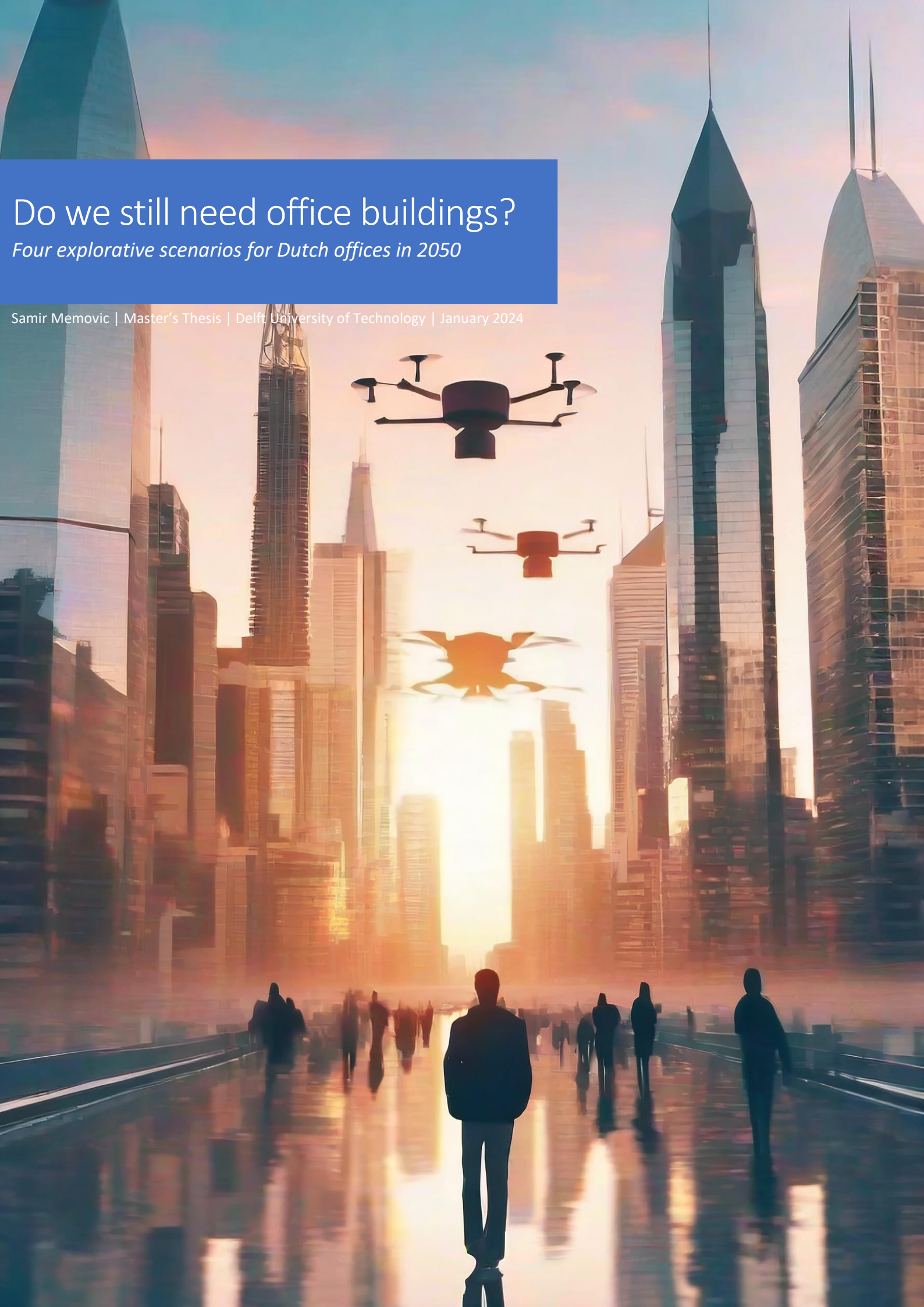
Do we still need office buildings?

Four explorative scenarios for Dutch offices in 2050

Samir Memovic | Master's Thesis | Delft University of Technology | January 2024



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Preface

In front of you lies the master thesis "Do we still need office buildings?" which has been written to fulfil the graduation requirements for the master track MSc Management in the Built Environment at Delft University of Technology. Within this graduation project, I have developed four explorative scenarios for Dutch offices in 2050.

This report marks the end of my student days and the beginning of my professional journey in the built environment. A career traditionally associated with an 'office job.' When embarking on this thesis, I was well aware of this, and it was precisely this awareness that fueled my interest in the issue surrounding offices. Therefore, this report serves as a preview of what awaits me once the ink on these pages has dried.

I would like to thank my mentors from TU Delft, Herman Vande Putte and Jelle Koolwijk, for their great guidance during this process. Also, I want to thank Roberto Rocco for being the chairman of the graduation committee. Furthermore, I would like to express my gratitude towards my colleagues of ING Bank from the department of Global Corporate Real Estate Management. In particular, I would like to thank Nicolaas Waaning for the opportunity to get an inside look at ING during the course of this thesis.

Finally, I want to thank the participants of this research for being available to share their insights in this topic.

I hope you enjoy reading this thesis.

Yours sincerely,

Samir Memovic

Delft, January, 2024

Abstract

This study explores the use and demand for offices in the Netherlands in 2050. Employees and employers have not found a balance in hybrid working, resulting in significant hidden vacancy. This refers to office space that is leased but not utilized, leading to ineffective office management. Real estate managers lack a guide to formulate a future-proof strategy for their real estate portfolio. Therefore, this study examines four exploratory scenarios on how work could be conducted in 2050 and its implications for office demand. This helps map external developments that may influence the demand for offices. The central research question is: "How can societal trends influence the way people work and, therefore, the demand for offices?" In this study, human scale and technology use are identified as the two key uncertainties. Along these uncertainties, four scenarios have been developed: Human Hands, Bionic Man, Manual Machines, and Technological Domination. In each of these scenarios, there is a different balance between human and technology, resulting in distinct characteristics of offices. In the Human Hands scenario, the quantitative demand for offices increases, while in the other three scenarios, this demand decreases. Nonetheless, each scenario indicates that there will still be a demand for offices in the Netherlands in 2050.

Key words: human scale, technology use, office demand, quality and quantity of space

Executive summary

Introduction

Office buildings have long been a fundamental component of urban landscapes, serving as hubs for economic activities and spaces for professional collaboration. However, with advancements in technology, changing work patterns, and the impact of global events such as the COVID-19 pandemic, there is a growing debate among the use of offices (Margariti et al., 2021). Offices are primarily meant to house an organization. Therefore, according to O'Mara (1999), an office only is of value if it supports the goals of the organization. According to O'Mara (1999), an office building has two functions. On the one hand, it provides physical support to an organization. The office is a place where people come together to perform work and therefore the office facilitates the work process. On the other hand, the office has symbolic value. The office expresses the company's values and goals to employees, customers, suppliers, and the outside world. According to O' Mara (1999), both the physical and symbolic functions of the office are important to align with corporate strategy. However, the Covid pandemic shed new light on the office use. The pandemic demonstrated that employees can work efficiently from their homes (De Klerk et al., 2021). According to quantitative research by Leesman (2023) among employees, the home office supports most of the work activities better than the (central) office. The offices therefore faces serious competition from the home office. The pandemic and the lockdowns that resulted from it forced working from home on a large scale. This working from home was appreciated by employees, therefore a large proportion of people indicated that they still want to work partially from home after the pandemic. Hybrid working therefore is expected to become the most widely used way of working in the (near) future (Williamson et al., 2021). Hybrid working is been described as working partly from the office and partly remote (Grzegorczyk, 2021). However, research by CBRE (2023) shows that employers and employees have not yet found a balance in this. Nonetheless, the researchers expect that as a result of hybrid working, the demand for offices will decrease in the long term (CBRE, 2023). In short, during the pandemic it became clear that it is possible to work efficiently without an office and after the pandemic and as a result of hybrid working the demand of offices will most likely decrease. This puts pressure on the self-evident nature of the office, which raises the question: Do we still need office buildings?

The aim of this study is to provide insights in how key developments could affect the office use and therefore the office demand. This study, therefore, explores what the demand for offices in the Netherlands in 2050 could look like. By shifting the discussion on office usage to the year 2050, the research challenges policymakers to broaden their time horizon, prompting a shift from a reactive (short-term thinking) to an anticipatory approach (long-term thinking). The findings of this research offer real estate managers a framework against which they can evaluate their strategies to ultimately develop a cohesive and future-proof policy for their real estate. The main research question therefore is: *How can societal trends influence the way people work and therefor the office demand?*

Research Method

For this research, the structure of the TAIDA method is applied to develop four explorative scenarios. This method consists of five steps: Tracking, Analysing, Imaging, Deciding, and Acting. The first three steps are intended for scenario development, while the last two steps are designed to assess and improve the strategy against these scenarios. Since this research is not written from the perspective of a specific organization, there is no strategy that can be benchmarked against the scenarios. Therefore, this research is limited to the development of four scenarios. The Deciding and Acting steps are thus beyond the scope of this research, see Figure 3.1.

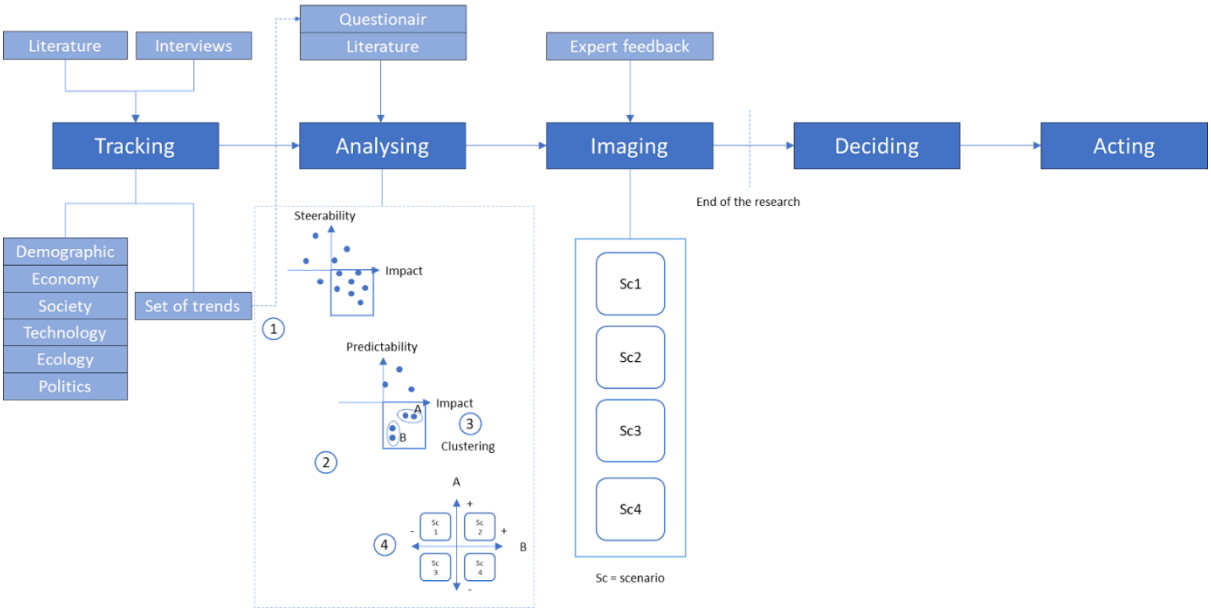


Figure 3.1. Research method diagram. (Author)

Tracking

Tracking aims to map developments. In this research, this step serves two specific functions and, therefore, consists of two distinct components.

Literature - On one hand, this step outlines the context by mapping an extensive range of developments. To obtain a comprehensive view, the DESTEP structure is applied. Trends are categorized into six themes: Demography, Economy, Society, Technology, Ecology, and Politics. A literature review is conducted to document these developments, utilizing publications from CBS, PBL, and the Ministry to capture demographic, social, political, and economic trends. Additionally, trendwatch forums are consulted to map technological developments, among other things.

Interviews - After outlining the context, the second part identifies an initial selection of relevant trends for the scenarios. For this purpose, 10 semi-structured interviews were conducted with experts from various fields and backgrounds, selected based on predetermined criteria as described in section 3.3.4. The goal of the interviews is to identify an initial selection of trends relevant to the scenarios. Respondents are asked about trends they expect to have the greatest impact on the future way of working. From these interviews, 11 trends were identified that participants anticipate will have an impact on the way of working, as shown in Table 4.1.

Trends
Technological innovation
Health & well-being
Individualization
Urbanization
Sustainability
Mobility
Digitalization
Diversity

Inequality
Globalization
Circular economy

Table 4.1. Identified trends during interviews. (Author)

Analysing

The trends from the interviews serve as input for the Analysing step. In this step, the trends are examined to identify a limited number of trends that are the most relevant for the scenarios. The assessment is based on three criteria: the degree of impact on the way of working, the degree of steerability, and the degree of predictability. Steerability ensures the nature of the scenarios. Since explorative scenarios are developed in this study, indicating limited to no controllability, only trends with a low degree of steerability are considered for the scenarios. Additionally, trends with a low degree of predictability are included. Due to the uncertainty surrounding them, these trends are suitable for exploration, while trends with a high degree of predictability can already be incorporated into the strategy. Furthermore, only trends with a significant impact on the issue are considered to limit the number of trends.

Questionnaire - To evaluate trends based on the three criteria, a questionnaire is designed. Twelve participants from five different organizations completed the questionnaire. It should be noted that the number of participants is limited, partly due to selection criteria, as outlined in section 3.3.5, and due to the deliberate choice to involve various companies to enhance applicability of the outcomes. It is also acknowledged that the research team has limited resources for recruiting the right participants.

In the questionnaire, participants are asked to rank the trends in two steps. In the first step, participants are requested to position the trends from the interviews on an Impact-Steerability matrix, as shown. In the second step, participants are asked to position trends from the quadrant High Impact Low Steerability in the Impact-Predictability matrix.

To compare the questionnaire results, coordinates on the X-axis (Impact) and Y-axis (Controllability) are determined for each trend for every participant. By adding up the coordinates for each trend and then dividing by the number of participants, the average for each trend is calculated, as shown in Table 5.2.

		Participants																								Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L			
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
1	Digitalization	3,27	2,05	2,8	-1,83	4,75	-4,84	4,23	-1,66	3,52	-1,61	3,72	1,96	3,72	1,96	3,23	4,12	3,52	-3,5	2,64	-0,61	4,1	-2,3	3,67	4,79	**3,60**	**-0,12**
2	Health and well-being	2,89	2,66	-2,97	-0,57	4,52	2,83	1,03	-4,21	1,8	-3,3	1,15	1,24	1,15	1,24	3,95	-0,65	-0,39	2,52	2,67	-3,65	3,23	-2,77	1,81	1,02	**1,74**	**-0,30**
3	(Ethnical) diversity	-1,63	3,01	-4,67	-0,58	4,52	5,5	1,42	0,57	-0,34	-2,17	0	0,46	0	0,46	-3,9	0,9	-1,03	4,12	3,41	1,04	0,21	-1,23	2,53	1,99	0,04	1,17
4	Individualization	3,82	2,55	-4,66	-1,69	0	0	0,41	-4,5	3,3	-3,28	0,53	-4,07	0,53	-4,07	-2,62	0,72	-0,72	-0,72	3,2	-1,85	2,01	-3,96	2,31	-1,14	**0,68**	**-1,83**
5	Globalization	0	1,92	-2,91	-1,69	0	-2,51	1,57	-1,02	2,46	-3,09	1,59	-3,64	1,59	-3,64	-0,75	-0,8	3,09	-1,91	1,3	-3,49	0,26	-1,76	3,11	-2,21	**0,94**	**-1,99**
6	Technological domination	2,03	1,18	1,89	-1,14	4,55	-2,49	0,95	0,76	0,9	-2,36	3,59	0,53	3,59	0,53	2,52	1,88	2,51	2,8	3,26	-2,38	2,6	-1,72	1,92	-2,41	**2,53**	**-0,40**
7	Sustainability	3,78	3,87	1,4	-0,57	2,29	0	2,81	0,94	1,26	0,56	2,72	1,92	2,72	1,92	2,15	2,93	3,66	4,64	1,01	-0,27	0,09	0,44	0,64	2,18	2,04	1,55
8	Urbanization	0,02	0,46	1,4	-1,58	2,36	-4,82	-0,45	1,41	-1,21	0,59	-0,73	1,35	-0,73	1,35	0,7	-1,7	-2,19	-2,64	-1,53	-1,88	-2,06	-1,06	1,06	-1,5	-0,28	-0,84
9	Mobility	1,47	3,63	2,91	-0,56	3,39	5,5	0,57	1,43	-0,04	0,49	0,51	2,62	0,51	2,62	0,58	-0,68	-1,23	1,33	2,54	0,56	2,75	2,45	-1,06	-0,25	1,08	1,60
10	Income inequality	-3,28	3	-4,77	-3,07	-0,65	2,81	-1,75	-0,11	-0,39	-1,63	0,35	-3,03	0,35	-3,03	0,62	0,49	-3,7	0,75	-2,11	-2,98	-0,95	0,79	-4,63	-1,34	-1,74	-0,61
11	Circular economy	-1,18	1,88	0,52	-2,89	-0,87	0	-4,28	-1,11	-2,82	-0,59	0,23	-0,37	0,23	-0,37	2,25	0,53	-2,96	2,94	-1,37	-1,26	-3,78	0,72	-3,93	-2,68	-1,50	-0,27

Table 5.2. Coordinates of each trend in step 1. (Author)

The average position of each trend shows that 5 trends fall into the High Impact Low Steerability quadrant:

- Digitalization
- Health and well-being
- Individualization
- Globalization
- Technological innovation

In the analysis of step two of the questionnaire, only these trends were used. The position of these trends has again been determined, after which the average position of the trends has been reconstructed, see Table 5.3.

		Participants																										Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L					
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y			X	Y
1	Digitalization			0,66	1,92	4,67	-4,84	4,23	-1,66	3,52	-1,61							3,65	-0,79	2,64	-0,61	4,1	-2,3						**3,35**	**-1,41**
2	Health and well-being							1,03	-4,21	1,8	-3,3					0,82	0,73			2,67	-3,65	3,23	-2,77						**1,91**	**-2,64**
4	Individualization							0,41	-4,5	3,3	-3,19	0,53	-0,54	0,53	-0,54					3,2	-1,85	2,01	-3,96	1,38	-0,7			**1,62**	**-2,18**
5	Globalization							1,57	1,93	2,46	-0,15	1,59	1,32	1,59	1,32			3,39	0,73	1,3	-0,54	0,26	1,18	2,58	-1,83			1,84	0,50
6	Technological domination			3,86	-2,94	4,03	-4,84			0,9	-1,51									3,26	-2,38	2,6	-1,72	3,95	-1,21			**3,10**	**-2,43**

Table 5.3. Coordinates of each trend in step 2. (Author)

From the average position, it appears that four trends fall into the quadrant of High Impact and Low Predictability:

- Digitalization
- Health and well-being
- Individualization
- Technological innovation

De trends die het dichtst bij elkaar liggen zijn digitalisering & technologische innovatie en gezondheid en welzijn & individualisering. Deze trends vormen de volgende twee clusters.

- Digitalization & technological innovation → technology use
- Health and well-being & individualization → human scale

Literature – Through literature, the two core uncertainties have been elaborated. In this study, the "human scale" refers to the extent to which the human element in the employee is acknowledged. The human scale is in this study examined in two situations: one where the human scale is High and another where it is Low. In the Low situation, McGregor's X Theory predominates within organizations, while in the High situation, the Y Theory takes precedence. The aspects influenced in both situations are autonomy, competence, and social connection. Table 5.4.1 provides an overview of these aspects in the two situations.

Low	*Human scale*	*High*
Employer decides how work is organized	*Autonomy*	Employee has the freedom to arrange his own work
Employees are hired based on the skills they already exist	*Competence*	Employer offers opportunities to employees to develop skills
Social connection is irrelevant to employers	*Social connection*	Employers promote social connetions

Table 5.3.1 Characteristics Human scale in situation Low and High. (Author)

In order to examine the effect of technology use on the way of working, 3 aspects have been identified: employment, tasks requirements and freedom of movement. The degree of technology use is compared in two situations: a situation with low technological integration where a skeptical view is taken towards technology, and a situation with high technological integration where an optimistic view is taken towards technology. The way the previously identified aspects of technological developments relate in these situations is presented in Table 5.4.2.

Low	*Aspects*	*High*
Balance between repetitive and creative work	*Employement*	High demand for creative and high educated jobs
Stable and clear tasks requirements	*Tasks requirements*	Diverse and continuously developing task requirements
Work is stuck to one place	*Freedom of movement*	Work is place independent

Table 5.4.2 Characteristics Technology use in situation Low and High. (Author)

Imaging

The final 4 scenarios that arise as a result of different values in the dimensions of human scale and technology use are as follows:

- Human Hands
- Bionic Man
- Manual Machines
- Technological Domination

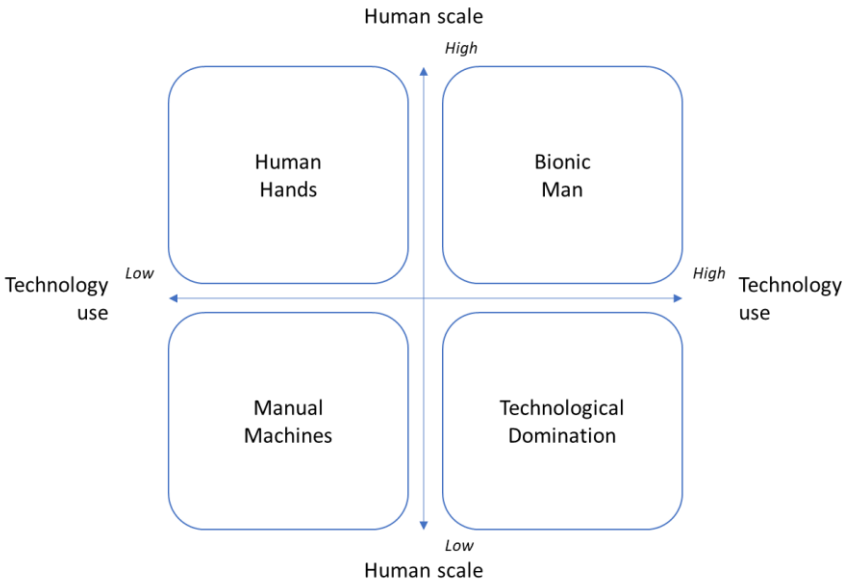


Figure 6.1. Four scenarios as a result of the key uncertainties. (Author)

Human Hands
In the scenario Human Hands, humanity thrives while technology takes on a modest role in the shadow of humans. The work is predominantly carried out by people, making it highly labor-intensive. The role of technology is limited to facilitating this work. Hierarchical organizational structures have been flattened, allowing decentralized decision-making to prevail. This has significantly improved the position of employees, making them feel heard and appreciated. Due to the limited use of technology, the office is the place to work and connect with others. In short, the office is the place to be.

Bionic Man
In the scenario Bionic Man, a harmonious balance is struck between humans and technology. Humans and technology collaborate closely to enhance efficiency, with humans taking the lead while technology supports them in handling predominantly repetitive tasks. As certain tasks fade away, new responsibilities emerge for employees that demand more knowledge and creativity. This solidifies the position of workers within an organization. The increased use of technology also leads to a further shift of work from the physical to the digital domain. This provides employees with the opportunity and flexibility to decide where and when they work. The powerful message conveyed by the office is: be aware of what you miss when you are not in the office.

Manual Machines
In the scenario Manual Machines, both humans and technology are conspicuous by absent. Technology plays a minimal role, resulting in highly labor-intensive work. Employees, in turn, find themselves overshadowed by the organization's primary pursuit of profit optimization. Organizations strive for this by focusing strictly on the essentials. Employees are provided with the bare necessities to carry out their jobs. Elements that do not directly contribute to increased productivity have no place in the workplace. The office is solely intended for work: nothing more and nothing less.

Technological Domination
In the scenario Technological Domination, technology takes the lead and humans follow suit. Organizations prioritize the most efficient systems, fully embracing technology at the expense of human involvement. Employees are solely evaluated based on their added value and often find themselves inferior to the latest technologies. Consequently, they are replaced by computers, leading to the domination of technology in the workplace. Due to extensive technology usage, the online domain has become more important than the physical one. Work is conducted entirely online, resulting in the office losing nearly all its traditional values. People only resort to offices when work cannot be accomplished elsewhere.

Discussion

Conclusion - The research question is as follows: *How can societal trends influence the way people work and therefor the office demand?*

To answer this question, four exploratory scenarios have been developed with the aim of helping real estate managers to formulate a future-proof real estate strategy. Table 5.1 provides an overview of the four scenarios.

		Human Hands	Bionic Man	Manual Machines	Technological Domination
	Human scale ↔ Technology use ↕				
Way of Working	Organizational structure	Decentralized	Decentralized	Hierarchical	Hierarchical
	Employees collaboration	All interactions physically	Social: physical Professional: online	Social: none Professional: physical	All interactions online
	Work location	One place	Multiple places	One place	Multiple places
Office characteristics	Quality of space	Meeting rooms Individual desk Silence areas Social areas	Meeting rooms Social areas	Meeting rooms Individual desk Silence areas	Individual rooms
	Quantity of space	Increase	Decrease	Decrease	Decrease
	Office location	Urban areas with good accessibility	Urban area with good accessibility	Good accessible but at the border of cities	Offices are spread all over the Netherlands

Table 6.1. Summary of the scenarios. *(Author)*

The title of this research is: *Do we still need office buildings?* From the four scenarios, there will still be a demand for office buildings in the Netherlands in the future. However, what this question will look like differs per scenario. In Human Hands, the demand for offices will increase because people will only work in the office and more space in the office will be reserved for informal activities. In the other three scenarios, the quantitative demand for offices will decrease. In the Bionic Man scenario, the office will be used for collaborative work and informal activities, and a significant part of the work will move to the online domain. In the Manual Machines scenario, the work will be concentrated in the office, where the office will be fully equipped for functionality. This means that informal activities will disappear from the office. In the Technological Domination scenario, virtually all of the work is done online. In this scenario, the decrease in the office will therefore be the greatest.

Limitations - This research may contain limitations. Some of these are discussed below.

Number of trends included in the scenarios: The scenarios in this study are built on the basis of two core uncertainties: human scale and technology use. These core uncertainties are the result of four trends (technology use: technological innovation & digitalization; human scale: health and well-being & individualization). However, there are more trends and different spheres of influence that influence the demand for offices, such as the number of employees, scarcity of materials and sustainability aspects can have a major impact on the demand for office space. The scenarios in this study therefore only cover part of the spectrum that affects the demand for offices.

Number of participants in questionnaire: The questionnaire was completed by 12 participants. This is mainly due to limited resources. This study was not intended as a case study for one organization, therefore it was intended to send the questionnaire to different organizations and not have it completed by employees of one organization. Participants from 5 organisations were therefore invited to participate in this study. This means that the results are not related to one organization and the results are more widely applicable. The scenarios are therefore not limited to one sector of real estate managers.

Elaboration of the scenarios: The scenarios were first worked out on the basis of the core uncertainties, after which they were sent to real estate managers for feedback. This was done to gather insights from experts as well as to ensure the elaboration and recruiting power of the scenarios. The feedback shows that real estate managers agree with the reasoning of the scenarios and that the scenarios provide them with a good framework for thinking. This means that the scenarios are in line with the criteria for elaboration and recruiting power. However, in terms of content, the comments on the scenarios remained limited.

Recommendations - Office use and office demand are topics that can be influenced by many factors. This research contributes to the discussion about this, but does not describe the full field. Follow-up research can therefore focus on the following topics:

Other perspectives: As indicated in the limitation, the scenarios in this study are based on two core uncertainties. To give policymakers more guidance in formulating their strategy, it can be valuable to approach office use and related office demand from more angles. In this way, a firmer foundation is created on which policymakers can build.

Normative scenarios: In this study, four exploratory scenarios were examined. This means that the scenarios explore different visions of the future, regardless of their desirability. A good addition to this research could be normative scenarios. They take a closer look at the vision of the organisation and therefore explore various policy options and the way to achieve them. By considering both explorative and normative scenarios, a picture emerges to which an organization can be exposed from external influences (explorative) and organizations can explore how they can deal with this in order to achieve their goals (normative).

The effect of changes in office demand on other sectors: From the point of view of the built environment, it is interesting to investigate the effect of shifts in the office landscape on other sectors. Three of the four scenarios show that the quantitative demand for offices will decrease. This can provide space for other sectors (housing, climate, energy, etc.) but can also put pressure on existing facilities (demand for larger homes, more social activities, etc.).

Developing and using scenarios: Furthermore, during this process, it was noticed that there are many ambiguities about scenarios. This is true both in literature and in practice. In the literature, there are many different views on scenarios, which made it difficult to formulate a good method for building scenarios. Furthermore, during discussions about this research, I noticed that in practice it is not always clear how scenarios can be applied. People often think that they have to choose between the scenarios and can work towards them. However, the literature describes that scenarios are relevant as a set and that they should be applied as a set. In short, the development and application of scenarios are fields that follow-up research can focus on.

Table of content

01 | Introduction

1.1 Context

1.1.1 Current state of the office building

Office buildings have long been a fundamental component of urban landscapes, serving as hubs for economic activities and spaces for professional collaboration. However, with advancements in technology, changing work patterns, and the impact of global events such as the COVID-19 pandemic, there is a growing debate among the use of offices (Margariti et al., 2021). Offices are primarily meant to house an organization. Therefore, according to O'Mara (1999), an office only is of value if it supports the goals of the organization. According to O'Mara (1999), an office building has two functions. On the one hand, it provides physical support to an organization. The office is a place where people come together to perform work and therefore the office facilitates the work process. On the other hand, the office has symbolic value. The office expresses the company's values and goals to employees, customers, suppliers, and the outside world. According to O' Mara (1999), both the physical and symbolic functions of the office are important to align with corporate strategy. However, the Covid pandemic shed new light on the office use. The pandemic demonstrated that employees can work efficiently from their homes (De Klerk et al., 2021). According to quantitative research by Leesman (2023) among employees, the home office supports most of the work activities better than the (central) office. The offices therefore faces serious competition from the home office. The pandemic and the lockdowns that resulted from it forced working from home on a large scale. This working from home was appreciated by employees, therefore a large proportion of people indicated that they still want to work partially from home after the pandemic. Hybrid working therefore is expected to become the most widely used way of working in the (near) future (Williamson et al., 2021). Hybrid working is been described as working partly from the office and partly remote (Grzegorczyk, 2021). However, research by CBRE (2023) shows that employers and employees have not yet found a balance in this. Nonetheless, the researchers expect that as a result of hybrid working, the demand for offices will decrease in the long term (CBRE, 2023). In short, during the pandemic it became clear that it is possible to work efficiently without an office and after the pandemic and as a result of hybrid working the demand of offices will most likely decrease. This puts pressure on the self-evident nature of the office, which raises the question:

Do we still need office buildings?

1.1.2 Development of the office building

In its broadest sense, the office can be described as a place designed to perform work. Over the years, however, there have been different conceptions and interpretations of this. The office as we know it today originated with paperwork. Clerks are considered the first office workers (Saval, 2014). Their workplace was modest and arranged in such a way that it was sufficient for performing the work. Therefore, the primary purpose of the office was to facilitate work. The introduction of the steam engine in 1765 initiated the industrialization. For the first time, large groups of people were brought

together in one place to perform work: the factory hall. The factories provided a huge increase in productivity but also exposed a lack of management within an organization (Savaal, 2014). Factories changed work dramatically. Whereas before, work was mostly done by hand in small groups, in small spaces, the factories brought together large groups of people. This led to a need for efficient planning, organization and control of work. To make the process more efficient, Taylor analyzed the work process (Thompson, 2004). To do this, he conducted time and motion studies to determine the best way to work. Tasks of the work process were then standardized and a person was selected and trained for a specific task. To trigger people to work faster, he introduced a performance reward. This gave people a reason to work faster and thus made the process more efficient. Finally, Taylor believed that planning and execution should be separated. Thinking labor was thus separated from the production process. This also created a new work group that took control of planning: management. Offices designed according to the principles of Taylor reflect the physical benefits factory halls provided. These offices are characterized by a large open space for repetitive work with smaller closed spaces at the head end for managers (Kotlyarov, 2015).

Offices according to Taylorism differ greatly from Traditional offices in both layout and core. In traditional, there was a strong focus on economic value (Gou, 2017). Cass Gilbert described this office building as ''A machine that makes the land pay.'' The primary task of an office building became to generate as much revenue as possible. Sullivan's Form Follows Function principle turned into Form Follows Finance (Willis, 1995). This strong emphasis on economic value created uniformity in the architecture of office buildings (Saval, 2014). To design these building, the smallest unit was first determined. This unit was then repeated as many times as possible within an efficient floor plan and this was then stacked on top of each other as many times as desired. This led to the traditional office.

By the late 19th century and early 20th century the workforce became more diverse: women began to enter the workplace. However, their work and power remained limited. Women mainly performed stenography and secretary work. More attention also came to the needs of workers. Designers began to think about how the work environment and workers affect each other. A work environment that encouraged work was sought (Saval, 2014). This was an important new insight. Until then, the workplace was designed by looking at what employees need to execute their work. Slowly and carefully more attention was paid to what employees want in order to execute their work. Until then, work was seen mostly as a variation of factory work. Robert Props, however, saw this differently; according to him, mental work was of an entirely different nature. The higher-skilled workforce, knowledge workers, needed a different work environment. The workplace had to become more performance-based and less hierarchical. There should be room for employees to integrate their own ideas. The office had to be designed differently. To achieve this, the Bürolandschaft (office landscape) emerged in Germany in 1960. According to this principle, the office had to be organic, natural and have a human character. For this purpose, large open spaces were created and desks were clustered in work zones of different sizes. The office should provide a more collaborative and human work environment (Kotlyarov, 2015)

The introduction of the computer in the late 90s has had a great impact on the way of working and thus on the office building. Digitization resulted in a significant decrease in paperwork which consequently led to a decrease in square footage requirements (Oliveira, 2021). Tech companies and Startups took a leading role in the new office design. The office began to become more informal and the 9 till 5 mentality was abandoned. Student life was extended to the office. The office began to become more of a ''place of informality.'' The workplace was decorated to suit one's needs so that it was suitable for working long days. More and more personal items also appeared in the workplace and there was no strict dress code (Kotlyarov, 2015). To increase spontaneous encounters, offices with an open plan were designed. The hard line between work and leisure disappeared and your office began to look more and more like your home (Saval, 2014).

At the start of the digitalization, in the 1980s and 1990s, people were already dreaming of an all-digital office, and with increasing technological developments, this was taking shape (Saval, 2014). The widespread use of the Internet, laptops and mobile phones made it possible to move work from the office to a cafe or home (Kotlyarov, 2015). Due to technological developments the freedom of movement of workers was increased.

The widespread adoption of the virtual office in the Netherlands however waited until the Corona pandemic. In March 2020, the Dutch government called on people and companies to work from home as much as possible (Ministerie van Volksgezondheid, Welzijn en Sport, z.d.). Later, this advice was converted into mandatory working from home unless there is no other way. However, the mass exodus from office cannot be ascribed entirely to the Covid pandemic. After all, deadly epidemics in the past did not lead to office exodus either. The Covid pandemic insisted on maintaining physical distance from each other while digitalization provided the tools to maintain contact while people are physically separated. The moment those two developments met in time, caused the mass exodus of the office building.

Work from home on a large scale has led to interesting insights and brought the need and value of office buildings into sharper focus than ever. The Covid pandemic demonstrated that the means are there to work efficiently from home (De Klerk, Joubert & Mosca, 2021; JLL, 2020). Moreover, working from home was perceived as pleasant by a large group of people (Ozimek, 2021). During the Covid pandemic, it became clear that the office building is technically obsolete. However, the pandemic also showed that there was still a desire from people to come to the office. People expressed missing social interaction with colleagues in particular (Fisher et al., 2020). Therefore people indicated they would like to return to the office (partly) after the Covid pandemic (Williamson et al., 2021). Now that the pandemic is beyond, it appears that the virtual dream was only half fulfilled. Hybrid working, which involves working partly in the office and partly remotely, is therefore described as the way of working in the (near) future (Williamson et al., 2021; CBRE, 2021). This suggests that people still value aspects of the physical office building.

1.1.3 The pre-pandemic office

Employers and employees have not yet found the right balance for hybrid working working (CBRE, 2023). This suggests that the guidelines for hybrid working are not well-defined within organizations. This, in turn, results in significant uncertainties about office design to accommodate the hybrid way of working. Therefore, in this study, the pre-Covid office concept is used as a starting point. Shared workspaces were a key feature of pre-Covid office design, strategically integrated to accommodate different working styles (Ahmad et al., 2020). The goal was to provide a flexible and inclusive environment by offering various workstations, from traditional desks to collaborative zones. This approach aimed to empower employees to choose work environments that matched their tasks, fostering a sense of autonomy and personalization within the workspace. Communal areas, including break rooms, cafeterias, and lounges, were integral to office layouts (Phapant et al., 2021). Beyond serving as spaces for relaxation and sustenance, these areas acted as hubs for informal conversations, idea generation, and building interpersonal relationships (Hurtienne et al., 2021). Recognizing the importance of social interactions in cultivating a positive work culture, the design philosophy encouraged chance encounters, promoting a communal spirit among employees. Meeting rooms were designed to cater to diverse functionalities. From small huddle rooms for quick discussions to large conference rooms for formal presentations, these spaces were equipped with technology to facilitate seamless communication. The intention was to provide employees with the necessary tools and spatial configurations for effective collaboration, accommodating both in-person and virtual interactions. The overarching goal of the pre-Covid office was to boost productivity, collaboration, and employee well-

being (Elskalakany et al., 2022). Beyond being a physical space for task completion, the office was conceived as a strategic tool for achieving organizational objectives (Fawcett & Chadwick, 2007). The design principles underlying this paradigm were based on the belief that a thoughtfully curated and aesthetically pleasing workspace could positively influence employee satisfaction, retention, and, ultimately, organizational success. The pre-Covid office spaces were the outcome of intentional design, promoting collaboration, creativity, and teamwork among employees through open layouts and shared workspaces (Sanghvi, 2022).

1.2 Research Problem

1.2.1 Impact of office buildings

Office buildings have a lifespan of 50 years (RFO, 2010). Moreover, office buildings are a significant part of our built environment (Bak, 2021). Because of the long timespan and the proportion of office buildings in the built environment, office buildings have a major impact on our urban structures and play an important role in the perception of a city. In addition, a large proportion of people in the Netherlands are directly confronted with office buildings. In the Netherlands, 9.6 million people had a job in the third quarter of 2022 which represents 72.2% of the workforce (CBS, 2022a). The vast majority of these people had an office job (CBS, 2022b). So besides the urban impact, office buildings have also an impact on society. Zooming in on the office market in the Netherlands, we see that in the first quarter of 2022, the Netherlands had over 94,000 office buildings (Statista, 2022). Since 2016, a trend can be seen that the number of office buildings has been decreasing every year, see figure 1.1. Office buildings at the beginning of 2022 accounted for some 4.87 million square meters (NVM Business, 2022). At the beginning of 2022, the investment volume in offices in the Netherlands was about €1.6 billion (Langens et al., 2022). This accounted for some 22% of the investment volume in all sectors, see figure 1.2. Offices thus have a significant contribution in the Dutch real estate market and with that they have also an economical impact.

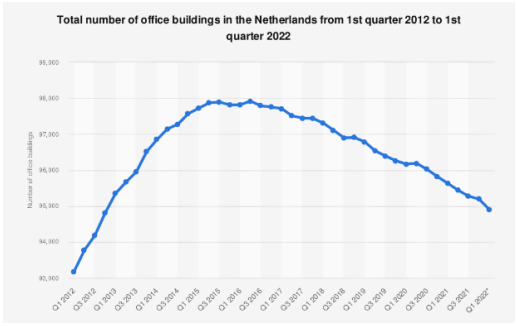


Figure 1.1 Number of office building in the Netherlands *(Statista, 2022)*

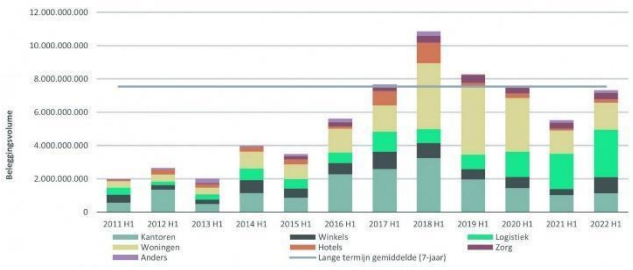


Figure 1.2 Investment volume per sector *(Langens et al., 2022)*

1.2.2 Research gap

As a result of the Covid pandemic, many studies have been written about the office in the post-pandemic area (McKinsey, 2022). These studies focus on the use of the office after the Covid pandemic, with the office being shaped in particular as a result of hybrid working. For example, Hancock et al.

(2022) argue that the office layout will differ substantially from the pre-pandemic layout. Zimmermann (2021) expects the firm's footprint to decrease by up to 40% in the near future. However, a survey among organizations by Oosting et al. (2021) shows that the decrease in office demand will limited as a result of hybrid working. Although the research describes the use of offices as a result of hybrid working, it appears that the balance in hybrid working has not yet been found by employers and employees (CBRE, 2023). This results in a lot of hidden vacancy (Coenders et al., 2022). This concerns office space that has been rented by organizations but is not used in practice This results in an inefficient real estate portfolio and raises the question to real estate managers what to do with this unused space.

Studies that support real estate managers to maintain an effective real estate portfolio are scarce. A widely used method to support policymakers in formulating future-proof strategies is the development of scenarios (Lindgren & Bandhold, 2009). However, these kinds of studies into the future of offices in the Netherlands are scarce. In 2017, PBL published a study into the demand for offices in 2030 and 2050 in the Netherlands. PBL (2017) approached the office demand as a result of 3 variables: the number of jobs, the share of office jobs and the office quotient[1]. These 3 variables were modulated from which 2 scenarios, high and low, for 2 time horizons, 2030 and 2050 are developed.

For the number of office jobs, the study adopts the results previously estimated in the WLO scenarios. A calm and sober interpretation of the scenarios was chosen for the WLO scenarios (CPB & PBL, 2015). This involves demographic and economic developments more or less along the same lines. In the high scenario, a number of basic assumptions are made such as a high migration balance, high life expectancy, high fertility, etc. While in the low scenario all of these take place at a reduced rate. The advantage of these calm and sober scenarios is that the range remains relatively narrow which gives guidance to policy makers. On the other hand, fundamental uncertainty for the future is less well taken into account (CPB & PBL, 2015).

For the rate of office jobs, the study takes the rate of office jobs in 2008 as a starting point. After 2008, the rate of office jobs decreased. This could be due to economic development. For the low scenarios, the study takes the line of office jobs development between 2008 and 2015. This would mean 82% in 2030 and 72% in 2050. For the high scenario, PBL sticks to the 2008 figures.

For the office quotient, the study again takes input from CPB data. CPB states that in 2040 the rentable area per job is 19.5 m2 (Ossokina, 2012). PBL puts this somewhat in perspective by stating that this is the case in 2050. For 2015, the office quotient is 22.5 m2. This would be a decrease of 10% (0.9) in 2050. For 2030, PBL assumes this is half as much as 5% (0.95). Figure 1.3 shows the assumptions for the scenarios.

	2030		2050	
	Laag	Hoog	Laag	Hoog
Aantal banen	WLO	WLO	WLO	WLO
Aandeel kantoorbanen	0,82 (Jaar 2008)	Jaar 2008	0,73 (Jaar 2008)	Jaar 2008
Kantoorquotiënt	0,95 (Jaar 2015)	0,95 (Jaar 2015)	0,90 (Jaar 2015)	0,90 (Jaar 2015)

Figure 1.3 Starting points PBL scenarios *(PBL, 2017)*

The study shows that in both scenarios, the current office stock in purely quantitative terms exceeds the need on both time horizons, see Figure 1.4.

[1] Office quotient is space occupation per office job in square meters of rentable floor area

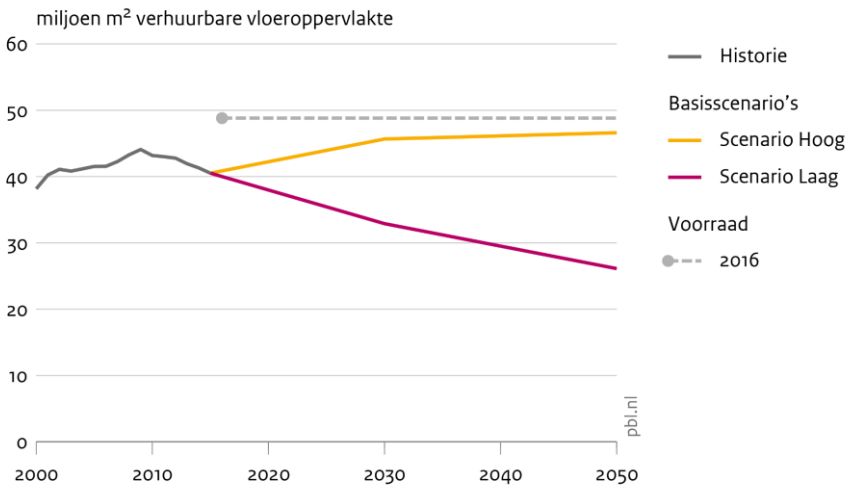


Figure 1.4. Office need according to PBL scenarios *(PBL, 2017)*

Although the scenarios of the PBL (2017) describe the demand for offices, these scenarios offer real estate managers little guidance on choices about their real estate portfolio. These scenarios describe the demand for offices as a result of economic developments, while real estate managers face the challenge of aligning their portfolio with the way of working (hybrid working). Moreover, the PBL's scenarios predate the pandemic. All in all, real estate managers lack the tools to formulate a future-proof strategy in order to maintain an effective real estate portfolio.

1.3 Research objectives

The aim of this study is to provide insights in how key developments could affect the office use and therefore the office demand. This study, therefore, explores what the demand for offices in the Netherlands in 2050 could look like. By shifting the discussion on office usage to the year 2050, the research challenges policymakers to broaden their time horizon, prompting a shift from a reactive (short-term thinking) to an anticipatory approach (long-term thinking). The findings of this research offer real estate managers a framework against which they can evaluate their strategies to ultimately develop a cohesive and future-proof policy for their real estate.

1.4 Research relevance

1.4.1 Scientific relevance

This research focuses on the demand for office buildings in 2050 in the Netherlands. In doing so it is contributing to research on the office use and office design. By approaching the office demand as a result of the way an organization works, this research approaches the office demand as an organizational issue rather than just an real estate issue. This aligns with findings by Cushman and Wakefield (2022) that argue that offices became an organizational issue rather than a real estate issue. Moreover, by approaching the office demand as a result of the way of working this research adds a dimension to the discussion about office use and office use.

1.4.2 Societal relevance

The purpose of this study is to explore the office demand in 2050 in the Netherlands. As mentioned in section 1.2.1, office buildings have an impact on society. On one hand, office buildings play a significant role in the perception of a city. In addition, many people are in direct contact with offices through their work. As the majority of individuals in the Netherlands hold office jobs (CBS, 2022b). Moreover, the Netherlands faces significant challenges that require space allocation. Housing shortages, the energy transition, and environmental concerns all demand space. These issues extend beyond politics and are frequently discussed in societal debates. In this context, it is crucial to manage the current space in an appropriate manner. This requires a sustainable real estate portfolio as well. Office buildings are an essential component of this. This research contributes to this goal by exploring office space requirements in the Netherlands in 2050.

1.5 Research questions

The main question for this research is:

How can societal trends influence the way people work and therefor the office demand?

In order to answer the research question, the following three sub-questions are formulated:

- SQ 1: What trends can affect the office use?
- SQ 2: What are the two key uncertainties that can impact the office use?
- SQ 3: How can the office be used as a result of the key uncertainties?

1.6 Personal research goals

During my studies, I noticed that my interest in the built environment lies in real estate management. As a result of the Covid pandemic, offices have been prominently in the news. From empty offices during the pandemic to underlaid offices after the pandemic. As a result, the office landscape is in a turbulent and therefore interesting phase. This applies both from a real estate management perspective and from an office user's perspective. I expect to combine these two perspectives after my studies, so I hope that this research will give me a push in the right direction. With this research, I hope to gain more knowledge about office use and how to give substance to it as a real estate expert. This research is the end of my student period and I have seized it as a stepping stone to my professional career. This is one of the reasons why I decided to do an internship during this graduation research. With this I hope to combine the theoretical knowledge with practice and to connect this as well as possible and thus add value to the discussion about office use.

1.7 Thesis outline

This research is structured as follows. In chapter 2 there is a literature study in which organizations, the office building and the development of scenarios are examined. Based on this, a conceptual model is been developed. Chapter 3 describes the methodology for developing the scenarios for this study. This chapter describes the steps and data collection that were taken to develop the scenarios. In chapter 4, trends are mapped out. This chapter has two objectives and is therefore divided into two parts. The first part involves mapping the broader context through a literature review. The trends identified in this review are categorized into six themes according to the DESTEP structure. In the second part, an initial set of relevant trends is outlined. For this purpose, 10 interviews are conducted with experts from various domains and backgrounds. The trends identified in these interviews then serve as input for Chapter 5. Chapter 5 identifies the two main core uncertainties that underpin the scenarios. To this end, a questionnaire is conducted. The two core uncertainties are then written out on the basis of scientific literature. In chapter 6, the 4 scenarios are elaborated on the basis of these core uncertainties and supplemented by feedback from experts. These scenarios are elaborated in visual and essay form, after which they are tested on the basis of the quality criteria that PBL uses for scenarios. Chapter 7 then provides an answer to the main question and a discussion of the research.

I - Literature

02 | Literature study

This chapter first discusses what an organization is and the role of office buildings. Secondly, it discusses what scenarios and scenario planning are.

2.1 Organization

An organization is a partnership between two or more persons. Here, strength, knowledge and skills are combined to achieve a goal or meet a need (Ensie, 2023). An organization is formed when deficiencies in satisfying human needs are observed (Jones, 2013). The deficiencies often stem from new technological developments. By filling this gap, an organization creates value. Quantitative research shows that CEOs and managers consider control, innovation and efficiency to be the most important parameters for measuring and assessing an organization's value creation (Jones, 2013).

- Control here refers to both an organization's attractiveness to resources and customers and its control over the external environment/context.
- Innovation involves developing skills and capabilities to discover new products and processes. In addition, innovation involves designing and creating new organizational structures and cultures that improve the rate of change, adaptation and the way an organization functions.
- Efficiency means developing modern production facilities using new information technologies that can produce and distribute a company's products in a timely and cost effective manner. It also means introducing techniques like Internet-based information systems, total quality management, and justin-time inventory systems to improve productivity.

The Input-Process-Output (IPO) model is a framework that can be used to understand how organizations operate (Walley, 2017). Inputs are the resources that an organization requires to carry out its activities and achieve its goals. These resources can include:

- Human Resources: The people who work within the organization, including employees, managers, and leaders.
- Financial Resources: The capital and funding needed to support operations, invest in assets, and cover expenses.
- Physical Resources: The tangible assets such as buildings, equipment, machinery, and infrastructure.
- Information Resources: The data, information systems, and knowledge necessary for decisionmaking and organizational processes.
- Material Resources: The raw materials, supplies, and components needed for production or service delivery.

Process: The process stage involves the activities and transformations that occur within the organization to convert inputs into outputs. This can include:

- Planning and Decision-making: Defining goals, formulating strategies, and making decisions to guide organizational activities.
- Organizing and Coordinating: Establishing structures, roles, and relationships to coordinate and manage the efforts of individuals within the organization.
- Executing and Implementing: Carrying out operational tasks, production processes, service delivery, marketing, sales, and other core activities.

- Monitoring and Controlling: Evaluating performance, tracking progress, and ensuring that activities align with organizational objectives.
- Learning and Adaptation: Incorporating feedback, adjusting strategies, and fostering continuous improvement based on experiences and insights.

Outputs: Outputs are the results or products that an organization generates as a result of its activities and processes. These outputs can vary depending on the nature of the organization and its goals, and may include:

- Products: Tangible goods or services produced by the organization for customers or clients.
- Outcomes: The intended results or impacts of the organization's activities, such as customer satisfaction, increased market share, or social benefits.
- Knowledge and Innovation: Intellectual property, research outcomes, and innovative solutions developed by the organization.
- Financial Performance: Financial indicators such as revenue, profitability, and return on investment.
- Organizational Reputation: The organization's brand image, reputation, and relationships with stakeholders.

In addition to input, process and output, the external environment (context) plays an important role in the functioning of an organization. According to Porter (1998), an organization must compete within a certain context to ensure its existence. To do this, an organization must create competitive advantage within its market. For this purpose, an organization has 2 types of processes, namely primary processes and supportive processes. The primary processes are the core activities of an organization which are directly contributing to the creation, delivery and support of a product or service. The primary processes are interconnected and together they determine the value creation of an organization. The supportive processes, in turn, support the primary processes. These processes ensure that the primary processes run smoothly and improve the effectiveness and efficiency of the entire process. These processes do not directly add value to an organization's end product but are essential for realizing the end product in an efficient and effective manner. The primary and supportive processes make up an organization's value chain. By optimizing and effectively managing these processes, an organization creates competitive advantage (Porter, 1998).

2.2 Office building

An office is a spatially independent unit that is largely in use or can be used for desk-related work or support activities (Bak, 2016). This definition describes the office as an entity. However, the office serves a purpose and that is to support the processes of an organization (O'Mara, 1999). An office building therefore has two critical functions. On the one hand, the office building provides physical support to an organization. The office building serves to bring people together in one location (Gou, 2017). Here people come together to perform work and share knowledge (O'Mara, 1999). According to Markland (1995) the office is an ''information factory''. Information transfer is critical for an organization to survive. So the office building facilitates the work process. Besides the physical support the office building provides, it is also the symbolic representation of the organization to the world (O'Mara, 1999). The physical building is seen by employees, customers and suppliers and shows the values and goals of the organization in a physical sense. Over the years, organizations have developed and this has had consequences for the (spatial) characteristics of the office. In the 20th century, there was a strong emphasis on the economic value of office buildings (Gou, 2017). Offices were characterized by a strong profit motive. The goal was mainly to make a profit and this translates into

the design. Sulvivan's famous statement Form Follows Function was interpreted as Form Follows Finance (Willis, 1995). Offices in American cities in particular sprang up like mushrooms. Due to the strong economic emphasis on offices, uniformity in architecture arose (Saval, 2014). Offices were built according to the same principle. For this purpose, the smallest unit was determined. This unit was then repeated as many times as possible within an efficient floor plan and this was then stacked on top of each other as many times as desired (Kotlyarov, 2015). This led to the traditional office, see Figure 2.1.

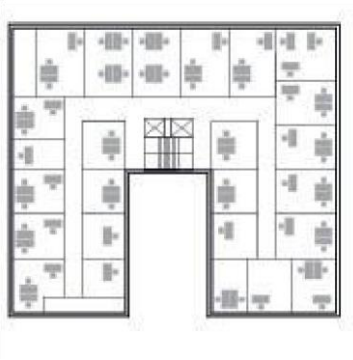


Figure 2.1. Traditional office layout. *(Kotlyarov, 2015)*

As a result of industrialization, organizations grew enormously in size. In order to be able to oversee the work, new layers were created in organizations. This was the beginning of management (Pindur, Rogers & Kim, 1995). With the growth in size, ideas arose to organize the work differently. Fredrick Taylor was an important driver of this. He was looking for ways to make the work more efficient. To do this, he conducted time and motion studies to determine the best way to work. Tasks of the work process were then standardized and a person was trained for a specific task. To trigger people to work faster, he introduced a performance reward. This gave people a reason to work faster and thus made the process more efficient. Finally, Taylor believed that planning and execution should be separated. Thinking labor was thus separated from the production process. Office buildings designed according to Taylor's principles were characterized by large open spaces where repetitive work was performed and some enclosed areas. The advantage of this was that managers could easily keep an overview of the work (Kotlyarov, 2015). See Figure 2.2.

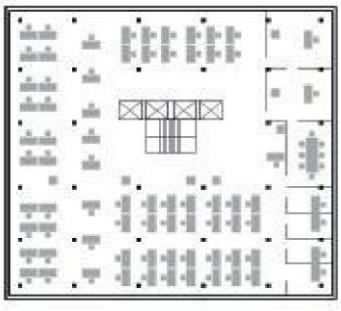


Figure 2.2. Office layout Taylorism. *(Kotlyarov, 2015)*

In the course of the 20th century, the composition of the workforce changed significantly (Saval, 2014). Not only was there the entry of women into the workplace, but there were also more and more highly educated employees. This new workforce also had fundamentally different needs. As a result, the work had to be organized differently. Where previously the emphasis was mainly on what the employees needed to do the work, there was a steady increase in attention to the needs of the employees. This also gave rise to new ideas about how the office should be designed. This is how it came about the Bürolandschaft (office landscape) emerged in Germany in 1960. According to this principle, the office

had to be organic, natural and have a human character. For this purpose, large open spaces were created and desks were clustered in work zones of different sizes. The office should provide a more collaborative and human work environment (Kotlyarov, 2015), see figure 2.3.

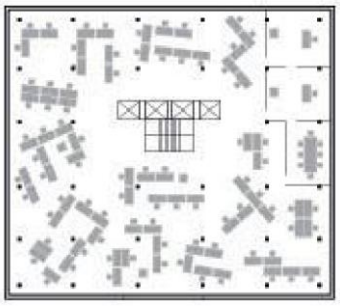


Figure 2.3. Die Bürolandschaft layout. *(Kotlyarov, 2015)*

The introduction of the computer has had a great impact on the way of working and thus on the office building. Digitization resulted in a significant decrease in paperwork which consequently led to a decrease in square footage requirements (Oliveira, 2021). Not only could the quantitative demand for office space decrease, but a new conception of how the office could be used also emerged (Kotlyarov, 2015). This was mainly driven by the tech industry. In this way, the office transformed more into a ''place of informality.'' The workplace was decorated to suit one's needs so that it was suitable for working long days there. More and more personal items also appeared in the workplace and there was no strict dress code (Kotlyarov, 2015). To increase spontaneous encounters, offices with an open plan were designed. The hard line between work and leisure disappeared and your office began to look more and more like your home (Saval, 2014). This resulted in the casual office, see figure 2.4.

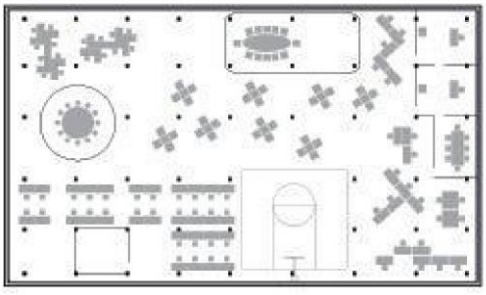


Figure 2.4. Casual office layout. *(Kotlyarov, 2015)*

In the 1980s and 1990s, people were already dreaming of an all-digital office, and with increasing technological developments, this was taking shape (Saval, 2014). The widespread use of the Internet, laptops and mobile phones made it possible to move work from the office to a cafe or home (Kotlyarov, 2015). Due to technological developments the freedom of movement of workers was increased. Dit resulteerde erin dat werk van buiten het kantoor kon worden uitgevoerd, zie figuur 2.5.

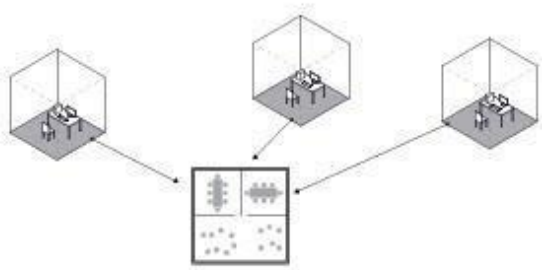


Figure 2.5. Virtual office. *(Kotlyarov, 2015)*

Where technological innovation made it possible to work remotely, the Covid pandemic created the need to keep a distance from each other. Together, these two developments have led to a massive exodus from the office. Although the Covid pandemic taught us that we can work from home in an efficient way, after the pandemic it turned out that employees still have a need to come back to the office partly (De Klerk, Joubert & Mosca, 2021). Hybrid working, in which people work partly in the office and partly remotely, is therefore described as the way of working for the (near) future (Williamson et al., 2021; CBRE, 2021). The interpretation that organizations will give to this way of working will have consequences for the office. After all, the firm should support the goals of the organization (O'Mara, 1999). The demand for office space therefore depends to a large extent on the way in which organisations operate.

2.3 Scenario planning

According to the PBL (2013), there are 3 ways to explore the future:

- Predictions
- Scenario 's
- Speculations

In it, PBL (2013) states that predictions are suitable for studies with a short time horizon and surrounded by a relatively small degree of uncertainty. Speculation, on the other hand, is a suitable method for looking very far into the future and surrounded by a high degree of uncertainty. Scenarios are somewhere in between. Scenarios are suitable for studies with a time horizon of 30 to 50 years and are surrounded by a certain degree of uncertainty. Porter (1985) describes scenarios as: ''an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome.'' Scenarios are a rich and detailed representation of assumed world images by Enserink, Kwakkel & Veenman (2013). Scenarios are not intended to predict the future but rather to depict what might plausibly occur. Consequently, scenarios do not stand alone but always come in multiple variants. Scenarios can be roughly divided into two groups, namely exploratory scenarios and normative scenarios (Kosow & Gaßner, 2008). These two types of scenarios differ in their approach and objectives. Normative scenarios aim to outline desired futures and define a specific path to achieve them, with an emphasis on identifying strategies and actions to make that future a reality. Exploratory scenarios, on the other hand, are designed to explore various possible future developments and outcomes without having a specific desired outcome in mind (Lindgren & Bandhold, 2009). Normative

scenarios focus on determining desired futures and proposing strategies to achieve them (Albrechts, 2005). They are based on preferences and desired goals and are characterized by a specific vision or goal, a defined path to achieve the desired future, and a focus on identifying strategies and actions to realize that future. Normative scenarios are used to determine strategic goals and desired outcomes, focusing on actions to achieve these desired futures (Spaniol & Rowland, 2018). For example, PBL (2023) recently published four normative scenarios on what the Netherlands could look like in 2050. The four scenarios assume that the Netherlands aims for sustainable development by 2050. Sustainability is expressed here in People, Planet, Profit. In each scenario, a different value of this predominates. Furthermore, the scenarios give substance to themes formulated by the central government (the Netherlands) in its Environmental Vision (NOVI). Based on this, the scenarios describe what the Netherlands could look like in 2050 and the road to get there. Exploratory scenarios, on the other hand, explore different possibilities without taking into account the (un)desirability of the outcomes (Albrechts, 2005). This involves investigating how different factors and events can lead to different future situations (Albrechts, 2005). They are more focused on exploring diverse potential futures and understanding their implications. They arise from a neutral and objective approach, exploring different options and possibilities without a pre-planned outcome. They therefore explore various possible future developments without a specific desired outcome in mind. In short, exploratory scenarios aim to explore different possible future developments and outcomes without committing to a specific desired outcome (Durance & Godet, 2010). An example of this is the PBL study (2017) into the demand for office space in 2030 and 2050 in the Netherlands. To do this, the researchers determined three variables: number of jobs, share of office jobs and office quantity. The researchers model these three variables, i.e. without formulating a goal for the results in advance, which results in two scenarios.

Scenario planning, also known as scenario thinking or scenario analysis, is a strategic tool in which multiple plausible futures (scenarios) are developed and analyzed (Doyle et al., 2015). These scenarios are not intended to predict the future with certainty, but rather to explore different possibilities and understand their potential implications (Fridell & Ekberg, 2015). They are used to investigate various possible outcomes or situations that may occur under specific circumstances. By considering a range of scenarios, decision-makers can assess potential risks and opportunities associated with different courses of action. In the context of strategic decision-making and planning, scenarios serve as valuable tools for organizations (Gabriel, 2013). Scenarios create a platform for communication and promote proactive and critical thinking among decision-makers (Gabriel, 2013). In addition, scenarios lay the foundation for strategic discussions within organizations, allowing different stakeholders to come together and discuss possible future developments. In addition, scenarios help organizations learn from past experiences and adjust their strategies accordingly. Foresight studies are a way to help policymakers formulate a future-proof strategy. For future exploratory studies, PBL (2013) uses the scenario cycle, see Figure 2.6. The scenario cycle describes 4 components: the baseline situation, the context scenarios, the policy scenarios and the messages for the policy or for the research that supports the policy. It is not always necessary to develop all four components or do them so extensively. Which components are needed depends on the purpose of the study. When both contextual and policy scenarios are implemented, the contextual scenarios often serve as an assessment framework for the policy scenarios. The four parts of the scenario are cyclically linked. This is a two-way cycle. First, there is a cycle in time, which runs from the past and the present ('zero situation') through the long term (environmental and policy scenarios) to the short term (messages). Secondly, there is a cycle in the degree of elaboration, which runs from the concrete ('zero situation') through the abstract (environmental and policy scenarios) back to the concrete (messages).

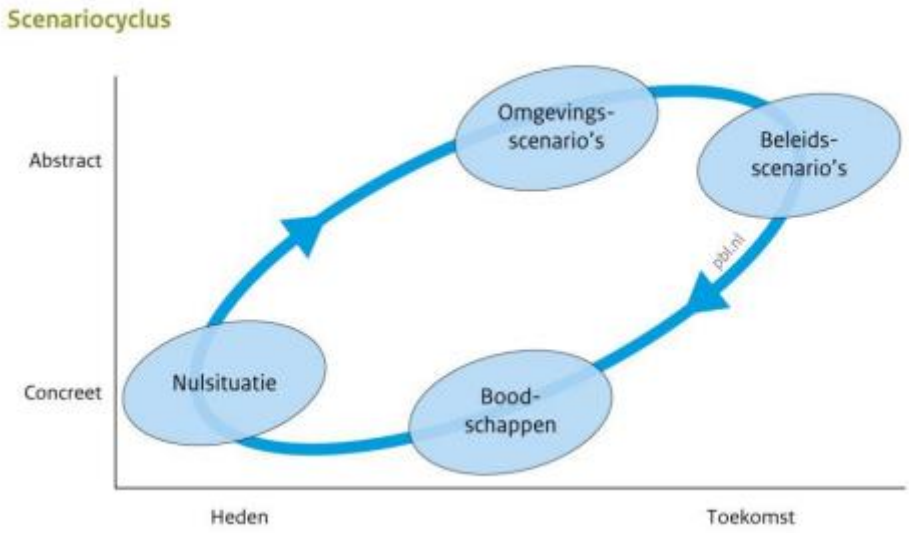


Figure 2.6. Scenariocyclus (PBL, 2013)

The scenario cycle describes the process that PBL often uses for its foresight studies. However, she argues that not all elements always have to be carried out. This depends on the choices made by the researchers, which in turn depends on the purpose of the study and the scenarios. A commonly used structure for scenario development is the TAIDA model as developed by Lindgren and Bandhold (2009), see Figure 2.7.

Figure 2.7. TAIDA Model (Lindgren & Bandhold, 2009)

The TAIDA model consists of 6 steps: Tracking, Analysing, Imaging, Deciding and Acting.

Tracking: In the analysis step, developments are mapped. This is done on the basis of a thorough analysis of internal and external trends that may affect the future.

Analysing: In the analysis step, the trends from the previous step are analyzed with the aim of identifying the two main core uncertainties.

Imaging: In the imaging step, the scenarios are worked out. The basis for this are two core uncertainties that were identified in the previous step.

Deciding: In the deciding step, the information is weighed, choices are made and strategies are coordinated.

Acting: In the act step, the emphasis is on formulating short-term goals and taking the first steps to realize the strategy.

In the TAIDA model, the two main nuclear uncertainties are intersected in a two-axis system. This creates four quadrants, each of which forms the basis for a scenario, see Figure 2.9.

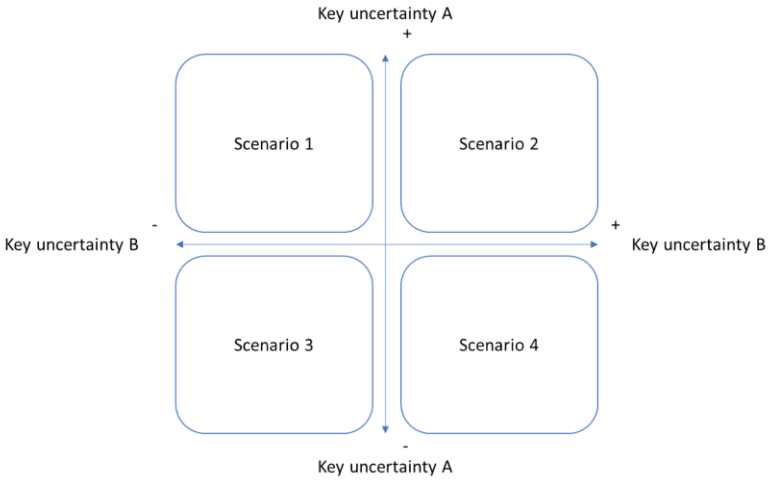


Figure 2.8. Four quadrants for scenarios (Author)

While the first three steps of the TAIDA model focus on the development of scenarios, the last two steps focus on the practical implication of the scenarios for the target group. In these steps, messages are drawn from the scenarios that policymakers can incorporate into their strategies to make them future-proof.

Scenarios are not intended to predict the future, but are intended to create a framework for policymakers. That is why it is important that the applicability of the scenarios for the target group is guaranteed. The PBL (2013) has therefore formulated 5 criteria to assess the quality of the scenarios.

1. Consistency: logical coherence within a scenario.
2. Contrast: the extent to which the scenarios explore different directions of the future.
3. Comparability: The scenarios should address the same problem and explore the same drivers, but they should explore different directions.
4. Elaboration: this has to do with the specificity of the statements about the future. In order to arrive at useful scenarios, the specificity must match the needs of the target groups.
5. Recruitment power: to what extent do the scenarios match the thinking and actions of the target groups?

Interviews with experts in the field of foresight showed that the development of scenarios is very intensive. It is therefore important to define the project well in advance. This provides guidance during the investigation. Defining the scope of the project means that choices have to be made. Important choices that have to be made in this regard concern the following points:

- Type of scenarios (Normative or Explorative)
- Data types (Qualitative or Quantitative or both)
- Target group
- Focal question

These choices depend on the purpose of the study. Scenarios are often initiated by an external client, so that the goal and part of the choices are often formulated in advance. If this is not the case, it is

advisable to approach the project from an external client. This provides structure in the delineation of the project and offers tools that can be relied on during the process.

2.4 Conceptual model

This research focuses on the demand for offices in 2050 in the Netherlands. The needs for office space are (to a large extent) determined by the way in which an organization operates. A more educated workforce has contributed to a more human-centric approach, while technological advances have led to a less location-based workplace. These changes have influenced both qualitative aspects (use of space) and quantitative aspects (office size) of office needs. The highly educated workforce needs a different kind of space than the low-skilled workforce, while the rise of technology has led to a decrease in the use of space per person. In short, this research examines the demand for offices due to changes in the way of working. Since this way of working is subject to continuous developments, this study explores how people will work in the Netherlands in 2050 and what the consequences will be for the demand for offices based on trends, see Figure 2.9.

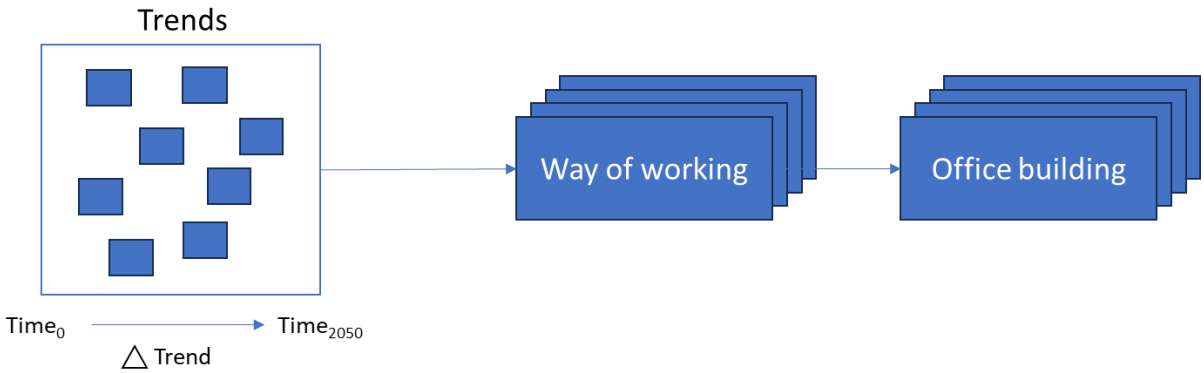


Figure 2.9. Conceptual model. (Author)

Ⅱ - Research Method

03 | Research method

3.1 Type of study

This study explores how offices in the Netherlands could be used in 2050 and what the implications as a result might be for office space. The central question is: *how can societal trends influence the way people work and therefor the office demand?* The goal of the study is to provide insight into how societal trends can impact work practices and the demand for office space. By shifting the discussion on office usage to the year 2050, the research challenges policymakers to broaden their time horizon, prompting a shift from a reactive (short-term thinking) to an anticipatory approach (long-term thinking). The findings of this research offer real estate managers a framework against which they can evaluate their strategies to ultimately develop a cohesive and future-proof policy. To explore office usage in the Netherlands in 2050, four explorative scenarios are developed. Given the lengthy timeline and complexity of the subject, scenarios, according to PBL (2013), are considered the most suitable method for this research. Scenarios are used to improve decision-making by providing structured information for stakeholders to contemplate the future. Scenarios can be broadly categorized into two types: normative and explorative scenarios. While normative scenarios explore desirable futures, explorative scenarios focus on future images where little to no influence can be exerted (Kosow & Gaßner, 2008). The goal of the study is to provide insight into how societal trends can impact work practices and the demand for office space. Therefore, based on trends, various contexts are outlined against which real estate managers can assess and, if necessary, adjust their strategy. Therefore, for this study, four exploratory scenarios are developed. In order to develop these scenarios, the structure of the TAIDA model is used. The TAIDA model is a commonly used approach for scenario development (Lindgren & Bandhold, 2009). For this study both quantitative and qualitative data are collected through literature reviews, surveys, semi-structured interviews, and expert feedback. The scenarios are ultimately elaborated in two forms: essays and visual representations. Finally, a reflection on the quality of the scenarios is provided based on the quality criteria set forth by PBL (2013) for scenarios:

- Consistency: logical coherence within a scenario.
- Contrast: the extent to which the scenarios explore different directions of the future.
- Comparability: the scenarios should deal with the same issue and explore the same drivers, however, they should explore different directions.
- Elaboration: this has to do with the specificity of the statements about the future. To arrive at useful scenarios, the specificity must match the needs of the target groups.
- Recruiting power: to what extent the scenarios match the thinking and actions of the target groups.

3.2 Research methods and techniques

For this research, the structure of the TAIDA method is applied to develop four explorative scenarios. The TAIDA method is a widely used approach for scenario development (Lindgren & Bandhold, 2009). The TAIDA method consists of five steps: Tracking, Analysing, Imaging, Deciding, and Acting. The first three steps are intended for scenario development, while the last two steps are designed to assess and improve the strategy against these scenarios. Since this research is not written from the perspective of a specific organization, there is no strategy that can be benchmarked against the scenarios. Therefore, this research is limited to the development of four scenarios. The Deciding and Acting steps are thus beyond the scope of this research, see Figure 3.1. In the Analysing step, trends are ranked based on steerability. By opting for trends with the lowest level of steerability, the focus is specifically on explorative scenarios. The subsequent sections of this chapter provide a detailed elaboration of the steps for this research.

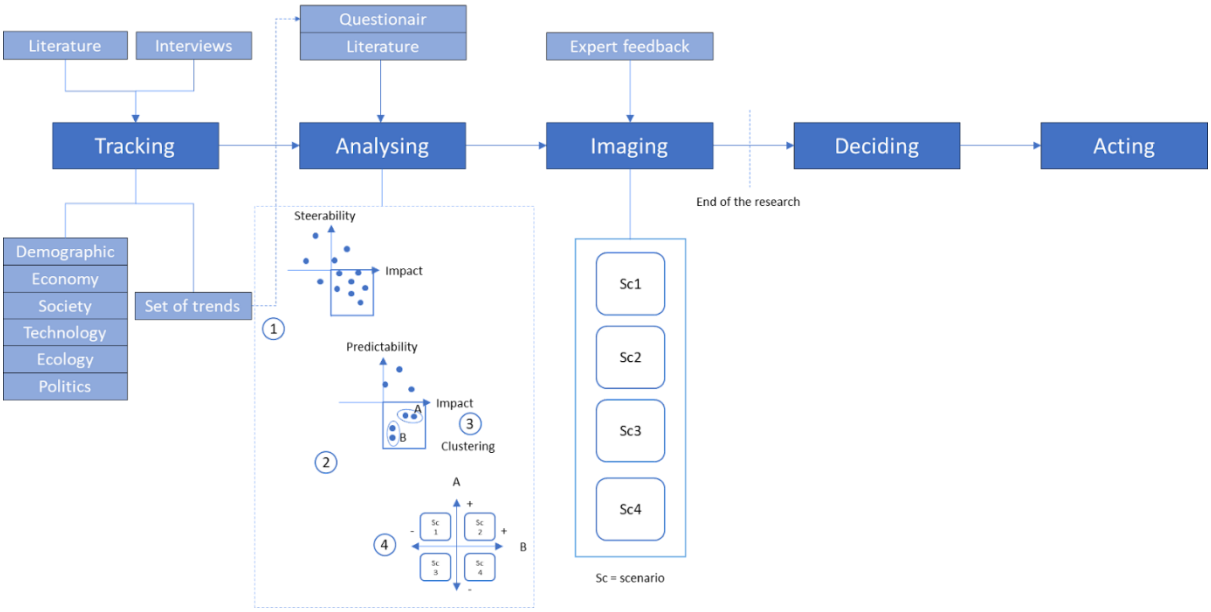


Figure 3.1. Research method diagram. (Author)

3.2.1 Tracking

Trends are mapped out in the Tracking. In this study, this step fulfils two specific functions and therefore consists of two parts. On the one hand, this step provides a context by mapping out an extensive series of developments. In order to obtain the most complete picture possible, the DESTEP structure is used. It classifies trends into six themes: Demography, Economy, Society, Technology, Ecology and Politics. A literature review will be conducted to document these developments, using publications from Statistics Netherlands, PBL and the Ministry to record demographic, social, political and economic developments. In addition, trend watch forums are consulted to map out technological developments, among other things.

Once the context has been outlined, the second section identifies an initial selection of relevant trends for the scenarios. To this end, 10 semi-structured interviews will be conducted with experts from various fields and backgrounds, selected on the basis of predetermined criteria as described in section 3.3.4. The aim of the interviews is to identify an initial selection of trends relevant to the scenarios. To avoid bias, the developments from the literature review will not be shared with the interviewees. During these interviews, respondents are asked about trends that they expect to have the greatest impact on the future way of working. The outcome of the interviews ultimately leads to a set of trends that are used as input for the Analysis phase.

Although both parts map trends and developments, the two parts are separate from each other. To avoid any form of bias, the trends for the context were not used as input for the interviews. The first part is intended to outline the context in which this research takes place, while the trends from the second part provide input for the next steps.

3.2.2 Analysing

In the Analysing step, the trends that emerge from the interviews are analyzed with the aim of identifying a limited number of trends that are most relevant to the scenarios. In the TAIDA model, scenarios are developed along 2 key uncertainties. This means that the number of trends that are included in the scenarios is limited. In order to arrive at meaningful scenarios, it is therefore important to include the most relevant trends for the issue. In order to identify the most relevant trends, the trends are assessed on 3 criteria: the degree of impact on the way of working, the degree of steerability by an organization and the degree of predictability. The degree of steerability is important to ensure the nature of the scenarios. In this study, explorative scenarios are developed, which means that the extent to which the target group can exert influence on the trends is little or no at all. Trends with a low steerability are therefore relevant for this study. Furthermore, trends are assessed on the basis of impact and predictability, as done by Dewulf and Van Der Schaaf et al. al. (1998). Trends with a high degree of predictability can already be taken into account for the strategy, while trends with a low degree of predictability are surrounded by uncertainty and therefore more relevant to explore. Finally, since not all trends can be included, trends with a high impact on the issue are more relevant than trends with a low impact.

The ranking of the trends is done by means of a questionnaire. In the questionnaire, participants are asked to rank the trends in 2 steps. This is a method that was learned during the Master study at the TU Delft. In the first step, the participants are asked to rank the trends based on the impact on the way of working and the degree of steerability. To do this, the participants are asked to place the trends in the Impact-Steerability matrix, see Figure 3.2. Participants are then asked to include the trends with the greatest impact and the lowest steerability in step 2. In this step, the trends are ranked based on impact and predictability. To do this, participants are asked to place the trends in the Impact-Predictability matrix, see Figure 3.3.

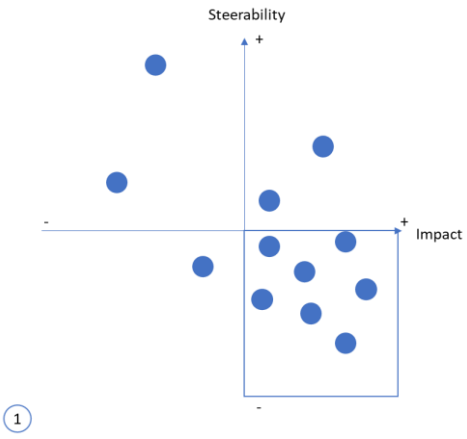


Figure 3.2. Impact-Steerability matrix. (Author based on Dewulf en van der Schaaf et. al., 1998)

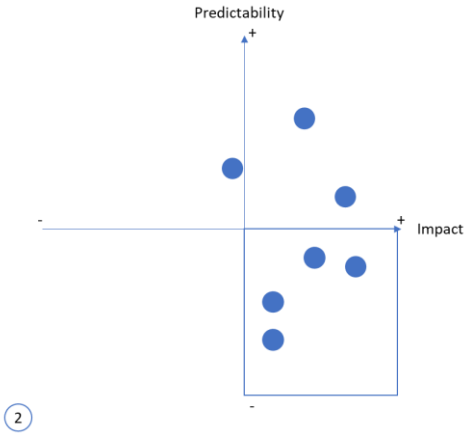


Figure 3.3. Impact-Predictability matrix. (Author based on Dewulf en van der Schaaf et. al., 1998)

Once the most relevant trends (high impact, low steerability, low predictability) have been identified, they are clustered, see Figure 3.4. The clusters ultimately form the core uncertainties along which the scenarios are developed, see Figure 3.5.

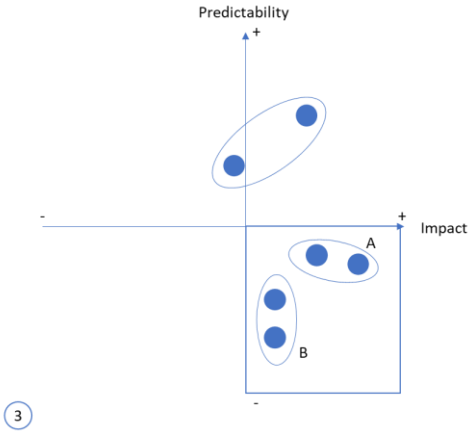


Figure 3.4. Clustering trends. (Author based on Dewulf en van der Schaaf et. al., 1998)

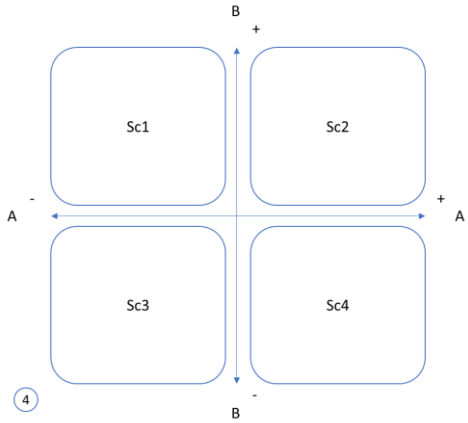


Figure 3.5. Scenario matrix. (Author based on Dewulf en van der Schaaf et. al., 1998)

The key uncertainties are first further elaborated by means of a literature study, in which different characteristics are identified for each key uncertainty, see table 3.1. Every key uncertainty has two values, namely Low and High. Based on the characteristics, the value Low and High is worked out for each key uncertainty. This is done by building the value Low from a skeptical approach and the value High from an optimistic approach. By combining the key uncertainties from different values, four scenarios are ultimately created. These scenarios are worked out in the Imaging step.

Low	*Key uncertainty*	*High*
	Characteristic 1	
	Characteristic 2	
	Characteristic 3	

Table 3.1. Core uncertainty description in situation Low and High. *(Author)*

3.2.3 Imaging

In the imaging step, the four scenarios are elaborated. Initially, the scenarios are constructed by combining the core uncertainties in various situations. They are then presented to 3 experts to provide feedback on the scenarios. Based on the feedback the scenarios are developed further. These experts are Real Estate Managers and therefore also the target group for this research, criteria and feedback process are described in paragraph 3.3.6. The scenarios are developed in two formats: essay and visual representation. Finally, a reflection, in which the feedback of the experts is also considered, is made on the quality of the scenarios based on the 5 quality criteria set by the PBL (2013) for scenarios:

- Consistency: logical coherence within a scenario.
- Contrast: the extent to which the scenarios explore different directions of the future.
- Comparability: the scenarios should deal with the same issue and explore the same drivers, however, they should explore different directions.
- Elaboration: this has to do with the specificity of the statements about the future. To arrive at useful scenarios, the specificity must match the needs of the target groups.
- Recruiting power: to what extent the scenarios match the thinking and actions of the target groups.

3.3 Data collection and analysis

3.3.1 Data types

For this study, different research methods are used to answer the research questions. Figure 3.2 gives an overview of the different methods and what they are used for. The application of each method in this study is further explained in the following sections.

Method Research question	Literature	Questionnaire	Interviews	Expert feedback
What trends can affect the office use?	✓	✓	✓	✗
What are the two key uncertainties that can impact the office use?	✓	✓	✗	✗
How can the office be used as a result of the key uncertainties?	✓	✗	✗	✓

Figure 3.2. Research question and research method. (Author)

3.3.2 Data plan

Effective data management and stewardship are not end goals but rather essential prerequisites that facilitate knowledge discovery and innovation (Wilkinson et al., 2016). In order to enhance the reusability of scientific data presented in this thesis, the process of creating the thesis adheres to the four foundational FAIR Data Principles (Wilkinson et al., 2016). These principles have been collaboratively established by a diverse range of stakeholders, including academia, industry, funding agencies, and scholarly publishers, with the aim of enhancing the infrastructure that supports the reuse of scholarly data. The four principles are Findability, Accessibility, Interoperability, and Reusability. The application of these principles within this thesis is outlined in Table 3.3.

Principle	Explanation
Findability & Accessability	In its final version, this thesis is made publicly available on the TU Delft repository. Furthermore, the repository's content is indexed by search engines, ensuring the thesis is easily findable and accessible.
Interoperability	While the topic of this research is examined in the Dutch context, it is presented in the English language. This choice enhances its interoperability by making it accessible to a wider audience.
Reusability	The research method and steps conducted in this study are described as specific as possible to enable the replication of the research in diverse contexts. Additionally, the widely recognized APA7 writing style and format, familiar to scholars in the realm of qualitative research, are adhered to.

Tabel 3.3. FAIR method. (Author)

3.3.3 Literature review

Literature review plays a role in various phases of this research. Firstly, a literature review is used to gain an understanding of the value that office buildings hold. Additionally, a literature review is employed to investigate how scenarios are generated. In the tracking phase, literature review is also

utilized to elucidate trends. Three types of sources are used to identify trends: scientific articles, institutional documents, and newspaper articles.

3.3.4 Interviews

For this research, semi-structured interviews were used for two purposes. Firstly, 3 interviews were conducted with experts in the field of future explorations. Additionally, 9 semi-structured interviews were conducted with experts from different domains and backgrounds to identify the key trends for this research.

Aim of the interviews

De interviews in dit onderzoek hebben twee doeleinden. De interviews met experts op het gebied van toekomstverkenning hebben als doel om meer kennis op te doen over hoe scenario's ontwikkeld kunnen worden en om de onderzoeksmethode voor dit onderzoek met hen te bespreken. De overige semi-structured interviews hebben als doel om meer inzichten te verzamelen over trends en de belangrijkste trends op het gebied van werken in kaart te brengen. Deze interviews zijn gebruikt om trends te selecteren die als input gaan voor de questionnaire.

Actor Sampling

The aim of this research is to provide real estate managers with insights into how the demand for office spaces may evolve. To achieve this, a wide range of participants are invited to take part in this study through semi-structured interviews. However, in order to develop meaningful scenarios for the target group and thus ensure the recruiting and elaboration power of the research the participants should be relevant for the subject. Since this research addresses the demand for offices as a result of the way of working, it is important that participants have knowledge of organizations, employees, and/or spatial arrangements resulting from the way of working. As this research focuses on the future, interviews are also conducted with experts in the field of future explorations. The criteria that participants must meet for this research are as follows:

1. The participant must have knowledge of how work may evolve.
2. The participant must have knowledge of human behavior.
3. The participant must have knowledge of how organizations function.
4. The participant must have knowledge of the relationship between the way of working and the physical work environment.
5. The participant must have knowledge of how future developments may unfold.
6. The participant must have knowledge of future exploration methodologies.

Participants are required to meet at least one of the above criteria to participate in this research. A total of 11 participants with various backgrounds are interviewed for this study. Table 3.1 provides an overview of the participants' fields of expertise and the criteria they meet.

Expertise	Selection criteria
Researcher Behaviour Science and Phycology	2, 3
Researcher New ways of working	1

Researcher Spatial planning	5, 6
Corporate real estate	3, 4
HR director	2, 3
Researcher Spatial economy	5, 6
Researcher Organizational Behaviour	2, 3
Prof Behaviour Science and Phycology	2
Researcher Spatial planning	5, 6
Researcher Toekomstverkening	6
Researcher Exploring the future	6

Tabel 3.2. Participants overview semi-structured interviews. (Author)

Interview Procedure

• **Participation and consent form:** interviewees will be selected according to the criteria mentioned in the previous paragraph. Thereafter, they will formally be asked to participate in the research by email. If willing and able, an interview consent form is sent in which the research is also briefly described.

• **Interview protocol:** digital interviews will be recorded by video-conferencing software. Physical interviews are preferred and will be recorded and notes will be made during the interview.

Interview Input

- Interviews about how to develop scenarios

Prior to the interviews, literature was consulted to gain insight into what scenarios are and how they can be developed. The main goal of the interviews is therefore focused on gaining a better understanding of the distinction between normative and exploratory scenarios and discussing the method for developing scenarios for this research with the participants. To achieve this, a presentation is prepared for the interviews. In this presentation, the purpose of this research is first discussed with the participants, followed by sharing the initial outline of the research method with them. Participants can then provide their feedback on this.

- Interviews about trends that can impact the way of working

The interviews with experts from different domains and backgrounds are intended to gain more insights into how work may evolve in the future. Participants are asked about the trends they expect to have the most impact and how these trends relate to each other. No trends are shared with the participants in advance to prevent bias. The intention is for the experts to identify the most relevant and impactful trends based on their own insights.

Expected Findings

- Interviews about how to develop scenarios

The desired outcomes from these interviews are, firstly, to foster a better understanding of the two types of scenarios and how scenarios can be implemented. Specifically, the goal of these interviews is to gain insights to improve the research methodology, where necessary, in order to achieve high-quality scenarios.

- Interviews about trends that can impact the way of working

This interviews are aimed at identifying the trends recognized by the participants. In this context, the focus is on how these trends might influence the way of working. Due to the diversity in backgrounds and areas of expertise among participants, the insights may vary. The advantage of this is that it fosters a broader understanding of the topic; however, it can also result in insights on certain topics that diverge significantly, making them challenging to compare. To mitigate this, during the interviews, an effort is made to identify connections between the various trends, thereby establishing deeper understanding about the impact of the trends. The expected findings from the interviews are specific: which trends will impact the way of working, how these trends are interconnected, and how they might influence the way of working.

Interview Analysis

The interviews will be recorded and notes will be made during the interviews. After each interview, the interviews are been transcript and a summary of the interview is been made. This summary first describes the participant. Then there is a summary about the content after which the key findings are described and finally an overview of the mentioned trends during the interview is been given.

3.3.5 Questionaire

The aim of the questionnaire is to identify the two main core uncertainties. These will form the basis for the scenarios. To identify the core uncertainties, trends are ranked based on their impact on the way of working, the degree of steerability by an organization, and predictability. This is done in two steps. The trends with the greatest impact on the way of working, the lowest controllability, and the lowest predictability are then clustered into two groups. These groups constitute the core uncertainties for this research.

Actor sampling

The trends are analyzed in the questionnaire based on their impact on the way of working, the degree of steerability by an organization, and the level of predictability. The questionnaire is intended to be completed from an organizational perspective. To make the results of this research more applicable to a wide range of organizations, participants from various organizations have been invited. Table 3.3 provides an overview of the participants.

Expertise
Corporate real estate manager
Portfolio manager
Business Analyst
Corporate Real Estate Analyst

Office transaction expert
Workplace expert
Architect
Architect
Branch manager
Department manager
Department manager
Department coordinator

Tabel 3.3. Participants overview questionnaire. (Author)

Questioniare input

The trends identified from the interviews and those identified from the literature are overlaid to form the input for the questionnaire. In the questionnaire, participants are asked to rank the trends. This is done in two steps. In the first step, participants are asked to rank the trends based on their impact on the way of working and the degree of steerability from an organizational perspective by placing the trends on the axis system, see Figure 3.6.

The trends from the High Impact and Low Steerability quadrant then serve as input for step two. In this step, participants are asked to rank the trends based on their impact on the way of working and predictability by placing the trends on the axis system, see Figure 3.7.

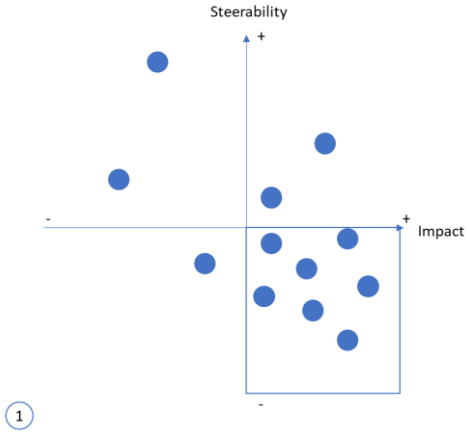


Figure 3.6. Impact-Steerability matrix. (Author based on Dewulf en van der Schaaf et. al., 1998)

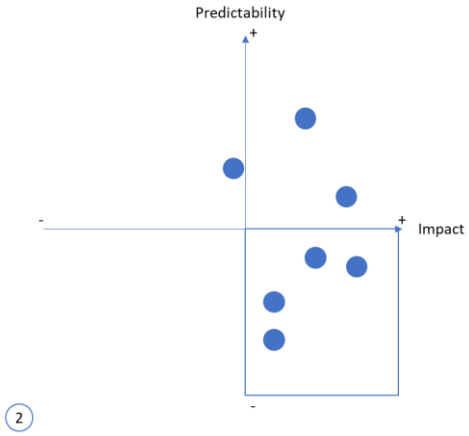


Figure 3.7. Impact-Predictability matrix. (Author based on Dewulf en van der Schaaf et. al., 1998)

Data analysis

For the data analysis, the coordinates of each trend according to each participant are determined in the axis system. These coordinates are then documented in an Excel file. Subsequently, the weighted average of each trend is calculated from this data. Based on the weighted average, each trend is then placed back into the axis system. The trends in the High Impact and Low Steerability quadrant are then analyzed in the same way in the second step. This results in an axis system in which the trends are classified based on impact and predictability. From the High Impact and Low Predictability quadrant, two clusters of trends are then formed. These clusters constitute the core uncertainties that will form the basis of the scenarios.

3.3.6 Expert feedback

The expert feedback in this research serves two purposes. Firstly, it gathers insights from various experts on how the core uncertainties, based on different values, can influence the way of working and consequently the demand for offices. Secondly, the feedback is intended to assess whether the scenarios align with the needs of the target group of this research. This ensures the recruiting power and elaboration of the scenarios.

Actor sampling

To test the practical implications of the scenarios, the target group of this research, namely real estate managers, is involved in this step to provide feedback. The participants for the feedback are not the same as those during the semi-structured interviews. For this step, 3 experienced real estate managers are invited.

Input

For this step, an initial draft of the scenarios is sent to the participants. This initial draft is constructed by combining the different values of the two core uncertainties. Participants are asked to reflect on the scenarios by indicating how, based on the values, each scenario is expected to develop.
Data analysis

Participants are asked to provide written responses to the scenarios. The feedback from the participants is then compared with each other and with the scenarios.

3.3.7 Trustworthiness

Research, such as this study, that deals with the future is based on assumptions. After all, no one knows exactly how the future will unfold. To ensure the academic foundation of this research, the criteria for trustworthiness, as described by Lincoln & Guba (1985), are taken into account. Lincoln and Guba outline four criteria to ensure trustworthiness: credibility, dependability, confirmability, and transferability.

Credibility – Feedback from various experts is sought during the development of the scenarios. This includes substantive feedback to ensure that the content of the scenarios aligns with the expectations of the experts.

Dependability – The steps and results from these steps are transparently shared. Furthermore, the expertise of the participants is disclosed in this study. The identity of the participants is anonymized, and the findings cannot be traced back to the participants.

Confirmability – During the development of the scenarios, various experts provided feedback and shared their own insights. Additionally, the scenarios were evaluated based on the quality criteria formulated by the PBL for scenarios.

Transferability – Participants are selected based on predefined selection criteria to generate relevant data for this research. The rationale behind establishing the selection criteria is also explained. Furthermore, the number of participants and their expertise are disclosed in this study. However, the participants themselves are anonymized, ensuring that this information cannot be traced back to an individual.

3.4 Research scope

This research focuses on office demand in the Netherlands in 2050. The office demand is approached as a result of the way of working. The way of working is, in turn, influenced by various trends. In this research, the DESTEP method is used to map out these trends. This method involves a wide spectrum of influencing factors in this study. However, these trends are analyzed step by step, from which ultimately the 2 clusters with the highest impact and the lowest steerability and the lowest predictability on the way of working form the basis of the scenarios. These are called the key uncertainties and form the basis of the scenarios. Although numerous factors influence the demand for office spaces, this study incorporates only a limited set of trends in the development of scenarios. The trends included are deemed the most relevant for crafting exploratory scenarios according to the TAIDA model.

3.5 Dissemination and audience

The aim of this study is to provide real estate managers with new insights into how the demand for office space may evolve in the Netherlands by 2050 due to changes in the way of working. The scenarios developed herein can serve as a tool for real estate managers to assess their real estate strategy and strengthen their policies. The potential of real estate demand is not only pertinent to real estate managers but also holds significance for investors and office property owners. Additionally, the findings from this research can offer relevant insights to policymakers engaged in shaping working practices. This study approaches the office space demand as a result of working practices, a topic that is shaped at a high strategic level within organizations.

3.6 Ethical considerations

This thesis will be published on the TU Delft Repository. Therefore, it is of great importance that no participants in this research experience any negative effects due to the publication of this research. To this end, interviewees receive a letter concerning the purpose of this research, the voluntary nature of participating in the interview, and the right to not answer a question. Furthermore, in the letter the interviewee is asked if the interview can be recorded. Interviews will only be recorded with permission of the interviewee and even after written permission to record the interview, this very question is asked again verbally at the beginning of each interview. Statements made by interviewee are validated by the interviewee to ensure the correct interpretation. In addition, all statements made by interviewees will be anonymized in this publication.

3.7 Graduation Internship

This thesis is written in the role of graduate intern within ING Bank. This research is conducted with guidance from Delft University of Technology and support from multiple professionals of the department Global Corporate Real Estate from ING Bank. This research explores the future office demand. Like most organizations ING is in the process of formulating a Hybrid Working strategy. While Hybrid Working shares some similarities with the subject of this research, it's essential to note that the time horizons significantly differ. Hybrid Working focuses on the near future, while this research is aimed at 2050. Consequently, the outcomes of this research are independent of ING Bank's Hybrid Work module. This research does not specifically target ING's core business but employs a broader lens. Therefore, this research does not serve as a case study for ING, and data and results cannot be

directly attributed to ING Bank. ING was chosen as the graduation company due to its pioneering role in defining new working methods, the expertise of the Global CREM department, and the infrastructure that ING provides, both within the organization and externally. The value of this research for ING aligns with the research's objectives: increasing insights into future office space requirements. Additionally, the develop scenarios can be used to test and improve ING’s real estate strategy.

Ⅲ- Findings

04 | Tracking

This chapter charts developments. In this study, this step fulfils two specific functions and therefore consists of two parts. First of all, an extensive series of developments is mapped out in order to outline the Dutch context. After all, this research focuses specifically on the Netherlands. Section 4.1 maps out a wide range of diverse developments that are classified according to the DESTEP structure according to 6 themes. On the other hand, this chapter makes a first selection of relevant trends for this research. To this end, section 4.2 maps out a set of trends by means of 10 interviews with experts from different domains and backgrounds. Section 3.3.4 gives an overview of the participants. The experts were selected on the basis of pre-defined selection criteria, see also section 3.3.4.

Although both parts map trends and developments, the two parts are separate from each other. To avoid any form of bias, the trends for the context were not used as input for the interviews. The first part is intended to outline the context in which this research takes place, while the trends from the second part provide input for the next steps.

4.1 Literature: Dutch context

The exploratory scenarios for this research focus on the Dutch context. To this end, a broader picture of developments that are taking place here is first sketched. These developments are identified by means of a literature review and organized according to the DESTEP method. Within the DESTEP methodology, trends are divided into six themes to provide a comprehensive overview of current developments: Demography, Economy, Society, Technology, Ecology and Politics. Various sources are consulted to obtain this information. Publications of the CPB and PBL are used to analyse changes in society, while newspapers and media are consulted to map political changes. In addition, ministerial documents are used to record economic and ecological developments. Finally, technological developments are identified on the basis of trendwatch forums.

4.1.1 Demographic

- **Population** growth: The Netherlands has experienced steady population growth in recent decades. This is largely due to both natural growth (birth surplus) and net migration (CBS, 2023).

- **Ageing population**: Like many other developed countries, the Netherlands is dealing with an ageing population. The number of elderly people is increasing, while the birth rate is declining (CBS, 2022a).

- **Increasing ethnic diversity**: Migration has made the Netherlands increasingly diverse in terms of ethnic background. There are large communities of people with a non-western migration background (CBS, 2022b).

- **Urbanization**: The population is expected to increase, especially in the cities. The population is concentrated in urban areas, particularly in the Randstad (Amsterdam, Rotterdam, The Hague, Utrecht) and other large cities (PBL, 2022).

- **Household dilution**: The number of people per household is decreasing. There are more and more single-person households and smaller households, partly due to an ageing population, divorces and changing social norms (PBL, 2022).

- **Increase in the number of highly educated people**: The level of education of the Dutch population is rising. There is a growing number of highly educated people (CBS, 2022a).

- **Individualization**: Dutch society has become more individualistic, with a greater emphasis on personal freedom, self-development, and autonomy. This has an impact on social relationships and societal behaviour (Denys, 2022).

4.1.2 Economy

- **Flexible labour market**: The labour market in the Netherlands has become increasingly flexible. There has been an increase in temporary contracts, self-employed workers (self-employed without staff) and platform work, which is changing traditional working relationships (Dekker, 2017; SharpSmart, 2023).

- **Sustainable economy:** The Netherlands has a strong focus on sustainability and the transition to a circular economy. There are initiatives in the field of sustainable energy, green technologies and the reduction of CO2 emissions. This has led to the growth of sustainable sectors and green jobs (BZK, 2022; Ministerie van Financiën, 2023).

- **Rising income inequality:** Like many other developed countries, the Netherlands is facing increasing income inequality. Although the Netherlands generally has an equal distribution of income, the gap between rich and poor has increased (CBS, 2019; CPB, 2022).

- **Globalisation:** The Netherlands attracts a lot of foreign investment, thanks in part to a favourable investment climate, a good infrastructure and a highly educated workforce. Foreign companies are establishing themselves in the Netherlands, creating jobs and economic growth (CBS, 2023).

- **Changing retail sector:** The retail sector in the Netherlands is undergoing changes due to the rise of e-commerce and online shopping. Brick-and-mortar stores need to adapt and invest in omnichannel strategies to stay competitive (Lightspeed, 2022).

- **Start-up culture**: The Netherlands has a thriving start-up culture, particularly in cities such as Amsterdam, Rotterdam, and Eindhoven. There is a growing ecosystem of innovative start-ups, incubators, accelerators, and venture capital, which has contributed to economic growth and job creation (Ririassa, 2022).

4.1.3 Society

- **Individualization:** There is a growing emphasis on individual freedom, autonomy, and self-fulfillment. People strive for personal happiness and pursue their own goals (Denys, 2022).

- **Digitalization and connectivity:** Digitalization is having a significant impact on Dutch society, with technology and the internet becoming an integral part of everyday life. People are constantly connected and use digital platforms and services (Colsters, 2022).

- **Sustainability and environmental awareness:** There is a growing awareness of the need to live sustainably and take care of the environment. People are striving for sustainable consumption, renewable energy, and environmentally friendly practices (Van Der Molen, 2020).

- **Gender equality:** There is an increasing focus on gender equality and inclusion in Dutch society. Efforts are being made to break gender stereotypes and promote equal opportunities and rights for all (RVO, 2022).

- **Increasing mobility:** People have become increasingly mobile, both within the Netherlands and internationally. There is a greater emphasis on flexibility and exploring new experiences and cultures (Durang et al., 2023).

- **Changing family structures:** Traditional family structures are changing. There are more single-parent families, blended families, and people who choose not to have children. The division of roles within families is also evolving (De Haan, 2023).

- **Increasing participation and activism:** People are increasingly participating in social issues and are actively involved in politics, social justice, and other societal issues (Van Keep & Timmermans, 2023).

- **Health and wellness:** There is a greater focus on health and well-being, both physically and mentally. People are aware of the importance of a healthy lifestyle and are looking for ways to promote their well-being, such as exercising, healthy eating, and mindfulness (Willemsen, 2021).
- **Increasing diversity:** The Netherlands is becoming increasingly diverse in terms of ethnicity, culture and religion. There are larger communities of people with a non-Western migration background, which leads to an enrichment of Dutch society (CBS, 2022a).

4.1.4 Technology

- **Digitalization:** The Netherlands is one of the most digitally developed countries in the world. Internet use and online services are widespread, and technological innovations are impacting various aspects of daily life (Colsters, 2022).

- **Technological innovation:** In recent years, the Netherlands has made great strides in the field of digitisation and technological innovation. This has led to growth in the IT sector, e-commerce, and the emergence of new technologies such as artificial intelligence and blockchain (De Heij, 2021).

- **Artificial intelligence (AI):** AI is becoming increasingly sophisticated, expanding into various domains, such as speech recognition, image recognition, natural language processing, and autonomous systems (TNO, 2022).

- **Internet of Things (IoT):** The number of connected devices is growing rapidly, allowing everyday objects to communicate with the internet and collect and share data (Donaldson, 2022).

- **5G connectivity:** The rollout of 5G networks will provide faster and more reliable wireless communication, enabling new applications such as autonomous vehicles, augmented reality, and smart cities (De Jongh, 2023).

- **Blockchain technology: Blockchain**, a decentralized and secure digital ledger, is being applied in various industries, such as finance, supply chain management, and healthcare, to promote transparency and security (De Jongh, 2023).

- **Robotics:** Robots and advanced automation systems are becoming increasingly sophisticated, taking over tasks in various industries, such as manufacturing, healthcare, and logistics (De Jongh, 2023).

- **Virtual and augmented reality (VR/AR):** VR and AR are increasingly being used in entertainment, training, education, and other applications to provide immersive experiences and improve interaction with the digital world (Emerce, 2022).

- **Biotechnology:** Ongoing developments in biotechnology are leading to breakthroughs in genetic modification, biomedical engineering, and pharmaceutical research (Emerce, 2022).

- **Sustainable technologies:** There is a growing focus on renewable energy sources, such as solar, wind, and energy storage, to address climate change and reduce reliance on fossil fuels (Emerce, 2022).

- **Big** data analytics: With the growing amount of data available, advanced analytics methods and data mining techniques are being used to gain valuable insights, identify trends, and improve decision-making (De Jongh, 2023).

4.1.5 Ecology

- **Sustainability and environmental awareness:** Environmental awareness and sustainability have become important themes in the Netherlands. There is a growing awareness of climate change, the need for renewable energy, and environmentally friendly behavior (Van Der Molen, 2020).

- **Energy transition:** The Netherlands is committed to a sustainable energy transition, with a focus on reducing reliance on fossil fuels and promoting renewable energy sources such as solar and wind energy (Ministerie van Algemene Zaken, 2023a).

- **Climate adaptation:** The Netherlands is aware of the consequences of climate change, such as rising sea levels and extreme weather conditions. Efforts are underway to adapt to these changes, such as the construction of floodplains and the strengthening of dikes (Ministerie van Algemene Zaken, 2023c).

- **Circular economy:** The Netherlands is committed to developing a circular economy, in which raw materials are used more efficiently and waste is prevented as much as possible. Recycling and reuse play an important role in this (Ministerie van Infrastructuur en Waterstaat, 2023).

- **Nature conservation and biodiversity:** There is an increasing focus on the conservation and restoration of natural habitats and the protection of biodiversity. Nature reserves and areas are protected and initiatives are taken to conserve endangered species (Ministerie van Infrastructuur en Waterstaat, 2023b).

- **Sustainable agriculture:** The Netherlands is striving for a sustainable agricultural sector with less use of chemical pesticides, more organic farming practices, and a better balance between agricultural production and nature conservation (Ministerie van Algemene Zaken, 2023b).

- **Water management:** The Netherlands has a long history of water management, and measures are constantly being taken to prevent flooding, improve water quality, and use water more efficiently (Ministerie van Infrastructuur en Waterstaat, 2022).

- **Sustainable mobility:** The Netherlands is committed to sustainable forms of mobility, such as electric vehicles, bicycle-friendly infrastructure and the promotion of public transport to reduce greenhouse gas emissions (Ministerie van Infrastructuur en Waterstaat, 2023a).

- **Green cities:** There is a growing focus on green cities, with more space for greenery, urban agriculture, and green infrastructure to improve the liveability and well-being of city dwellers (PBL, 2023).

- **Awareness and behavioural change:** There is a growing awareness among citizens and businesses about the need for sustainability and environmental responsibility. This has led to behavioral changes, such as reducing plastic use and making more sustainable consumption choices (Vingerhoeds, 2023).

4.1.6 Politics

- **Rise of populism:** Populist movements and parties are gaining popularity, focusing on anti-establishment sentiments and often being critical of the established political order (Broekhuizen & Van Ostaaijen, 2021).

- **Increasing polarization**: Political debates are often characterized by polarization, further amplifying contradictions between different political ideologies and viewpoints (Ministry of Health, Welfare and Sport, 2022).

- **Rise of nationalist and anti-immigration movements:** In several countries, there are movements that aim to restrict immigration and protect national interests and identity (Rooduijn, 2021).

- **Growing influence of social media** : Social media is playing an increasingly important role in politics, with politicians and parties actively using these platforms for campaigning and communicating with voters (Ariens, 2023).

- **Increasing attention to climate change:** The urgency of climate change is increasingly recognized, and political parties and policymakers are forced to put sustainability measures and climate policy high on the agenda (Ministry of Economic Affairs and Climate, 2022).

- **Strengthening Euroscepticism:** In addition to domestic populist movements, there is also increasing Euroscepticism, with criticism of the European Union and its institutions (University of Amsterdam, 2020).

- **Rise of identity politics:** Political discussions are increasingly influenced by identity issues, such as gender, race, religion, and sexual orientation, with groups fighting for recognition and equal rights (Salman & De Regt, 2022).

- **Increasing emphasis on privacy and data protection:** With the growth of digital technologies, there has been a greater concern about privacy and data protection, leading to stricter

regulations and debates on surveillance and data breaches (Ministry of Justice and Security, 2023).

- **Rise of Progressive Movements:** There is a growing presence of progressive movements and parties advocating for social justice, inclusion, and equality in various areas, such as gender equality and LGBTQ+ rights (Ministry of Education, Culture, and Science, 2023).

- **Increasing youth involvement:** Young people are becoming increasingly politically active and involved in social issues, particularly in the areas of climate change and social justice (Den Ridder, 2020).

4.2 Interviews

The trends identified in section 4.1 describe a wide range of developments in the Netherlands. This sets the context. In the TAIDA method, however, scenarios are developed on the basis of a limited number of trends. Therefore, in order to arrive at meaningful scenarios, it is important to identify the most relevant trends for the topic. In this section, a first selection of trends is made. In this study, the demand for office space is approached from the point of view of the way of working. Relevant trends for this research are therefore trends that can influence the way of working. To map these trends, 10 interviews were conducted with experts from different domains and backgrounds. In this way, a wide range of insights into the way of working is collected. To ensure this, selection criteria have been drawn up in advance for the interviewee to meet, see section 3.3.4 for an overview of the interviewee and the selection criteria.

The interviewees were then approached by e-mail for an interview with the question whether they would like to participate in this study. To this end, an explanation of the research was first sent. After written agreement, they were sent an Informed Consent stating the purpose of the study and that their input would be treated confidentially and that results could not be traced back to them. A number of interviews were conducted in person and a number online. The interviews themselves have all been recorded and transicribed. These were then analysed. During the interviews, participants were asked which trends they thought would have the greatest impact on the way of working and how these trends relate to each other.

The participants all expect that technology and digitization will continue to have a major impact on the way of working in the future. Technological developments are the biggest challenge for the physical office. For example, a professor of Organizational and Behavioral Sciences argues that the office still serves a purpose, because not all aspects of physical interaction can be replicated online. While you can see and hear each other online, you can't smell or touch each other. As a result, the online transmission of information is not complete. According to a researcher from Spatial Planning, the technology is not (yet) advanced enough to facilitate all aspects of working outside the office. Creative processes and discussions are better suited to the office environment. The office is therefore primarily intended as a meeting and discussion space.

In addition, the interviews show that people-oriented aspects are receiving more and more attention within organizations. One participant indicates that health and well-being have increasingly become a priority for organizations over the past 15 to 20 years. However, several participants expect this to become more challenging in the future due to individualization and increasing diversity of the workforce. Socio-economic inequality in society can also exert pressure on this. Although organizations pay more attention to their employees, their freedom of choice has become more limited. Organizations are more or less forced to prioritize this. If they don't, they run the risk of not hiring new

staff and their current employees may leave. As a result, the freedom of choice that companies have in this regard is decreasing.

Another development mentioned in some interviews is sustainability, which is already an important theme for both companies and society. During an interview, the concept of a circular economy was also mentioned as a trend that companies should take into account. A circular economy requires certain adaptations from organisations. In addition, globalization was discussed in one interview. Although globalization has brought prosperity in recent years, there are also voices in society advocating for more local production. Finally, mobility is another factor that organizations should consider. People have become increasingly mobile. Table 4.1 provides an overview of the trends mentioned by the interviewee as having an impact on the way of working.

Trends
Technological innovation
Health & well-being
Individualization
Urbanization
Sustainability
Mobility
Digitalization
Diversity
Inequality
Globalization
Circular economy

Table 4.1. Identified trends during interviews. (Author)

The interviews revealed 11 trends that, according to various experts, may influence the way of working in the future. However, the frequency with which the trends were mentioned was not taken into account during the analysis of the interviews. Therefore, Table 4.1 does not show a hierarchical order of the trends. The purpose of the interviews was solely to identify trends that could influence the way of working. In the next chapter, Analysing, the trends are ranked. This is done on the basis of three criteria: the degree of impact on the way of working, the manageability of the trend and the predictability of the trend.

05 | Analysing

In this chapter, the trends that emerged from the interviews are further analyzed. The aim of this step is to identify the most relevant trends for the scenarios. To this end, the trends are assessed on 3 criteria: the impact on the way of working, the controllability and the predictability. To this end, a questionnaire has been drawn up in which the trends are classified in 2 steps. In the first step, the participants were asked to rank the trends based on the impact on the way of working and the controllability of the trends. The trends with the greatest impact and the lowest degree of controllability are then input for step 2. In this step, participants were asked to rank the trends based on their impact and degree of predictability. The trends with the greatest impact and the lowest degree of predictability are then the most relevant trends for the scenarios. These were then clustered by the research team into 2 core uncertainties. Twelve participants from five different organisations completed the questionnaire. The number of participants was limited due to predefined selection criteria to ensure the relevance of the insights combined with the limited resources of the research team. When compiling the group of participants, a conscious decision was made to involve different organizations, instead of gathering insights from one organization, in order to ensure a broader applicability of the findings. The discussion section elaborates on the limitations of this research.

5.1 Questionnaire

5.1.1 Impact-Steerability

In the first step of the questionnaire, the participants were asked to rank the 11 trends from Table 4.1 based on the impact of the trend on the way of working and the degree of controllability of the trend. To this end, the participants were asked to place the trends on the Impact-Steerability matrix, see Figure 3.2. The questionnaire was completed by twelve participants. This led to twelve different Impact-Steerability matrices in which the trends are placed in a different position each time. In order to be able to compare the results, the coordinates on the X-axis (Impact) and Y-axis (Controllability) were determined for each participant. These coordinates were then documented in an Excel file and by adding the coordinates for each trend and then dividing by the number of participants, the average position for each trend was determined, see table 5.1.

		Participants																								Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L			
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
1	Digitalization	3,27	2,05	2,8	-1,83	4,75	-4,84	4,23	-1,66	3,52	-1,61	3,72	1,96	3,72	1,96	3,23	4,12	3,52	-3,5	2,64	-0,61	4,1	-2,3	3,67	4,79	**3,60**	**-0,12**
2	Health and well-being	2,89	2,66	-2,97	-0,57	4,52	2,83	1,03	-4,21	1,8	-3,3	1,15	1,24	1,15	1,24	3,95	-0,65	-0,39	2,52	2,67	-3,65	3,23	-2,77	1,81	1,02	**1,74**	**-0,30**
3	(Ethnical) diversity	-1,63	3,01	-4,67	-0,58	4,52	5,5	1,42	0,57	-0,34	-2,17	0	0,46	0	0,46	-3,9	0,9	-1,03	4,12	3,41	1,04	0,21	-1,23	2,53	1,99	0,04	1,17
4	Individualization	3,82	2,55	-4,66	-1,69	0	0	0,41	-4,5	3,3	-3,28	0,53	-4,07	0,53	-4,07	-2,62	0,72	-0,72	-0,72	3,2	-1,85	2,01	-3,96	2,31	-1,14	**0,68**	**-1,83**
5	Globalization	0	1,92	-2,91	-1,69	0	-2,51	1,57	-1,02	2,46	-3,09	1,59	-3,64	1,59	-3,64	-0,75	-0,8	3,09	-1,91	1,3	-3,49	0,26	-1,76	3,11	-2,21	**0,94**	**-1,99**
6	Technological domination	2,03	1,18	1,89	-1,14	4,55	-2,49	0,95	0,76	0,9	-2,36	3,59	0,53	3,59	0,53	2,52	1,88	2,51	2,8	3,26	-2,38	2,6	-1,72	1,92	-2,41	**2,53**	**-0,40**
7	Sustainability	3,78	3,87	1,4	-0,57	2,29	0	2,81	0,94	1,26	0,56	2,72	1,92	2,72	1,92	2,15	2,93	3,66	4,64	1,01	-0,27	0,09	0,44	0,64	2,18	2,04	1,55
8	Urbanization	0,02	0,46	1,4	-1,58	2,36	-4,82	-0,45	1,41	-1,21	0,59	-0,73	1,35	-0,73	1,35	0,7	-1,7	-2,19	-2,64	-1,53	-1,88	-2,06	-1,06	1,06	-1,5	-0,28	-0,84
9	Mobility	1,47	3,63	2,91	-0,56	3,39	5,5	0,57	1,43	-0,04	0,49	0,51	2,62	0,51	2,62	0,58	-0,68	-1,23	1,33	2,54	0,56	2,75	2,45	-1,06	-0,25	1,08	1,60
10	Income inequality	-3,28	3	-4,77	-3,07	-0,65	2,81	-1,75	-0,11	-0,39	-1,63	0,35	-3,03	0,35	-3,03	0,62	0,49	-3,7	0,75	-2,11	-2,98	-0,95	0,79	-4,63	-1,34	-1,74	-0,61
11	Circular economy	-1,18	1,88	0,52	-2,89	-0,87	0	-4,28	-1,11	-2,82	-0,59	0,23	-0,37	0,23	-0,37	2,25	0,53	-2,96	2,94	-1,37	-1,26	-3,78	0,72	-3,93	-2,68	-1,50	-0,27

Table 5.1. Coordinates of each trend in step 1. (Author)

Based on the average position of each trend, the position of each trend on the Impact-Steerability matrix has been reconstructed, see Figure 5.1.

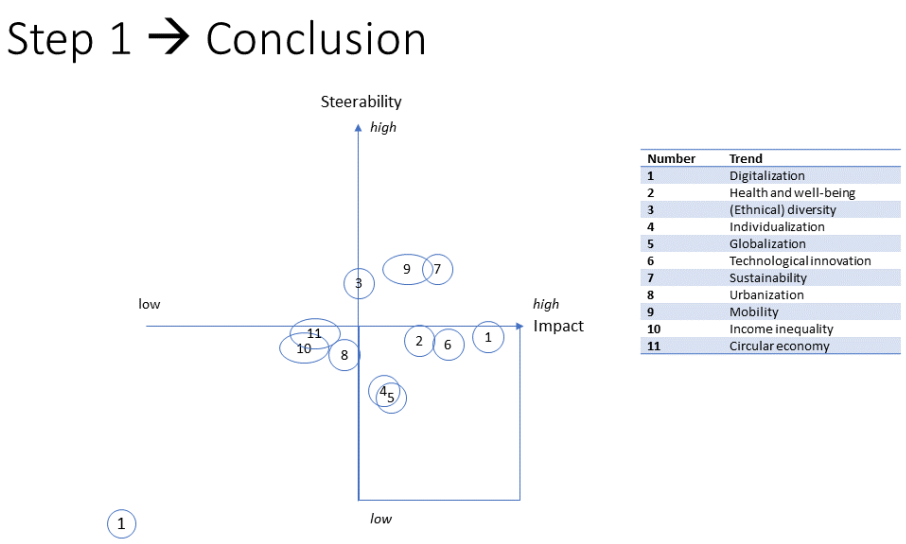


Figure 5.1. Impact-Steerability matrix based on weighted averages from step 1. (Author)

From the matrix in figure 5.1, it appears that 5 trends fall into the quadrant of High Impact and Low Steerability:

- Digitalization
- Health and well-being
- Individualization
- Globalization
- Technological innovation

5.1.2 Impact-Predictability

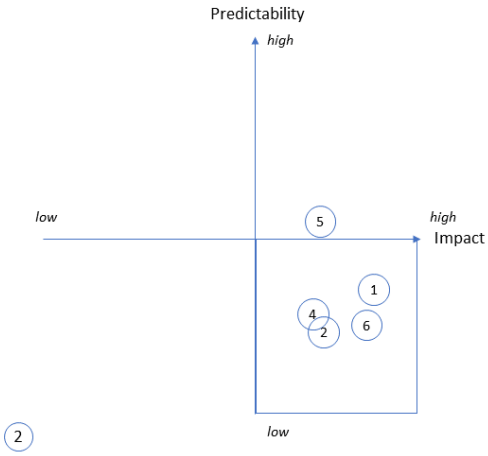
In the second step of the questionnaire, participants were asked to include the trends they placed in the quadrant of high impact and low manageability in step one to step two. Since each participant placed the trends in the Impact-Steerability matrix based on their own insight in the first step, the input for step two differed per participant. This resulted in twelve matrices in which the same trends did not always occur. In order to compare the results and arrive at the trends with the greatest impact, lowest controllability and lowest predictability, only the trends that are in the quadrant of high impact and low controllability according to Figure 5.1 were included in the analysis for step two of the questionnaire. This means that only the position of 5 trends (digitalization, health and well-being, individualization, globalization and technological innovation) has been determined in the Impact-Predictability matrix of each participant. The X and Y coordinates of each participant for these trends have been redetermined. These are documented in an Excel file, and the average position of the trends is again determined by adding the coordinates together and dividing by the number of participants who actually placed these trends in matrix two, as shown in Table 5.2.

		Participants																										Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L					
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
1	Digitalization			0,66	1,92	4,67	-4,84	4,23	-1,66	3,52	-1,61							3,65	-0,79	2,64	-0,61	4,1	-2,3					**3,35**	**-1,41**
2	Health and well-being							1,03	-4,21	1,8	-3,3					0,82	0,73			2,67	-3,65	3,23	-2,77					**1,91**	**-2,64**
4	Individualization							0,41	-4,5	3,3	-3,19	0,53	-0,54	0,53	-0,54					3,2	-1,85	2,01	-3,96	1,38	-0,7	**1,62**	**-2,18**
5	Globalization							1,57	1,93	2,46	-0,15	1,59	1,32	1,59	1,32			3,39	0,73	1,3	-0,54	0,26	1,18	2,58	-1,83	1,84	0,50
6	Technological domination			3,86	-2,94	4,03	-4,84			0,9	-1,51									3,26	-2,38	2,6	-1,72	3,95	-1,21	**3,10**	**-2,43**

Table 5.2. Coordinates of each trend in step 2. (Author)

Based on the average position of each trend, the position of each trend on the Impact-Predictability matrix has been reconstructed, see Figure 5.2.

Step 2: Conclusion



Number	Trend
1	Digitalization
2	Health and well-being
4	Individualization
5	Globalization
6	Technological innovation

Figure 5.2. Analysing process step 2. (Author)

From Figure 5.2, it appears that four trends fall into the quadrant of High Impact and Low Predictability:

- Digitalization
- Health and well-being
- Individualization
- Technological innovation

5.2 Clustering

The conclusion from the previous step indicates that the following four trends have the greatest impact on the way of working, the lowest degree of controllability and the lowest predictability:

- Digitalization
- Health and well-being
- Individualization
- Technological innovation

The closest trends are digitalisation and technological innovation and health and well-being and individualisation, as shown in Figure 5.3. These trends form the next two clusters.

- Digitalization & technological innovation → technology use
- Health and well-being & individualization → human scale

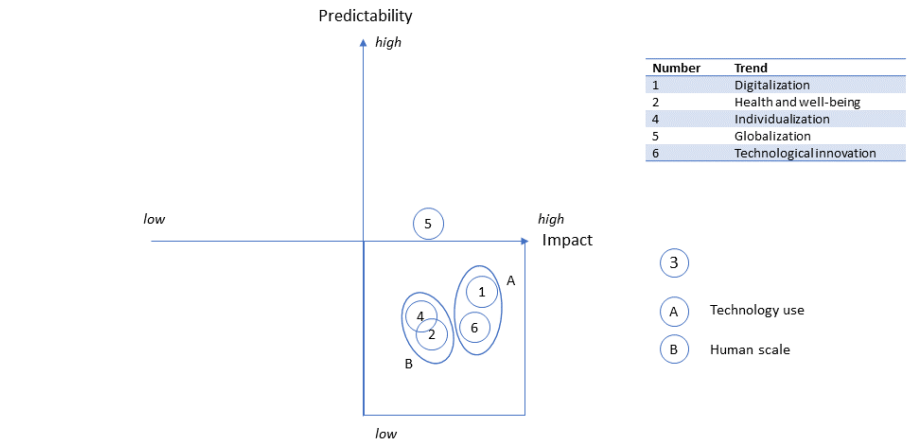


Figure 5.3. Clustering trends. (Author)

5.3 Literature: key uncertainties

In the previous step, 2 clusters were identified: human scale and technological use. These two clusters are the key uncertainties that form the basis for the 4 scenarios in this study. Each key uncertainty can occur in 2 situations, namely, Low and High. In the following paragraphs, these key uncertainties and the 2 situations in which they occur are discussed.

5.3.1 Human scale

In 1960, Douglas McGregor formulated two theories, presenting two contrasting perspectives on human nature and motivation in the workplace, known as Theory X and Theory Y. These theories serve as a foundation for understanding the management perspective on employee motivation. Theory X assumes that employees inherently dislike work and need active control and direction. Managers adhering to Theory X believe that employees are naturally lazy, lack ambition, and prefer to avoid tasks. Leadership under Theory X involves control, punishment, and strict hierarchy, with managers viewing external motivators such as rewards and punishments as necessary to stimulate employees. On the other hand, Theory Y assumes that employees naturally desire to work and harness their creativity and initiative. Managers embracing Theory Y believe that employees are intrinsically motivated, ambitious, and willing to take responsibility for their work. Theory Y posits that employees can self-direct, and managers should adopt a supportive and participative role to unleash their potential. Van Doorn (nd) suggests that the principles of Theory X have particularly influenced traditional organizational structures, especially in contexts where a one-sided dependency between employee and employer prevails. However, societal developments, such as higher levels of employee education and the establishment of labor unions, have contributed to an improved position for employees, requiring a different perspective on them. Bal (2015) argues that neoliberal principles such as profit and shareholder value currently dominate organizations and advocates for human dignity as a guiding

principle. Nauta, Sjollema, and Houtman (2016) emphasize that work should be designed with a focus on human dignity by placing individuals at the center and catering to their intrinsic values. Intrinsic values are psychological desires that naturally originate from the individual, without external influence or rewards. Recognizing and facilitating intrinsic needs can lead to increased fulfillment, satisfaction, and motivation in various aspects of life. Nauta et al. (2016) base their approach to intrinsic values on Deci and Ryan's (2000) Self-Determination Theory, which asserts that people inherently seek autonomy, competence, and connection.

- Autonomy involves individuals' desire to make choices and have control over their behavior.
- Competence pertains to individuals' desire to develop skills, be effective in their tasks, and tackle challenges contributing to their growth and success.
- Connection refers to individuals' desire to be connected with others, form relationships, experience support and warmth, and be part of social groups.

According to the Self-Determination Theory, individuals fulfilling these basic psychological needs will be more intrinsically motivated, experience higher well-being, and perform better in various life and work domains (Deci & Ryan, 2000; Reeve, 2005).

In essence, there are various perspectives on how employers interact with their employees. The meaning of the "human scale" in this study is aptly summarized in the following quote, in which someone describes their experience with Uber and Postmates as follows: "Perhaps it's not a problem that companies don't see us as employees - maybe the real problem is that they don't see us as humans" (Nauta et al., 2016). This quote suggests that there is a human element within the employee that organizations do not always pay attention to. In this study, the "human scale" refers to the extent to which the human element in the employee is acknowledged. The human scale is in this study examined in two situations: one where the human scale is High and another where it is Low. In the Low situation, McGregor's X Theory predominates within organizations, while in the High situation, the Y Theory takes precedence. The aspects influenced in both situations are autonomy, competence, and social connection. Table 5.4.1 provides an overview of these aspects in the two situations.

Low	***Human scale***	***High***
Employer decides how work is organized	*Autonomy*	Employee has the freedom to arrange his own work
Employees are hired based on the skills they already exist	*Competence*	Employer offers opportunities to employees to develop skills
Social connection is irrelevant to employers	*Social connection*	Employers promote social connetions

Table 5.3.1 Characteristics Human scale in situation Low and High. (Author)

5.3.1.1 Low Human scale

A low human scale means that there is little attention given to the personal needs of employees. Organizations prioritize business goals and profit maximization over the individual needs, well-being, and human aspects of their employees. In this context, organizations primarily consider what is advantageous for themselves and how they can operate as efficiently as possible to maximize profits. They focus on financial performance and short-term results, causing the needs of the employees to be overlooked. Consequently, the work environment becomes more impersonal, with employees viewed as numbers or resources. The organization dictates the way of working without allowing room for deviations by employees. Employees have no say in how they want to structure their work, and they are hired solely based on their competencies, without employers initiating development programs. Employers prefer hiring new staff over providing opportunities for existing personnel to develop.

Lastly, employers establish a clear distinction between work and private life. The organization only facilitates the essentials for performing the job, and elements that do not directly contribute to the work are not supported. Social connection is not a priority on the employers' agenda.

5.3.1.2 High Human scale

A high level of attention to the human scale means that there is a strong focus on the needs of the personnel. Organizations highly value the individual needs, well-being, and human aspects of their employees. This contributes to sustainable employability, which pays off in the long term for the financial goals of the organization. The personnel is at the forefront, and policy choices are carefully weighed in relation to their impact on the personnel. This involves not only considering the personnel as a group but also paying significant attention to the individual. Organizations recognize the uniqueness of each individual and their diverse needs. They strive to create work environments where employees feel heard, and their individual needs are respected. This means that employees have the freedom to organize their work, giving them substantial influence over their tasks. Furthermore, organizations provide their employees with opportunities for continuous growth through offered learning programs, making substantial investments in the development of their personnel. Finally, employers encourage connectivity within the organization and among employees.

5.3.2 Technology use

Barbosa et al.'s research (2022) on the future of work in 2050 indicates that the demand for low-skilled and low-wage jobs may decrease due to automation. Research by De Boer and Staarink (2023) suggests that about half of all jobs could disappear due to technological developments. However, there is no consensus in the literature on how quantitative employment will evolve as a result of these developments. While De Boer and Staarlink (2023) argue that about half of the jobs can be taken over by machines, Acemogku and Restrepo (2018) emphasize that new jobs will emerge around technological progress. According to economists at Rabobank (2017), the number of jobs is mainly determined by labor supply and not the other way around. They point to the dynamics and flexibility of the economy, referring to examples such as the massive entry of women into the labor market in the 1990s and the early retirement of the elderly in the 1980s, which did not lead to extreme unemployment. Although technological developments can disrupt the labor market, these economists do not expect this to result in a structural increase in unemployment. Derous and Rietzschel (2020) suggest that the day when people render themselves completely unnecessary is highly unlikely to ever arrive. However, Barbosa et al. (2022) do predict a shift in the type of jobs, transitioning from low-skilled jobs to those that are more knowledge-intensive. Brynjolfsson and McAfee (2014) argue that technology will simplify or even make the work of lower-skilled workers obsolete. Plomp and Peeters (2020) add that technological developments also come with higher demands on tasks and increasing complexity. Therefore, employees will need continuous training (Barbosa et al., 2022). Additionally, the Covid-19 pandemic has demonstrated that work can be efficiently performed remotely as a result of technological developments (De Klerk, Joubert & Mosca, 2021; JLL, 2020).

For this study, the degree of technological integration is compared in two situations: a situation with low technological integration where a skeptical view is taken towards technology, and a situation with high technological integration where an optimistic view is taken towards technology. The way the previously identified aspects of technological developments relate in these situations is presented in Table 5.4.2.

Low	*Aspects*	*High*
Balance between repetitive and creative work	*Employement*	High demand for creative and high educated jobs
Stable and clear tasks requirements	*Tasks requirements*	Diverse and continuously developing task requirements
Work is stuck to one place	*Freedom of movement*	Work is place independent

Table 5.4.2 Characteristics Technology use in situation Low and High. (Author)

5.3.2.1 Low Technology use

In the Low situation, there is a critical attitude towards technology. Technological applications are therefore implemented cautiously in the workplace. Organizations still rely on manual processes, resulting in a significant share of repetitive work. As a consequence, operational procedures proceed slower and less efficiently. Additionally, remote collaboration is more challenging as communication primarily takes place face-to-face. Employees also experience limited flexibility in terms of working hours and locations. Work is predominantly carried out at one location. Employers have clear expectations, and the task package is relatively stable.

5.3.2.2 High Technology use

In the High situation, there is an optimistic attitude towards technology. Technological progress is embraced and widely applied, bringing about significant changes in the way of working. Not only does technology lead to a substantial increase in productivity and efficiency, but it has also caused profound changes in the nature of work. Repetitive tasks are fully automated and taken over by robots and computers. Simultaneously, technology has led to the creation of new jobs that require a higher level of knowledge and creativity. The task package for individuals has undergone a drastic transformation, with a considerable increase in the variety of tasks, and furthermore, this task package is constantly evolving. This necessitates continuous upskilling for employees to meet the changing circumstances. Moreover, technology has ensured seamless online communication, making work entirely location independent.

06 | Imaging

6.1 Introduction of the scenarios

In this chapter, the 4 scenarios from the previous chapter are elaborated. These four scenarios were initially developed based on the combinations of core uncertainties discussed in the previous chapter. This resulted in four 'draft' scenarios. Subsequently, these 'draft' scenarios were sent to three real estate managers for reflection. Participants were asked how, from their expertise, they expected the scenarios to unfold based on the core uncertainties in each scenario. Participants were asked to reflect by indicating whether they recognized themselves in the scenarios, did not recognize them at all, or recognized them partially. The feedback revealed that the scenarios resonate with their thinking and provide them with a good conceptual framework. On a substantive note, it was observed that in the "Manual Machines" scenario, the quantitative demand for office space may decrease. The pre-Covid office was designed to accommodate people for 4-5 days and also provided social areas. In a scenario where the office is used purely for business purposes, the social areas would disappear, resulting in a decrease in net office demand. The final 4 scenarios that arise as a result of different values in the dimensions of human scale and technology use, see figure 6.1, are as follows:

- Human Hands
- Bionic Man
- Manual Machines
- Technological Domination

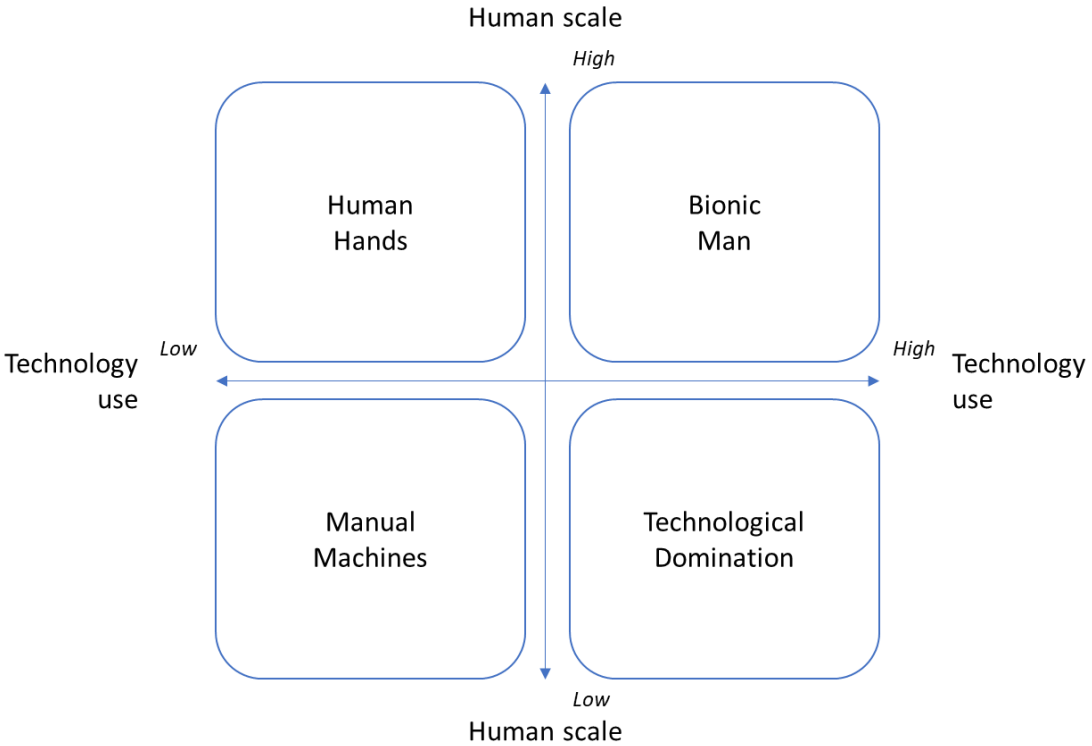


Figure 6.1. Four scenarios as a result of the key uncertainties. *(Author)*

6.1.1 Characterization of the scenarios

The 4 scenarios are characterized as follows:

Human Hands
In the scenario Human Hands, humanity thrives while technology takes on a modest role in the shadow of humans. The work is predominantly carried out by people, making it highly labor-intensive. The role of technology is limited to facilitating this work. Hierarchical organizational structures have been flattened, allowing decentralized decision-making to prevail. This has significantly improved the position of employees, making them feel heard and appreciated. Due to the limited use of technology, the office is the place to work and connect with others. In short, the office is the place to be.

Bionic Man
In the scenario Bionic Man, a harmonious balance is struck between humans and technology. Humans and technology collaborate closely to enhance efficiency, with humans taking the lead while technology supports them in handling predominantly repetitive tasks. As certain tasks fade away, new responsibilities emerge for employees that demand more knowledge and creativity. This solidifies the position of workers within an organization. The increased use of technology also leads to a further shift of work from the physical to the digital domain. This provides employees with the opportunity and flexibility to decide where and when they work. The powerful message conveyed by the office is: be aware of what you miss when you are not in the office.

Manual Machines
In the scenario Manual Machines, both humans and technology are conspicuous by absent. Technology plays a minimal role, resulting in highly labor-intensive work. Employees, in turn, find themselves overshadowed by the organization's primary pursuit of profit optimization. Organizations strive for this by focusing strictly on the essentials. Employees are provided with the bare necessities to carry out their jobs. Elements that do not directly contribute to increased productivity have no place in the workplace. The office is solely intended for work: nothing more and nothing less.

Technological Domination
In the scenario Technological Domination, technology takes the lead and humans follow suit. Organizations prioritize the most efficient systems, fully embracing technology at the expense of human involvement. Employees are solely evaluated based on their added value and often find themselves inferior to the latest technologies. Consequently, they are replaced by computers, leading to the domination of technology in the workplace. Due to extensive technological usage, the online domain has become more important than the physical one. Work is conducted entirely online, resulting in the office losing nearly all its traditional values. People only resort to offices when work cannot be accomplished elsewhere.

6.1.2 Summary of the scenarios

The scenarios in this chapter are structured as follows. Each scenario begins with an introduction discussing the development of the two core uncertainties upon which the scenarios are built. This is followed by an "Imagine..." section, where the reader is taken into the scenario. The Way of Working describes what work looks like in the scenarios. This includes discussing the relationship between the employer and the employee, as well as the relationship between employees. Finally, the "Office Characteristics" are presented. This section discusses the quality and quantity of space, as well as the allocation of the office for each scenario. Table 6.1 provides an overview of how the Way of Working and the Office Characteristics appear in each scenario.

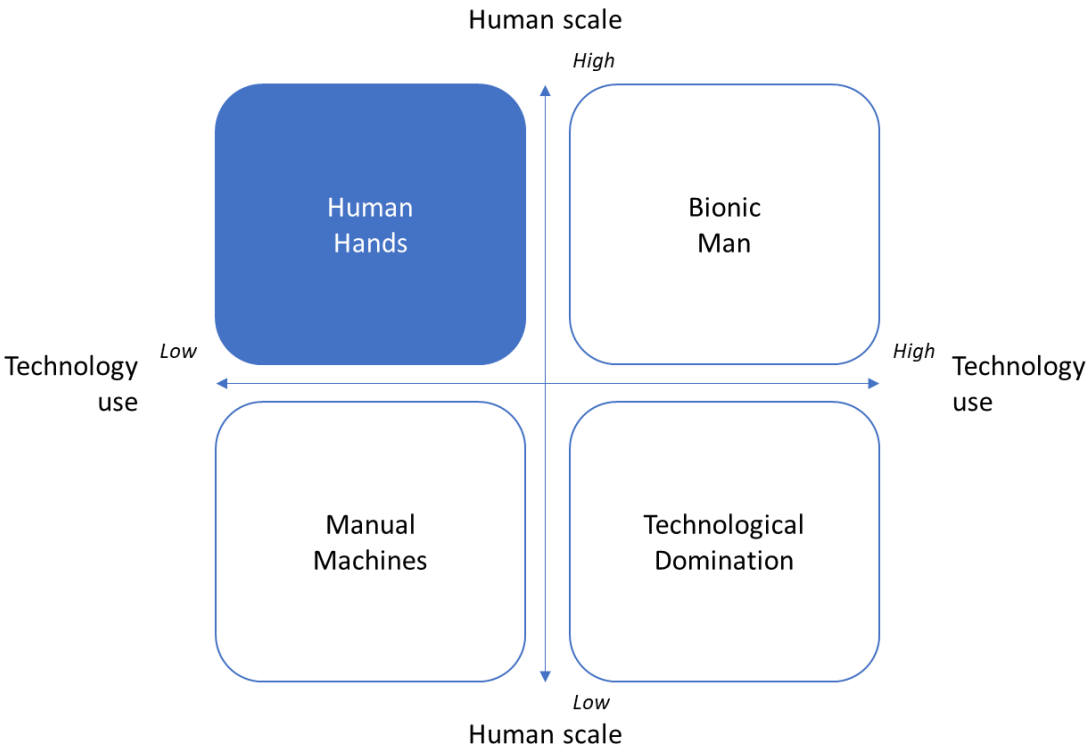
		Human Hands	Bionic Man	Manual Machines	Technological Domination
	Human scale ↔ Technology use ↕				
Way of Working	Organizational structure	Decentralized	Decentralized	Hierarchical	Hierarchical
	Employees collaboration	All interactions physically	Social: physical Professional: online	Social: none Professional: physical	All interactions online
	Work location	One place	Multiple places	One place	Multiple places
Office characteristics	Quality of space	Meeting rooms Individual desk Silence areas Social areas	Meeting rooms Social areas	Meeting rooms Individual desk Silence areas	Individual rooms
	Quantity of space	Increase	Decrease	Decrease	Decrease
	Office location	Urban areas with good accessibility	Urban area with good accessibility	Good accessible but at the border of cities	Offices are spread all over the Netherlands

Table 6.1. Summary of the scenarios. *(Author)*

6.2 Human Hands

Characteristics of the scenario

- Human aspects are dominant
- Technology is applied to make work easier
- Interactions are primarily physical
- Office service as the place to perform work and to socialize



Introduction

In the scenario the Human Hands, humanity thrives with technology serving as the invisible ally of the workforce. The purpose of technology is meticulously aligned with facilitating human work, emphasizing that the core of any organization lies in the individuals who power it. Human values serve as the guiding principles, and the sustained effort of people is the driving force behind organizational success. The work environment exudes unity. While the tasks may be labor-intensive, they are carried out with a robust sense of camaraderie. Work goes beyond completing assigned tasks. It's a journey of forging meaningful connections and not only advancing professional skills but also nurturing personal development. Organizations foster this sense of togetherness by emphasizing one team, one task, and one vibrant place. And that is the office. The workplace is a harmonious blend of spaces for work and relaxation, seamlessly intertwined. The office is meticulously designed to enrich the well-being and experience of individuals, placing humans at the forefront. Amidst the labor-intensive tasks, there is space to rejuvenate the mind and body in the relaxation areas, perhaps even indulging in a well-deserved massage. The organizational focus transcends the traditional pursuit of maximum profit, prioritizing the sustainable well-being of employees. Decision-making is not an exclusive, remote process hidden behind closed doors. Instead, it is an inclusive endeavor where employees actively participate in shaping the decisions that influence their work lives. Their voices are not merely heard, they are genuinely considered, and their interests are handled with utmost care. The value placed on employees goes beyond mere acknowledgment. It creates an environment where each individual is not only valued but also feels valued. This sense of appreciation forms a robust foundation for trust between employer and employee, fostering a profound and enduring bond of loyalty. Despite limited technological integration, robust ethical standards and regulations are in place to safeguard human dignity and privacy. Personal data ownership remains with individuals, and a culture of complete transparency exists regarding the utilization and sharing of this data. Furthermore, it's the people who dominate the workplace, with technology gracefully occupying the background. Work revolves around the human, who is also an employee. The office, therefore, offers the ultimate support for both work and relaxation, ensuring a harmonious blend of productivity and well-being.

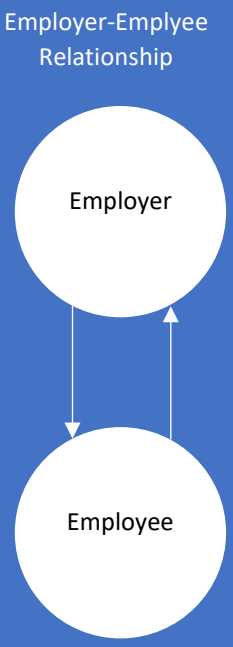
Imagine…

it's Monday morning, and you're cycling to work. Along the way, you decide to stop at the local bakery to grab some fresh rolls. After a fifteen-minute bike ride, you arrive at the bike shed, where your colleague has just locked his bike. Together, you walk to the office, which is already quite busy. Some colleagues are already present in your departments. You find a free spot, set down your belongings, and then walk with a few colleagues to the coffee machine. At the coffee machine, you discuss your weekends and then return to your workspace to get started. You open your laptop and continue with the quantitative analysis of the office portfolio. After two hours of hard work, you walk to the massage area for a well-deserved relaxation. After your short break, you resume the analysis. When a colleague asks an hour later if it's already lunchtime, everyone gets up and heads to the restaurant, where a comprehensive lunch awaits, fully provided by the company. During lunch, you discuss the upcoming Second Chamber elections. After lunch, you get back to work. At the end of the day, the company organizes a get-together, after which you hop back on your bike to head home.

Way of working

Organizational structure

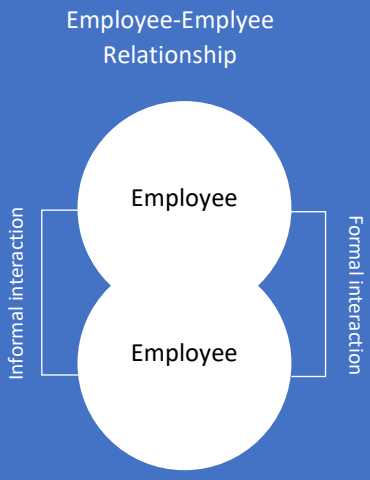
The relationship between employer and employee is based on mutual dependence. Employers rely on employees to get the work done, while employees depend on employers for their income. This creates a playing field in which both parties are interdependent, and therefore, obligated to safeguard each other's interests. Their relationship therefore is meticulously nurtured, creating an environment of mutual respect and collaboration. Employees are not mere spectators in decision-making, they actively participate, sharing their insights and expertise. Employers, in turn, weigh these contributions seriously, valuing the unique perspectives of their workforce. This collaborative approach grants employees a substantial degree of influence over the direction of the company.



In this atmosphere of inclusion, a profound sense of trust blossoms between the employer and the employees. This trust becomes the cornerstone of a deeply rooted, enduring connection. Employees feel valued and heard, leading to a workforce that is not just dedicated but also profoundly loyal. This loyalty, fostered by the genuine engagement and the sense of being an integral part of the organizational fabric, permeates the entire workplace, creating a positive and productive atmosphere.

Collaboration

Embracing a limited reliance on technology has brought about a workplace culture where the primary means of connecting with colleagues is through enriching face-to-face interactions. In this setting, the physical workspace has been purposefully designed to celebrate the vibrant tapestry of human engagement. Here, we not only acknowledge but actively champion both formal and informal interactions within the office environment. Informal interactions, characterized by the joy of social exchanges unrelated to immediate work tasks, are given ample room to flourish. Think of it as a space where impromptu gatherings, post-work socializing, and friendly table tennis matches are not just allowed but encouraged. These moments play a pivotal role in weaving a positive and collaborative team fabric, fostering genuine connections and a shared sense of camaraderie. At the same time, formal interactions are celebrated for the impact they have on organizational tasks. Meetings, presentations, and purposeful discussions find a welcoming home in spaces designed to enhance focus and productivity. The intentional design seeks to create an environment where both formal and informal interactions coalesce seamlessly, contributing to a workplace culture that is not only productive but also joyful, dynamic, and brimming with positivity.



Office characteristics

Quality of Space

The office space has transcended its traditional role, becoming a versatile arena that caters to the intricate needs of work and life. Within its walls, a carefully curated environment has been crafted, where formal and social activities seamlessly intertwine. In response to the limitations imposed by technology, the office has emerged as the focal point of productivity. Within this multifaceted workspace, diverse areas serve distinct purposes. There are designated zones for solitary tasks, fostering an atmosphere of focus and concentration. These spaces are meticulously designed, offering individuals a serene ambiance where they can delve deep into their work without distractions. In contrast, collaborative workspaces bustle with creativity and innovation. These areas are vibrant hubs where brainstorming sessions come to life, and collective efforts transform ideas into reality. Moreover, the office layout has ingeniously incorporated open spaces, providing opportunities for spontaneous interactions. Here, coworkers engage in casual conversations, sharing insights, and building connections. These spaces serve as the heartbeat of the office, where the exchange of ideas fosters a sense of community and belonging. Additionally, recognizing the significance of social interactions, the office includes dedicated areas for relaxation and camaraderie. Breakout rooms, coffee corners, and communal spaces are meticulously designed to encourage colleagues to unwind, socialize, and rejuvenate. These spaces are not just corners of the office; they are nurturing grounds for friendships and collaborations, where a simple conversation can spark creativity and innovation.

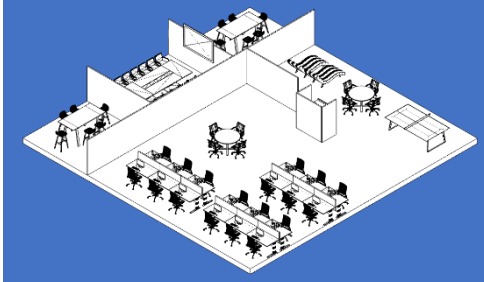
Quantity of Space

The demand for office space has soared to unprecedented heights, driven by the evolving dynamics of work-life integration. The office has become more than just a workspace; it is a vibrant ecosystem that accommodates a myriad of activities. As a result, the office's physical footprint has increased compared to pre-Covid.

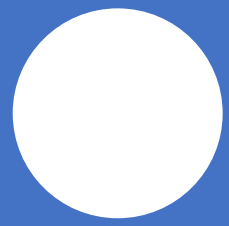
Office Location

Offices are strategically placed with meticulous consideration given to accessibility and ambiance. Offices are nestled in bustling urban centers, strategically positioned at the crossroads of convenience. These locations boast excellent public transportation connectivity, ensuring that employees can commute seamlessly. Moreover, the proximity to major hubs of activity ensures that the office environment is not isolated but part of a thriving ecosystem. Besides practical considerations, the office's surroundings are chosen to offer a holistic experience. These areas teem with life, offering a myriad of options beyond the office hours. From gourmet restaurants to cultural landmarks, employees find themselves amidst a tapestry of activities, enriching their lives both personally and professionally. This strategic positioning not only attracts top talent but also creates a work environment where employees thrive, both within and beyond the office walls.

Quality of Space



Quantity of Space (m^2)



2019

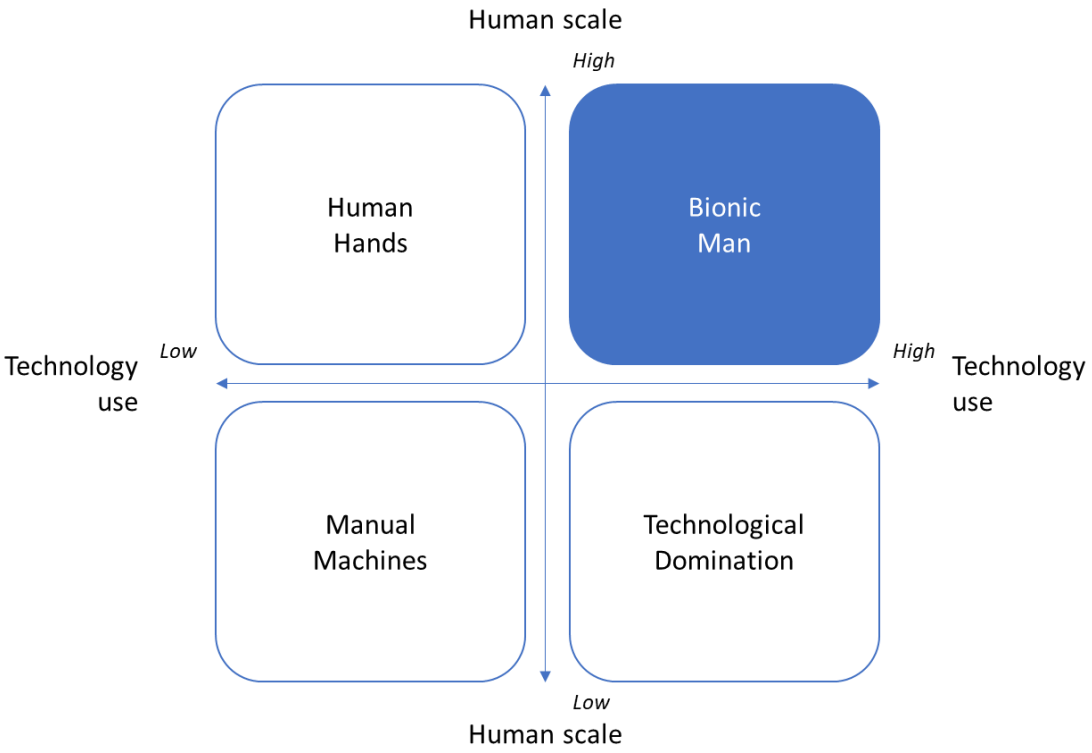
2050

Office Location

6.3 Bionic Man

Characteristics of the scenario

- Human and technology are collaborating
- Boost to efficiency
- Professional interaction are primarily online while social interactions are primarily physical
- Office is the place to bolster organizational cohesion



Introduction

In the scenario Bionic Man, people take center stage in a world saturated with advanced technology meticulously designed to enrich the human experience. This technology isn't an external entity but an integral part of work, aiming to enhance individual well-being while maximizing efficiency. A hallmark of this work environment is the flexibility it offers to individual employees. With the advancement of technology, it is now possible to work from anywhere. The office is no longer the primary workplace but just one of many possible locations. Work follows the employee and seamlessly transitions from home to on the go, and to the office. Working hours are now efficiently distributed across various places, resulting in a significant decrease in working at the office. Work is tailored to the specific needs and capacities of each person, made possible by customized AI-supported learning paths. This grants people the freedom to constantly acquire new skills and deepen their knowledge, enabling them to adapt to an ever-evolving job market. The workplace of the future is a masterpiece of digitization and artificial intelligence. Here, technology isn't viewed as a replacement for human interaction but rather as a catalyst for creativity and collaboration. People seamlessly collaborate with intelligent machines and robots, where repetitive tasks are effortlessly taken over, freeing up valuable time and energy for deep thinking, innovation, and exploring uncharted possibilities. Alongside technological advancement, stringent ethical standards and regulations have been implemented to safeguard human dignity and privacy. This ensures individuals retain control over their own data. Every piece of personal information is protected and respected, fostering a culture of complete transparency about how this data is used and shared. Furthermore, there exists a harmonious balance between the digital realm and real life. While technology is an integral part of daily existence, ample space is reserved for offline activities, human interactions, creative expression, and mindfulness. This world emphasizes that technology isn't merely a tool but a servant of humanity, contributing to thriving, balanced organizations where human values and connection take precedence.

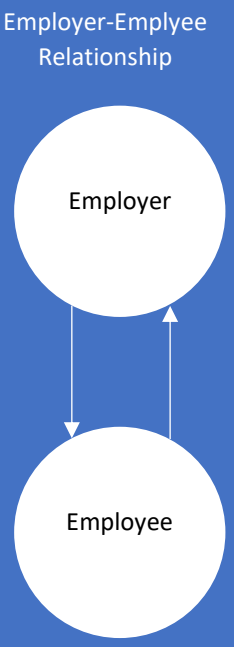
Imagine…

you take your child to their dentist appointment while simultaneously being on a call with your colleague from Manila. By putting your work-glasses on, your colleague's image is projected in front of you, despite being on the other side of the world. As you discuss tasks, the self-driving car maneuvers you and your child to the dentist. Meanwhile, your virtual assistant summarizes the conversation and outlines the next steps. The car is just parking itself as your conversation ends. At the dentist's office, you can walk right in because your virtual assistant has already checked you in. You order a cup of coffee, delivered by the coffee drone, and while the dentist examines your child's teeth, you go through the summary. Once the dentist finishes, you drop your child off at school and head to the office to discuss the next steps with your colleagues. While your virtual assistant is finalizing the next steps, you all head to the bar for a drink, and your workday comes to an end.

Way of working

Organizational structure

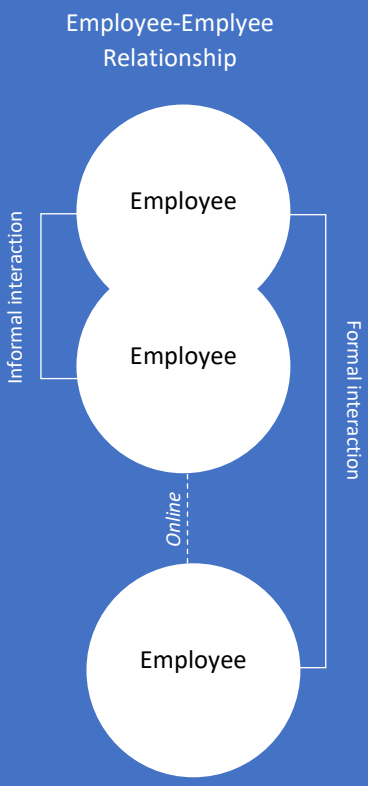
The relationship between employers and employees is characterized by a balanced power dynamic. While employers hold sway over the financial aspects, the true success of the organization, namely knowledge, lies with the employees. This establishes a dynamic interplay where both parties occupy crucial roles, recognized and valued by each other. Consequently, the employer-employee relationship becomes a dynamic interplay of mutual respect and active collaboration. Employees are not only encouraged but are integral to the decision-making processes within the organization. Their perspectives and insights are not just acknowledged but actively sought after. In a conscientious approach, employers meticulously weigh the concerns and aspirations of their employees when making significant decisions. This inclusive approach grants employees not just a voice, but a powerful one, instilling in them a sense of ownership and pride in their workplace.



This active involvement of employees doesn't just stop at decision-making tables, it permeates the entire organizational culture. Regular forums, brainstorming sessions, and open-door policies are the norm, fostering an environment where ideas are freely exchanged, innovations are celebrated, and feedback is constructively used for continuous improvement. This engagement forms the bedrock of an unshakable trust between the employer and the workforce, creating a work environment where loyalty isn't demanded but willingly given.

Collaboration

Within this vibrant ecosystem, interactions among colleagues are a rich tapestry of physical and digital engagements. In the physical realm, the office serves as a hub of informal yet meaningful exchanges. Collaborative spaces are meticulously designed, encouraging spontaneous discussions, brainstorming sessions, and teamwork. Here, colleagues share ideas, troubleshoot challenges, and celebrate victories, creating a vibrant atmosphere of collaboration and camaraderie.



Simultaneously, the digital landscape amplifies the connectivity. Online platforms facilitate formal interactions, enabling seamless collaboration regardless of physical distances. Colleagues engage in virtual meetings, collaborative document editing, and project management, ensuring the work processes are efficient and streamlined. The digital channels not only bridge geographical gaps but also serve as avenues for skill-sharing, mentorship, and peer-to-peer learning.

This intricate web of interactions, both physical and digital, nurtures a workplace culture where colleagues are not just coworkers but collaborators, mentors, and friends. It's an environment where every conversation, whether in person or online, contributes to the collective growth, knowledge, and spirit of unity among employees, making the organization not just a workplace, but a thriving community.

Office characteristics

Quality of Space

In the wake of rapid technological integration, the landscape of work has undergone a profound metamorphosis. Traditional office spaces have gracefully adapted and evolved into dynamic platforms of virtual interaction. This transformation has been driven by the relentless march of technology, ushering in an age where the boundaries of the workplace have transcended physical constraints. The office has expanded into a virtual realm, a sophisticated ecosystem facilitated by cutting-edge online tools. Within this digital tapestry, the (digital) office has transformed into a fluid, adaptive space, where colleagues are seamlessly connected across continents and time zones. The buzz of productivity resonates through the digital threads that bind professionals together. Face-to-face meetings are no longer confined to boardrooms but unfold in virtual spheres that echo with the cadence of diverse voices. Sophisticated online platforms have emerged as the lifeblood of modern formal interactions. Video conferences transcend geographical distances, bringing together minds from different corners of the globe. In this virtual expanse, ideas flow freely, fostering collaborations that are as dynamic as they are innovative. Amidst this digital domain, the heartbeat of the workplace remains the human connection. The physical office has evolved into a central hub where colleagues gather not only for work-related discussions but for meaningful exchanges of ideas, experiences, and social connections. The office is therefore a seamless combination of open spaces for collaborative work, quiet areas for focused tasks, meeting rooms of various sizes, and a range of recreational areas.

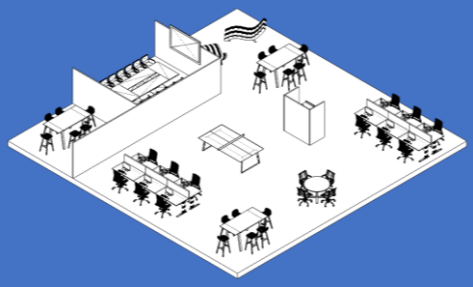
Quantity of Space

The evolution of work dynamics, propelled by the technological integration, has recalibrated the spatial requirements of offices. The pervasive shift of professional interactions into the online realm has led to a fundamental recalibration of spatial requirements. With the virtual landscape now accommodating a significant portion of collaborative efforts, the physical office space has witnessed a reduction in its spatial demands compared to pre-Covid area.

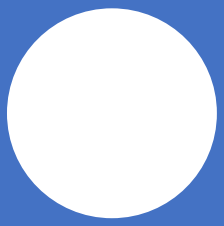
Office Location

Modern work philosophy places a premium on holistic experiences, extending beyond the confines of office walls. This ethos is not only reflected within the office environment but also in its strategic placement within the urban landscape. Offices are strategically positioned in accessible locales, ensuring seamless connectivity through robust public transportation systems and convenient private vehicle access. These offices are nestled in central, bustling urban areas, where a myriad of activities flourish. From cultural events to culinary delights, these locations provide a vibrant environment where professionals can thrive both professionally and personally. This intentional placement transforms the office into a nexus, a meeting point where work harmoniously blends with the vibrant pulse of urban life, enriching the overall experience for every employee.

Quality of Space



Quantity of Space (m^2)



2019

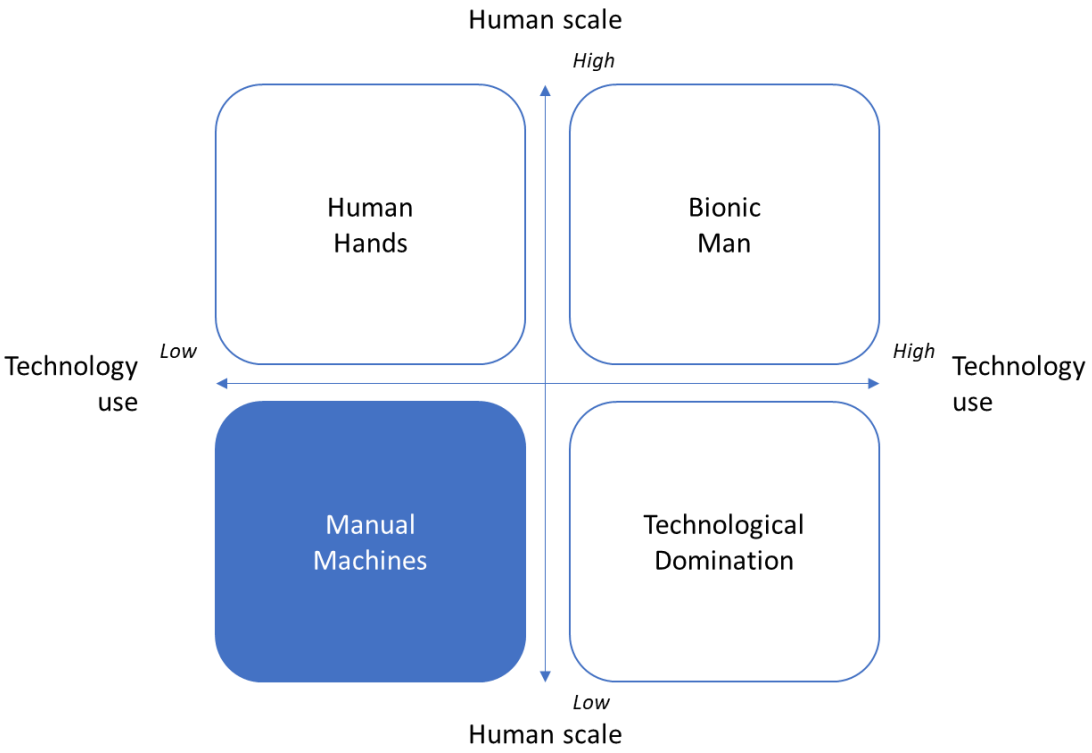
2050

Office Location

6.4 Manual Machines

Characteristics of the scenario

- Organizations aiming for profit maximalization
- Work and workplace are designed around functionality
- Professional interaction physical, social interaction outside the organization
- Office services only as a place to conduct work



Introduction

In the scenario Manual Machines, a unique balance between humanity and technology unfolds. Organizations, fueled by the pursuit of profitability, have directed their focus solely on functionality. Due to the long return on investment associated with technology, organizations shy away from its adoption, placing the burden of all tasks squarely on the shoulders of the employees. These employees are anticipated to carry out their work in the most efficient manner possible, with minimal consideration given to their personal needs. In this highly functional work environment, individual creativity and personal development find little room. The echo of functionality and minimalism resounds throughout the organization and is reflected in the office. Employees often find themselves confined within rigid job descriptions, limiting opportunities for growth and innovation. Within the organization, employees become anonymous figures, devoid of recognition for their individual contributions or potential. The organization dictates how, where, and when work should be done, and employees conform to these directives. The workplace strikes a meticulous balance between functionalism and minimalism. Every space is precision-designed to offer optimal support to employees. In an office where technology has no foothold, simplicity defines the workspace. Employees find only the essential tools needed to perform their work efficiently. The office serves as a place where employees come to execute their tasks and leave once they are completed. In the functional realm, ethical standards and regulations are primarily focused on data security and minimizing disruptions in automated processes. The emphasis lies in protecting company information and ensuring operational system stability, rather than prioritizing human dignity or privacy. Data ownership predominantly rests in the hands of organizations, with limited transparency about the use of personal data. Individual control over data is restricted, resulting in limited insight into how personal information is being used and shared. In essence, functionality serves as the framework against which both humans and technology are measured. Human needs that don't directly contribute to productivity, such as well-being, fall outside the organization's responsibilities and onto the shoulders of society. As technology involves long-term investments, organizations place greater value on human labor. In summary, humans and technology coexist in the background, with both relegated to the periphery.

Imagine …

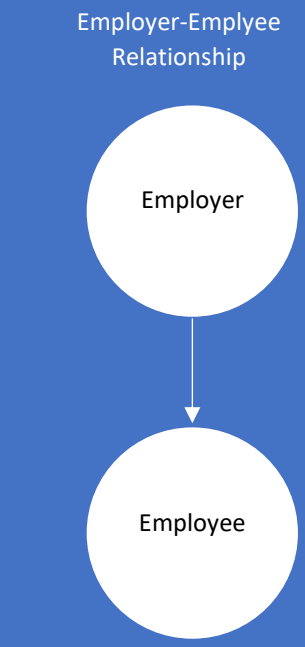
you hop on the subway, joining a crowd of commuters all heading to work. When you reach your stop, a queue forms as everyone disembarks at the same station. Walking from the metro station to the office, you traverse a street lined with numerous other office buildings. At your workplace, you enter a spacious, open area filled with desks. You choose your spot, open your laptop, and resume working on the Excel calculations you didn't quite finish yesterday. Lost in entering data, you barely notice someone sitting down next to you. You offer a quick greeting and continue with your task. During the break, you heat up your own meal and briefly catch up with your colleagues on what everyone is working on. After the break, you prepare a presentation for your manager, and by the end of the day, you present it to them. At 5:00 PM, you close your laptop, head to the subway, and make your way back home.

Way of working

Organizational structure

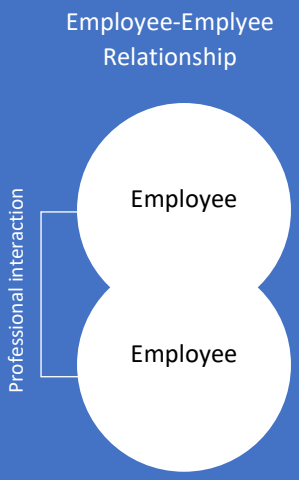
The relationship between employer and employees is one in which one party holds a monopoly. In this unbalanced relationship between employer and employee, the imbalance in power is glaringly apparent. The dynamics heavily favor unilateral decision-making, with employers exercising authority without soliciting input or collaboration from their workforce. Employees find themselves in a position where their responsibilities are limited to carrying out tasks dictated by the employer, leaving little room for expressing opinions or influencing decisions.

The decision-making process is concentrated within the employer's realm, and employees are frequently kept in the dark about the rationale behind various directives. Their role is confined to executing assigned tasks, with limited opportunities for discussion or feedback. This lopsided dynamic not only impacts the workplace environment but can also affect employee morale and engagement.



Collaboration

Embracing a limited reliance on technology has brought about a workplace culture where the primary means of connecting with colleagues is through enriching face-to-face interactions. In this setting, the physical workspace has been purposefully designed to support employees in fulfilling their tasks. Here, only formal interactions among colleagues are supported. Informal interactions, characterized by the joy considered within the scope of the organization. are given ample room to flourish. Think of it as a space where impromptu gatherings, post-work socializing, and friendly table tennis matches are not just allowed but encouraged. At the same time, formal interactions are encouraged for the added value they have on organizational goals. Meetings, presentations, and purposeful discussions find a welcoming home in spaces designed to enhance focus and productivity.



Office characteristics

Quality of Space

Within the walls of the office, every detail has been meticulously designed with a focus on work efficiency. The architecture, furniture, and equipment have been carefully curated to create an environment solely dedicated to optimizing productivity. The design is minimalist, emphasizing ergonomics and functionality. Workstations are strategically placed, considering workflow and minimizing unnecessary movements.

In this functional setup, spaces for relaxation are scarce. There's a lack of recreational corners or lounge areas because the space is purely devoted to work-related activities. Social interactions are subdued, providing limited opportunities for spontaneous conversations among colleagues. The office is a place of dedication to tasks: employees enter, work with focus, and leave without spending much time in social interactions.

The office layout mirrors this businesslike approach. The majority of the office consists of an open space where employees carry out their tasks. Separate, enclosed areas are available for meetings and tasks requiring maximum concentration. The office functions as a streamlined machine, where every square meter is optimized for productivity.

Quantity of Space

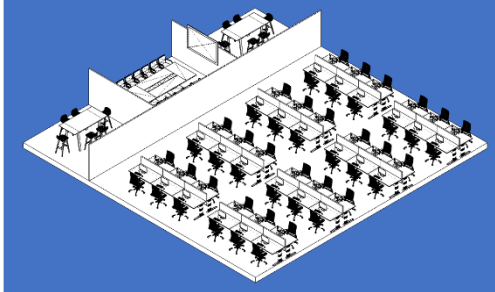
Due to the strong reliance on human labor, office space has assumed a central role in all operational activities. Employees come to the office daily, where they perform their assigned tasks. Due to the strong focus on functionality, amenities that does not serve to the productivity of employees have been removed from the office. This resulted in a significant decrease in office space.

Office Location

The location of the office is chosen carefully, considering both accessibility and cost control. Employees must have easy access to the office, making public transportation connections crucial. Simultaneously, financial aspects need to be optimized. Therefore, offices are situated in locations outside the city center, where costs are lower, yet accessibility is ensured via efficient public transportation lines.

These office locations have evolved into modern industrial zones where businesses thrive amidst an environment that is both cost-effective and functional. The office environment is not just a place of work but a strategic hub where efficiency, accessibility, and cost optimization go hand in hand.

Quality of Space



Quantity of Space (m^2)

2019

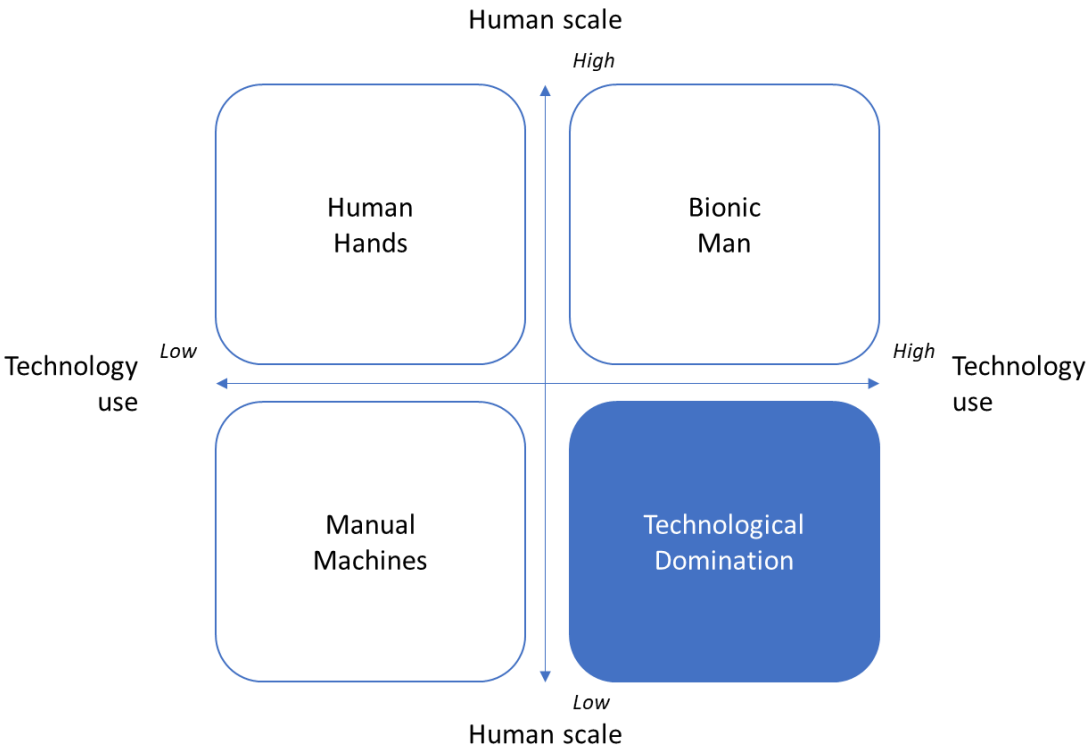
2050

Office Location

6.5 Technological Domination

Characteristics of the scenario

- Technology is thriving efficiency
- Humans are replaced by technology
- Virtual domain is dominant over physical domain
- Interactions are all online
- Office is only used if necessary



Introduction

In the scenario Technological Domination, humanity takes a backseat, overshadowed by a world immersed in cutting-edge technology meticulously crafted to achieve the objectives of organizations. Here, technology isn't merely a tool but emerges as the central driving force, dedicated to the relentless pursuit of efficiency and profitability. The work environment is transformed into a fully digitized realm, where precision and optimization rule, and human errors are virtually eliminated. Intelligent machines and robots stand at the forefront, replacing human tasks to maximize efficiency. Work processes are standardized and fine tuned to align with the capabilities of automated systems, leaving scant room for individual creativity or personal development. Employees become mere figures within the organizational structure, their individuality overshadowed by the mechanical precision of technology. Technology has permeated every aspect of daily life and is fully integrated into both personal and professional spheres. The primary goal is to maximize efficiency and productivity, without empathy or attention to human emotions. People have access to advanced AI-driven personal assistants that are functional rather than empathetic. These assistants understand human needs analytically, with minimal regard for emotions. With the overwhelming use of technology, the online domain has gained a superiority over the physical domain. This has made it possible to work from anywhere. The significance of the office has thus been reduced to a minimum, with the office only being used when the work truly cannot be done elsewhere. Ethical standards and regulations regarding technology are focused on data security and minimizing disruptions in automated processes, rather than protecting human dignity or privacy. Data ownership primarily rests with organizations, with limited transparency about data usage. In essence there is minimal room for offline activities, creativity, or mindfulness. Technology prevails, relegating human values and interactions to a subordinate position in the pursuit of efficiency and productivity.

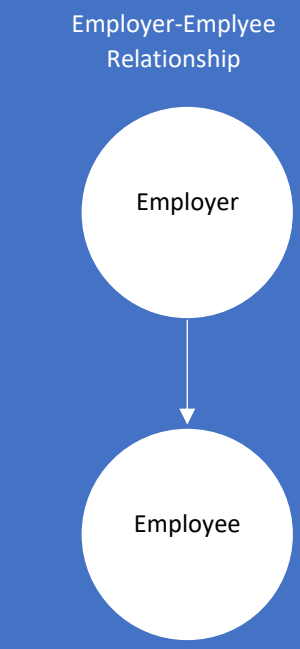
Imagine …

starting your day with a digital assistant managing your daily tasks and appointments. You have breakfast with a meal prepared by an automated kitchen robot and receive updates from your virtual social circle through augmented reality glasses. From your kitchen table, you participate in a virtual meeting with colleagues scattered across the world. Human interaction is minimal as most communication happens through chatbots and virtual avatars. Your lunch is delivered by a drone, and you eat while watching a virtual entertainment show. After work, you swap your kitchen table for the couch, immersing yourself in a virtual environment for relaxation and social interaction, facilitated by advanced VR technology. Technology dominates every aspect of your day, and physical human connections are rare.

Organizational structure

As technology overwhelmingly dominates the workplace, the balance in the employer-employee relationship has shifted in favor of the employer. With technology taking over tasks previously performed by employees, workers have also relinquished a portion of their power. The dynamics now heavily lean toward unilateral decision-making, where employers wield authority without seeking input or collaboration from their workforce. Employees find themselves in a position where technology looms as a potential replacement, leaving little room for expressing opinions or influencing decisions.

The decision-making process is concentrated within the employer's domain, and employees are frequently left uninformed about the rationale behind various directives. Their role is confined to executing assigned tasks, reduced to mere cogs in the vast machinery of industry, with limited opportunities for discussion or feedback. The relationship is a one-sided affair where employers dictate and employees comply without question. There is no room for dialogue, no space for employee input, and certainly no consideration for their aspirations or desires.

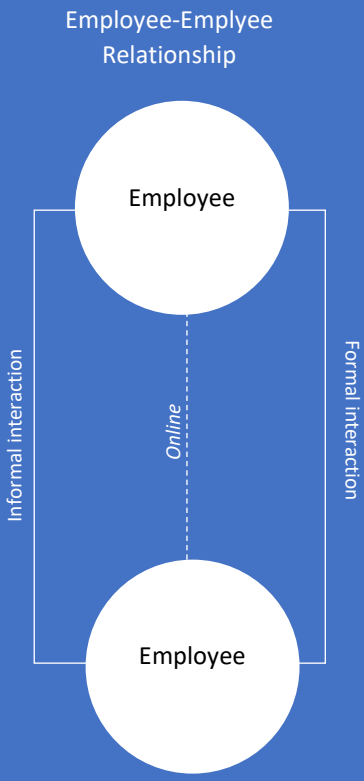


Collaboration

Amidst the digital sprawl of Technological Domination, human interaction has found refuge in the virtual realm. Face-to-face encounters have become relics of the past, replaced by the cold glow of screens. Almost every interaction, be it formal collaboration or personal connection, unfolds within the confines of the online domain.

In this digital wilderness, formal collaborations are confined to email threads, virtual meetings, and collaborative platforms. Colleagues share ideas, exchange information, and work together on projects, all mediated through technology. The personal touch of a handshake or a pat on the back has been replaced by digital avatars and typed messages, rendering interactions impersonal and detached.

Even informal interactions have migrated to the virtual space. Colleagues attempt to fill the void left by the absence of physical proximity through social media groups, virtual coffee breaks, and online team-building activities. These efforts strive to recreate a sense of camaraderie by replacing the warmth and spontaneity of genuine human connections.



Office characteristics

Quality of space

In this era defined by the digital revolution, work has seamlessly transitioned into the online realm, where the virtual landscape dominates the physical world. The very nature of work has shifted, making the traditional office a space used only when absolutely necessary. These offices are meticulously designed with a sharp focus on efficiency, catering specifically to tasks that demand physical presence, perhaps related to highly sensitive technological features or confidential data. Technology permeates every corner, with advanced systems ensuring seamless connectivity and data security within the office premises. The office is composed of small spaces equipped with the latest technology to carry out work and then leave again.

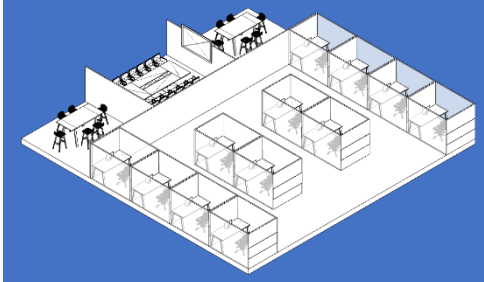
Quantity of space

As a consequence of the extensive technological integration, the demand for physical office space has dramatically plummeted compared to the landscape of pre-Covid. With the majority of work activities now conducted online, the need for vast office spaces has diminished substantially. This shift has reshaped the spatial requirements of businesses, leading to a significant reduction in the quantity of space dedicated to traditional office setups.

Office Location

The significance of the physical domain has waned, rendering the traditional centralized office model obsolete. Offices are now strategically scattered across the Netherlands, strategically placed in various locations to be closer to employees. These offices are not monumental structures but rather compact, decentralized spaces. Several small offices are strategically positioned, allowing employees to swiftly access them if the need arises and to move freely within these flexible workspaces. The location of offices is driven by the concept of proximity, ensuring that the physical workspace is always within reach, adapting to the dynamic needs of the modern workforce.

Quality of Space



Quantity of Space (m^2)

2019

2050

Office Location

6.6 Reflection on scenarios

In this paragraph, a reflection is provided on the quality of the scenarios. To assess the quality of scenarios, the PBL (2013) has formulated 5 criteria:

- Consistency: logical coherence within a scenario.
- Contrast: the extent to which the scenarios explore different directions of the future.
- Comparability: the scenarios should deal with the same issue and explore the same drivers, however, they should explore different directions.
- Elaboration: this has to do with the specificity of the statements about the future. To arrive at useful scenarios, the specificity must match the needs of the target groups.
- Recruiting power: to what extent the scenarios match the thinking and actions of the target groups.

6.6.1 Consistency

All four scenarios follow the same structure. First, the introductions of the scenarios describe the relationship between humans and technology. Subsequently, the Imagine section provides a brief description of how a workday looks in each scenario. The two key uncertainties form the fundament for the way of working. The section Way of Working delves into how employers and employees relate to each other and how collaboration looks in each scenario. Based on the Way of Working, the Office Characteristics section explores spatial considerations. This is done based on the quality of space, quantity of space, and the positioning of the office. The quality of space addresses the need for specific types of spaces, while quantity describes the change in net office space demand compared to the year 2019 (pre-Covid). The office location details the strategic positioning of the office within the Netherlands. In essence, the scenarios are structured around different values for the human scale and technology use, shaping a way of working that subsequently influences the demand for office space.

6.6.2 Contrast

Because the four scenarios are built from different combinations of values for the key uncertainties (human scale and technology use), there are significant differences between the scenarios. In the Human Hands scenario, humans take center stage, while technology is of secondary importance. On the other hand, roles are completely reversed in the Technological Domination scenario, where technology prevails, and the human factor is of less importance. These differences manifest in both the way of working and the characteristics of the office. In the Human Hands scenario, the relationship between employer and employee is based on mutual respect, with primarily face-to-face collaboration. The office provides space for both formal and informal activities, resulting in an increase in demand for office space. In Technological Domination, on the other hand, the employer makes decisions without employee input, and collaboration occurs entirely online. As a result, the demand for office space decreases significantly. In the Bionic Man scenario, there is a balanced harmony between humans and technology. The office is less intensively used than in Human Hands because work does not necessarily have to take place in the office. However, the demand for office space in Bionic Man is greater than in Technological Domination because the office also provides space for informal activities. In Manual Machines, on the other hand, the office is exclusively used for tasks directly contributing to productivity, and due to limited technology use, everything is done in the

office. This leads to a net increase in demand for office space. In summary, because all four scenarios are built from different values for the core uncertainties, the scenarios exhibit significant differences.

6.6.3 Comparability

The comparability of the four scenarios is ensured as they are all built upon the same two core uncertainties, namely human scale and technology use. Nevertheless, by incorporating diverse values for these key uncertainties, the scenarios simultaneously explore distinct directions. Moreover, each scenario adheres to a uniform structure, encompassing an introduction, imagination, way of working, and office characteristics. Additionally, all scenarios delve into identical themes, including organizational structure, collaboration, quality of space, quantity of space, and office location. The unfolding of these themes in each scenario is outlined in Table 6.1 in paragraph 6.1.2.

6.6.4 Elaboration

This research aims to provide insights into the demand for office space in 2050, intending to offer policymakers dealing with office-related issues a deeper understanding. The scenarios address the demand for office space through three themes: the quality of space, the quantity of space, and the positioning of the office. The quality of space provides insights into space utilization within the office. Quantity of space describes the net office space demand, while office location delineates the strategic positioning of the office. These three themes offer a comprehensive overview of the demand for office space, providing useful insights for policymakers dealing with office-related challenges.

6.6.5 Recruiting power

To align the scenarios with the thinking and actions of the target audience, feedback was sought from real estate managers during the development of the scenarios. In this way, it ensures, on the one hand, that the scenarios comprise a collection of diverse insights from professionals, and on the other hand, that the scenarios align with and add value to the issues this group is engaged in.

07 | Discussion

7.1 Conclusion

This chapter provides an answer to the research question, which sounds as follows:

How can societal trends influence the way people work and therefor the office demand?

To answer this question, four exploratory scenarios have been developed. The scenarios have been developed using the structure of the TAIDA model. To this end, the first three parts of the model were executed: Tracking, Analysis and Imaging.

Tracking

Tracking aims to map developments. In this research, this step served two specific functions and, therefore, consists of two distinct components.

Literature - On one hand, this step outlines the context by mapping an extensive range of developments. To obtain a comprehensive view, the DESTEP structure is applied. Trends are categorized into six themes: Demography, Economy, Society, Technology, Ecology, and Politics. A literature review is conducted to document these developments, utilizing publications from CBS, PBL, and the Ministry to capture demographic, social, political, and economic trends. Additionally, trendwatch forums are consulted to map technological developments, among other things.

Interviews - After outlining the context, the second part identifies an initial selection of relevant trends for the scenarios. For this purpose, 10 semi-structured interviews were conducted with experts from various fields and backgrounds, selected based on predetermined criteria as described in section 3.3.4. The goal of the interviews is to identify an initial selection of trends relevant to the scenarios. Respondents are asked about trends they expect to have the greatest impact on the future way of working. From these interviews, 11 trends were identified that participants anticipate will have an impact on the way of working, as shown in Table 4.1.

Trends
Technological innovation
Health & well-being
Individualization
Urbanization
Sustainability
Mobility
Digitalization
Diversity
Inequality
Globalization
Circular economy

Table 4.1. Identified trends during interviews. (Author)

Analysing

The trends from the interviews serve as input for the Analysing step. In this step, the trends are examined to identify a limited number of trends that are the most relevant for the scenarios. The assessment is based on three criteria: the degree of impact on the way of working, the degree of steerability, and the degree of predictability. Steerability ensures the nature of the scenarios. Since explorative scenarios are developed in this study, indicating limited to no controllability, only trends with a low degree of steerability are considered for the scenarios. Additionally, trends with a low degree of predictability are included. Due to the uncertainty surrounding them, these trends are suitable for exploration, while trends with a high degree of predictability can already be incorporated into the strategy. Furthermore, only trends with a significant impact on the issue are considered to limit the number of trends.

Questionnaire - To evaluate trends based on the three criteria, a questionnaire is designed. Twelve participants from five different organizations completed the questionnaire. It should be noted that the number of participants is limited, partly due to selection criteria, as outlined in section 3.3.5, and due to the deliberate choice to involve various companies to enhance applicability of the outcomes. It is also acknowledged that the research team has limited resources for recruiting the right participants.

In the questionnaire, participants are asked to rank the trends in two steps. In the first step, participants are requested to position the trends from the interviews on an Impact-Steerability matrix, as shown. In the second step, participants are asked to position trends from the quadrant High Impact Low Steerability in the Impact-Predictability matrix.

To compare the questionnaire results, coordinates on the X-axis (Impact) and Y-axis (Controllability) are determined for each trend for every participant. By adding up the coordinates for each trend and then dividing by the number of participants, the average for each trend is calculated, as shown in Table 5.2.

		Participants																								Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L			
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
1	Digitalization	3,27	2,05	2,8	-1,83	4,75	-4,84	4,23	-1,66	3,52	-1,61	3,72	1,96	3,72	1,96	3,23	4,12	3,52	-3,5	2,64	-0,61	4,1	-2,3	3,67	4,79	**3,60**	**-0,12**
2	Health and well-being	2,89	2,66	-2,97	-0,57	4,52	2,83	1,03	-4,21	1,8	-3,3	1,15	1,24	1,15	1,24	3,95	-0,65	-0,39	2,52	2,67	-3,65	3,23	-2,77	1,81	1,02	**1,74**	**-0,30**
3	(Ethnical) diversity	-1,63	3,01	-4,67	-0,58	4,52	5,5	1,42	0,57	-0,34	-2,17	0	0,46	0	0,46	-3,9	0,9	-1,03	4,12	3,41	1,04	0,21	-1,23	2,53	1,99	0,04	1,17
4	Individualization	3,82	2,55	-4,66	-1,69	0	0	0,41	-4,5	3,3	-3,28	0,53	-4,07	0,53	-4,07	-2,62	0,72	-0,72	-0,72	3,2	-1,85	2,01	-3,96	2,31	-1,14	**0,68**	**-1,83**
5	Globalization	0	1,92	-2,91	-1,69	0	-2,51	1,57	-1,02	2,46	-3,09	1,59	-3,64	1,59	-3,64	-0,75	-0,8	3,09	-1,91	1,3	-3,49	0,26	-1,76	3,11	-2,21	**0,94**	**-1,99**
6	Technological domination	2,03	1,18	1,89	-1,14	4,55	-2,49	0,95	0,76	0,9	-2,36	3,59	0,53	3,59	0,53	2,52	1,88	2,51	2,8	3,26	-2,38	2,6	-1,72	1,92	-2,41	**2,53**	**-0,40**
7	Sustainability	3,78	3,87	1,4	-0,57	2,29	0	2,81	0,94	1,26	0,56	2,72	1,92	2,72	1,92	2,15	2,93	3,66	4,64	1,01	-0,27	0,09	0,44	0,64	2,18	2,04	1,55
8	Urbanization	0,02	0,46	1,4	-1,58	2,36	-4,82	-0,45	1,41	-1,21	0,59	-0,73	1,35	-0,73	1,35	0,7	-1,7	-2,19	-2,64	-1,53	-1,88	-2,06	-1,06	1,06	-1,5	-0,28	-0,84
9	Mobility	1,47	3,63	2,91	-0,56	3,39	5,5	0,57	1,43	-0,04	0,49	0,51	2,62	0,51	2,62	0,58	-0,68	-1,23	1,33	2,54	0,56	2,75	2,45	-1,06	-0,25	1,08	1,60
10	Income inequality	-3,28	3	-4,77	-3,07	-0,65	2,81	-1,75	-0,11	-0,39	-1,63	0,35	-3,03	0,35	-3,03	0,62	0,49	-3,7	0,75	-2,11	-2,98	-0,95	0,79	-4,63	-1,34	-1,74	-0,61
11	Circular economy	-1,18	1,88	0,52	-2,89	-0,87	0	-4,28	-1,11	-2,82	-0,59	0,23	-0,37	0,23	-0,37	2,25	0,53	-2,96	2,94	-1,37	-1,26	-3,78	0,72	-3,93	-2,68	-1,50	-0,27

Table 5.2. Coordinates of each trend in step 1. (Author)

The average position of each trend shows that 5 trends fall into the High Impact Low Steerability quadrant:

- Digitalization
- Health and well-being
- Individualization
- Globalization
- Technological innovation

In the analysis of step two of the questionnaire, only these trends were used. The position of these trends has again been determined, after which the average position of the trends has been reconstructed, see Table 5.3.

		Participants																										Weighted average	
		A		B		C		D		E		F		G		H		I		J		K		L					
	Trend	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y			X	Y
1	Digitalization			0,66	1,92	4,67	-4,84	4,23	-1,66	3,52	-1,61							3,65	-0,79	2,64	-0,61	4,1	-2,3						**3,35**	**-1,41**
2	Health and well-being							1,03	-4,21	1,8	-3,3					0,82	0,73			2,67	-3,65	3,23	-2,77						**1,91**	**-2,64**
4	Individualization							0,41	-4,5	3,3	-3,19	0,53	-0,54	0,53	-0,54					3,2	-1,85	2,01	-3,96	1,38	-0,7			**1,62**	**-2,18**
5	Globalization							1,57	1,93	2,46	-0,15	1,59	1,32	1,59	1,32			3,39	0,73	1,3	-0,54	0,26	1,18	2,58	-1,83			1,84	0,50
6	Technological domination			3,86	-2,94	4,03	-4,84			0,9	-1,51									3,26	-2,38	2,6	-1,72	3,95	-1,21			**3,10**	**-2,43**

Table 5.3. Coordinates of each trend in step 2. (Author)

From the average position, it appears that four trends fall into the quadrant of High Impact and Low Predictability:

- Digitalization
- Health and well-being
- Individualization
- Technological innovation

De trends die het dichtst bij elkaar liggen zijn digitalisering & technologische innovatie en gezondheid en welzijn & individualisering. Deze trends vormen de volgende twee clusters.

- Digitalization & technological innovation → technology use
- Health and well-being & individualization → human scale

Literature – Through literature, the two core uncertainties have been elaborated. In this study, the "human scale" refers to the extent to which the human element in the employee is acknowledged. The human scale is in this study examined in two situations: one where the human scale is High and another where it is Low. In the Low situation, McGregor's X Theory predominates within organizations, while in the High situation, the Y Theory takes precedence. The aspects influenced in both situations are autonomy, competence, and social connection. Table 5.4.1 provides an overview of these aspects in the two situations.

Low	*Human scale*	*High*
Employer decides how work is organized	*Autonomy*	Employee has the freedom to arrange his own work
Employees are hired based on the skills they already exist	*Competence*	Employer offers opportunities to employees to develop skills
Social connection is irrelevant to employers	*Social connection*	Employers promote social connetions

Table 5.3.1 Characteristics Human scale in situation Low and High. (Author)

In order to examine the effect of technology use on the way of working, 3 aspects have been identified: employment, tasks requirements and freedom of movement. The degree of technology use is compared in two situations: a situation with low technological integration where a skeptical view is taken towards technology, and a situation with high technological integration where an optimistic view is taken towards technology. The way the previously identified aspects of technological developments relate in these situations is presented in Table 5.4.2.

Low	*Aspects*	*High*
Balance between repetitive and creative work	*Employement*	High demand for creative and high educated jobs
Stable and clear tasks requirements	*Tasks requirements*	Diverse and continuously developing task requirements
Work is stuck to one place	*Freedom of movement*	Work is place independent

Table 5.4.2 Characteristics Technology use in situation Low and High. (Author)

Imaging

In the Imaging step, four scenarios were elaborated. The scenarios were first written out in a draft version based on the core uncertainties. Each scenario is based on a combination of values and core uncertainties. The scenarios were then sent to 3 real estate managers for substantive feedback. Based on this feedback, the scenarios were then adjusted. In answer to the research question: *How can societal trends influence the way people work and therefor the office demand?* The following four scenarios have been developed: Human Hands, Bionic Man, Manual Machines and Technological Domination. In each of these scenarios, there is a different balance between people and technology, which leads to a different way of working and therefore to different office characteristics. In the Human Hands scenario, humans are the dominant factor, while technology is applied with restraint. In the Bionic Man scenario, there is a harmonious balance between man and technology. In the Manual Machines scenario, there is little attention for the human dimension and there is also limited technology available. In the Technological Domination scenario, it is precisely technology that predominates: there is little attention for people. Table 7.1 gives an overview of the way of working and the office characteristics in each scenario.

		Human Hands	Bionic Man	Manual Machines	Technological Domination
Human scale ↔ Technology use ↕					
Way of Working	Organizational structure	Decentralized	Decentralized	Hierarchical	Hierarchical
	Employees collaboration	All interactions physically	Social: physical Professional: online	Social: none Professional: physical	All interactions online
	Work location	One place	Multiple places	One place	Multiple places
Office characteristics	Quality of space	Meeting rooms Individual desk Silence areas Social areas	Meeting rooms Social areas	Meeting rooms Individual desk Silence areas	Individual rooms
	Quantity of space	Increase	Decrease	Decrease	Decrease
	Office location	Urban areas with good accessibility	Urban area with good accessibility	Good accessible but at the border of cities	Offices are spread all over the Netherlands

Table 6.1. Summary of the scenarios. *(Author)*

The title of this research is: *Do we still need office buildings?* From the four scenarios, there will still be a demand for office buildings in the Netherlands in the future. However, what this question will look like differs per scenario. In Human Hands, the demand for offices will increase because people will only work in the office and more space in the office will be reserved for informal activities. In the other three scenarios, the quantitative demand for offices will decrease. In the Bionic Man scenario, the office will be used for collaborative work and informal activities, and a significant part of the work will move to the online domain. In the Manual Machines scenario, the work will be concentrated in the office, where the office will be fully equipped for functionality. This means that informal activities will disappear from the office. In the Technological Domination scenario, virtually all of the work is done online. In this scenario, the decrease in the office will therefore be the greatest.

7.2 Limitations

This research may contain limitations. Some of these are discussed below.

Number of trends included

The scenarios in this study are built on the basis of two core uncertainties: human scale and technology use. These core uncertainties are the result of four trends (technology use: technological innovation & digitalization; human scale: health and well-being & individualization). However, there are more trends and different spheres of influence that influence the demand for offices, such as the number of employees, scarcity of materials and sustainability aspects can have a major impact on the demand for office space. The scenarios in this study therefore only cover part of the spectrum that affects the demand for offices.

Questionnaire participants

The questionnaire was completed by 12 participants. This is mainly due to limited resources. This study was not intended as a case study for one organization, therefore it was intended to send the questionnaire to different organizations and not have it completed by employees of one organization. Participants from 5 organisations were therefore invited to participate in this study. This means that the results are not related to one organization and the results are more widely applicable. The scenarios are therefore not limited to one sector of real estate managers.

Elaboration of the scenarios

The scenarios were first worked out on the basis of the core uncertainties, after which they were sent to real estate managers for feedback. This was done to gather insights from experts as well as to ensure the elaboration and recruiting power of the scenarios. The feedback shows that real estate managers agree with the reasoning of the scenarios and that the scenarios provide them with a good framework for thinking. This means that the scenarios are in line with the criteria for elaboration and recruiting power. However, in terms of content, the comments on the scenarios remained limited.

7.3 Recommondations

Office use and office demand are topics that can be influenced by many factors. This research contributes to the discussion about this, but does not describe the full field. Follow-up research can therefore focus on the following topics:

Other perspectives

As indicated in the limitation, the scenarios in this study are based on two core uncertainties. To give policymakers more guidance in formulating their strategy, it can be valuable to approach office use and related office demand from more angles. In this way, a firmer foundation is created on which policymakers can build.

Normative scenarios

In this study, four exploratory scenarios were examined. This means that the scenarios explore different visions of the future, regardless of their desirability. A good addition to this research could be normative scenarios. They take a closer look at the vision of the organisation and therefore explore various policy options and the way to achieve them. By considering both explorative and normative scenarios, a picture emerges to which an organization can be exposed from external influences (explorative) and organizations can explore how they can deal with this in order to achieve their goals (normative).

The effect of changes in office demand on other sectors

From the point of view of the built environment, it is interesting to investigate the effect of shifts in the office landscape on other sectors. Three of the four scenarios show that the quantitative demand for offices will decrease. This can provide space for other sectors (housing, climate, energy, etc.) but can also put pressure on existing facilities (demand for larger homes, more social activities, etc.).

Developing and using scenarios

Furthermore, during this process, it was noticed that there are many ambiguities about scenarios. This is true both in literature and in practice. In the literature, there are many different views on scenarios, which made it difficult to formulate a good method for building scenarios. Furthermore, during discussions about this research, I noticed that in practice it is not always clear how scenarios can be applied. People often think that they have to choose between the scenarios and can work towards them. However, the literature describes that scenarios are relevant as a set and that they should be applied as a set. In short, the development and application of scenarios are fields that follow-up research can focus on.

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Appendix 1 Reflection

In this reflection, I look back on my graduation process. I reflect on how I experienced the process, my internship period, and the final products.

Process

My graduation process was a lengthy and challenging journey. The subject and research methodology were intricate, demanding a significant amount of time to comprehend and apply effectively. Office usage is a complex topic due to the multitude of influencing factors, and finding the right perspective required considerable effort. For my research, I opted to develop scenarios. Although I had prior experience developing scenarios during my master's, I realized during my graduation period that academically justifying these scenarios was a complex task. Hence, I reached out to various experts who assisted me in formulating a method for scenario development. Throughout this process, I encountered challenges and learned that planning, conducting, and processing interviews took much more time than initially estimated. Planning was an aspect of my graduation process where I underestimated, and these lessons will guide me in future projects.

Internship

The internship at ING complemented my theoretical knowledge gained during this graduation process. I participated in various projects during my internship, and while not all directly related to my graduation research, I gained relevant practical experience and engaged in discussions with professionals both within and outside of ING. Although internships are not obligatory during graduation, I am glad I seized this opportunity during my graduation process.

Final Products

The scenarios resulting from this research are intended to support real estate managers in making their real estate strategies future-proof. During feedback sessions, I heard from various experts that the scenarios provide a valuable thinking framework. Informal discussions about my research revealed an engaging perspective on current issues related to office usage. However, it's important to note that the research does not cover the entire spectrum of the theme, and sometimes expectations are high upon hearing the title. With this research, I aimed to bridge the gap between theoretical knowledge and practical applicability. The fact that the scenarios are perceived as interesting and useful in practice indicates that the research has achieved this connection, albeit to some extent.

Throughout my graduation process, I expanded my understanding of real estate management. Not only did I enhance my theoretical knowledge of office usage and demand for office space, but I also gained practical experience during my internship. Overall, I dare say that thanks to my graduation process, I have significantly increased my knowledge of real estate management, particularly in the field of offices.

Appendix 2 Interview Protocol

Preparation

- Approaching participants
- Coordinate time and location
- Sending informed consent

Start interview

- Thanking the interviewee
- Questions about whether an interview can be recorded
- Turning on recording equipment

Begin interview

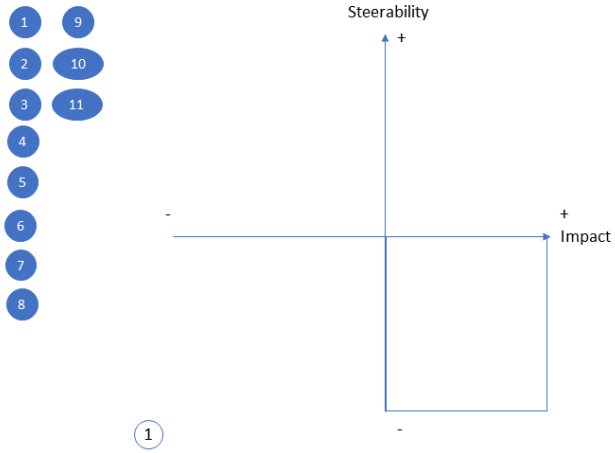
- Brief introduction to topic and researcher
- Interview questions
    - What are the most important developments in the field of working?
    - How do organizations balance the wishes of their employees against the goals of the organization?
    - Which trends do you expect to have the biggest impact on the way you work?
    - How much influence do employees have on the employer's policy?
    - How flexibly can organizations adapt to a changing context?
- Asking if the interviewee wants to add anything

Appendix 3 Questionnaire

Explanation

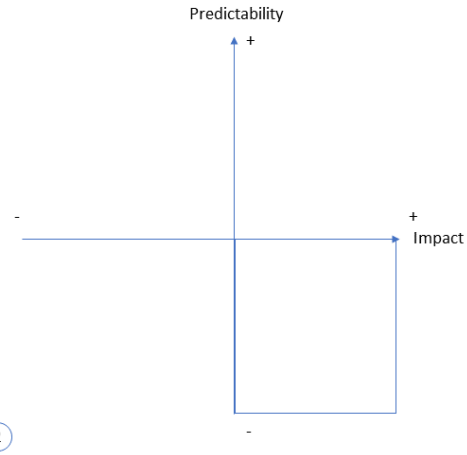
- Step 1
  - Rank the trends from the table based on their steerability and impact on the way of working in the matrix
    - Steerability: the degree of control an organization has on the trend
    - Impact: the degree of impact of the trend on the way of working
- Step 2 → the trends in the quadrant with high impact and low steerability form the input for this step (right-bottom quadrant from step 1)
  - Rank the trends based on the predictability and the impact on the way of working
    - Predictability: the degree of uncertainty of how trends can unfold
    - Impact: the degree of impact of the trend on the way of working

Step 1



Number	Trend
1	Digitalization
2	Health and well-being
3	(Ethnical) diversity
4	Individualization
5	Globalization
6	Technological innovation
7	Sustainability
8	Urbanization
9	Mobility
10	Income inequality
11	Circular economy

Step 2



Number	Trend

2

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