cijfers moet gebeuren en we	Persona's	Workers' fit	organisational goals
	9.4	Om op die manier via workshops, surveys De vraag Helder te krijgen. En van daaruit te werken en	performance evaluation	Workers' fit	organisational goals
	9.5	dus en dat betrekken van de Mensen heeft ook te maken met gedrag, namelijk goh als Mensen we	Change management	Social dimension	Management issues
	9.6	Nou ja dat one size fits all, dat ten eerste al, omdat er geen one size fits all is binnen (...) en dat is v	User involvement	Workers' fit	Management issues
	9.7	De afdeing (...) als voorbeeld, die doet heel veel Ontwikkeling van logaritmes enzo en Als je daar o	Persona's	Workers' fit	Management issues
	9.8	Ja en de analysefase en ook occupancy measurements en de workshops, al die dingen maken van	Measuring occupancy	Sensing technologies	Predicting room usage
	9.9	Ja, We hebben een paar jaar terug binnen Research and development. Dat is de grootste groep M	Persona's	Workers' fit	organisational goals
	9.10	Voor onszelf met name, hoe goed we het doen. Kijk ABW is ABW, Alleen hoe krijg je het zo goed n	Functionality of the office	Spatial dimension	Management issues
	9.11	We zien nu dat we op de drukste dagen 60% van de kantoren gebruikt hebben. Ja wie had het van	Occupancy	Optimization of space	organisational goals
	9.12	Ja, ABW werken is ook volgens mij een continuüm hè, je bent continu bezig met analyseren, luiste	Flexibility	Optimization of space	organisational goals
	9.13	Dus je bent eigenlijk al continu het concept aan het tweaken, of in ieder geval de toepassing daan	Flexibility	Optimization of space	organisational goals
	9.14	Nee, Ik denk dat we Een andere mix aan faciliteiten gaan krijgen. Wat we voor COVID voornameli	Hybrid working	Digital dimension	Workplace management
	9.15	Twee is: Er waren nog wel wat mensen die een keer thuiswerkten of bij de klanten uiteraard, Maa	Productivity	Workers' fit	organisational goals
	9.16	Dat is een en twee is wat We hebben moeten doen is in plaats van alles in één Kamer Samen t	d Misusage of rooms	Spatial dimension	Management issues
	9.17	Dus om elkaar te zien, moet je dingen gaan regelen, dus wij zien een paar dingen. Één: deze activi	Measuring occupancy	Sensing technologies	Predicting room usage
	9.18	Ze zijn wel bezet. Dus Mensen hoeven niet te reserveren, Omdat de druk er niet is	Workplace reservation system	Sensing technologies	Predicting room usage
	9.19	je ziet een aantal dingen wel. Maar de vraag is wat er gaat gebeuren Als we meer kantoren naar k	Reducing real estate costs	Optimization of space	organisational goals
	9.20	Maar dat er een nieuwe voorziening nodig is die akoestisch goed is, die Privacy biedt in alle opzich	Sufficient facilities	Spatial dimension	Management issues
	9.21	Die focus booths worden sowieso redelijk gebruikt, die bureaus die worden gebruikt, meeting roo	Persona's	Workers' fit	Management issues
	9.22	Ik denk met name dat we te weinig hebben van de faciliteiten die ik net noemde, dus dat de de on	Sufficient facilities	Spatial dimension	Management issues
	9.23	Alleen daarbij het ingewikkeld is, Is dat Mensen toch mijn productiviteit een beetje koppelen aan l	Productivity	Workers' fit	organisational goals
	9.24	Precies, dus als je zo een interview Doet, moet je dat wel goed beseffen ook, zeg maar. Hier is, Als	Productivity	Workers' fit	organisational goals
	9.25	Nou, Ik denk Misschien aanvullend, maar (...) heeft daar denk ik veel beter zicht op, Maar ik denk c	Misusage of rooms	Spatial dimension	Management issues
	9.26	Klopt, het heeft ook te maken met het niet hebben van andere voorzieningen. En Als je ze wel het	Misusage of rooms	Spatial dimension	Management issues
	9.27	Ja, eerst zorgen dat de ruimtes er zijn, dat is wel handig. Nou, We gaan nu in ons eigen kantoor ee	Sufficient facilities	Spatial dimension	Management issues
	9.28	En als die Er zijn, Mensen ook l n het gedrag mee te nemen, kijk, Dit is waar ze voor zijn, Dat is wat	Change management	Social dimension	Management issues
	9.29	Nou, dat kan wel, niet Iedereen doet het. Je moet er ook een beetje comfortabel mee zijn om het	Resistance from employees	Social dimension	Management issues
	9.30	We hebben een app waarin je de Beschikbaarheid van werkplekken en Meeting ruimtes kunt inzic	Workplace reservation system	Sensing technologies	Predicting room usage
	9.31	We hebben aan de ene kant een smart grid wat in het plafond zit met sensoren. En, We hebben e	Measuring occupancy	Sensing technologies	Predicting room usage
	9.32	En daarmee kunnen Mensen via een app die is ontwikkeld live de beschikbaarheid zien en de gebo	Insights into availability of space	Sensing technologies	Predicting room usage
	9.33	We hebben dat nu op een deel van onze gebouwen. De nieuwe gebouwen die we bouwen, daar k	Describing workplace functions	Stimulating desired behaviour	Workplace management

9.34	In die zin doen we dat wel. We hebben collega's die zijn business partner, dus ze zijn gesprekspartij	Optimizing user experience	Workers' fit	Workplace management
9.35	En wat we opmerken bijvoorbeeld. We hebben Natuurlijk wel een vrij sterke secretariële groep die	Evaluating	User involvement	Side constraints
9.36	Als we met de Work council praten, hè? De ondernemingsraad, want die krijgen Natuurlijk allerlei	Evaluating	User involvement	Side constraints
9.37	Volgens mij zijn er wel 3 succesfactoren hierin. Dat is (1) investeren in een smart grid. In het verleden	Investments	Building characteristics	Side constraints
9.38	Twee is denk ik ook goede rapportages kunnen maken, hè, dus Je moet wel het verband begrijpen	Useability	Added value of Big Data	Side constraints
9.39	En het derde is meer de analytics kant, dus Je moet ook De data kunnen analyseren en Daar concluderen	Useability	Added value of Big Data	Side constraints
9.41	Ja, ja, Omdat we merken dat, Als je kijkt naar het karakter van onze Mensen die in dienst zijn. Als ik	Autonomy of employees	Social dimension	Workplace management
9.42	Dat is een mooie discussie die we hier wel eens hebben gehad, hè? Traditioneel had je bezettingssy	Measuring occupancy	Sensing technologies	Predicting room usage
9.43	Ik denk uiteindelijk wat we doen met elkaar, of je nou In het team van Europa werkt of in mijn team	Optimizing user experience	Workers' fit	Workplace management
9.44	Dus ja. Wat ik graag zou willen, is dat we ook die Feedback van de klant als KPI zouden hebben. Dus	User involvement	Workers' fit	organisational goals
9.45	Nou, We hebben een combinatie van tools. We doen nu een analyse met een (...) survey. Dat is een	performance evaluation	Workers' fit	organisational goals
9.46	Ja, ja, wij doen een klanttevredenheidsonderzoek. Dat hebben we jaren niet gedaan. Om allerlei red	Combining with qualitative measuring tools	User involvement	Side constraints
9.47	Ja het is ook subjectief. De ene vindt het ene prettig. Ik vind het prettig om veel op kantoor te zijn	Persona's	Workers' fit	Management issues
9.48	Nee, kijk wat ik zei. De applicatie biedt daar mogelijkheden voor, die gebruiken we nu nog niet, dus	performance evaluation	Workers' fit	organisational goals
9.49	Voor de grote vergaderkamers doen we het al. We hebben wat systemen ondersteuning nog bij ons	Describing workplace functions	Stimulating desired behaviour	Workplace management
9.50	Ik heb nog niet echt per se onderzoek naar gedaan heeft, Maar ik heb nog niet een Optimum gevonden	Useability	Added value of Big Data	Side constraints
9.51	Niet per se, Maar ik denk niet dat er een holy grail bestaat om Al deze facetten goed in kaart te brengen	Combining with qualitative measuring tools	User involvement	Side constraints
9.52	Ja en eigenlijk ook bijvoorbeeld access en Mobility is een heel belangrijk onderwerp waar we ook	Functionality of the office	Spatial dimension	Management issues
9.53	Ik denk niet dat je het dan allemaal in een survey moet proppen, want dan worden Mensen gek. Nu	performance evaluation	Workers' fit	organisational goals
9.54	Nou, Ik denk dat de grootste uitdaging is, eenzelfde look and feel en beleving in verschillende kant	Creating uniformity	Optimization of space	organisational goals
9.55	Want ja, gebouwen die wij zelf neerzetten, die hebben een bepaalde uitstraling, terwijl gebouwen	Aligned with organisational identity	Optimization of space	organisational goals
9.56	Ik denk dat nog niet eens zo. Het werkelijk concept met alle faciliteiten van vergaderen, concentreren	Building layout	Spatial dimension	Management issues
9.57	Ja eigenlijk het belangrijkste is sensing, dus daar waar wij zelf bouwen, kunnen we het smart grid	Useability	Added value of Big Data	Side constraints
9.58	Ja retrofit is eigenlijk Een light versie van een smart grid, dus een smart grid op de nieuwbouw is het	Automatic data delivery	Sensing technologies	Predicting room usage
9.59	Zeker speelt dat mee. We hebben Natuurlijk een hele ontwikkeling van de smart kit en de applicatie	privacy regulations	Privacy	Side constraints
9.60	en daarnaast heb je In de applicatie. Natuurlijk kun je ook nog keuze mogelijkheden, dus de ene persoon	Sharing data with coworkers	Privacy	Side constraints
9.61	en uiteindelijk het belangrijk is dat je uiteraard data anonimiseert. En dat Mensen de keuze hebben	user anonymity	Privacy	Side constraints
9.62	Zeker denk ik zeker. Business analist is één, twee is: dat hebben we al gedaan, Investeren in Rapporten	Investments	Building characteristics	Side constraints
9.63	En waardoor waar je eigenlijk Je modulering ook op poten zet, waarbij je data gewoon automatis	Automatic data delivery	Sensing technologies	Predicting room usage
9.64	En Ik ben er echt heilig van overtuigd dat je Als je dat niet doet, dan kun je een smart grid uitrollen	Investments	Building characteristics	Side constraints
9.65	Nou, Ik denk persoonlijk, bewust zijn van de succesfactoren, investeringsbereidheid, competentie	Investments	Building characteristics	Side constraints
9.66	en Ik denk ook belangrijk In dit geval (...) en ik heel bewust ook kijken naar de toepassingen, hè? Want	Useability	Added value of Big Data	Side constraints
9.67	en dat, Ja ik noem maar even dat achtje moet je continu maken, anders heeft het geen zin.	Evaluating	User involvement	Side constraints