

Hybrid Office Portfolio Optimisation – PAS Method

**A Study on Integrating Hybrid Working Demands into
the PAS Design and Decision-making Method: Testing Its
Fit-for-Purpose in Optimising the Netherlands Police
Office Portfolio**

Author: M.F.A (Martijn) Eversdijk - 5945925

Master of Science Thesis

Delft University of Technology

Date: October 2025

COLOPHON

Report

Title: Hybrid Office Portfolio Optimisation – PAS Method
Subtitle: A Study on Integrating Hybrid Working Demands into the PAS Design and Decision-making Method: Testing Its Fit-for-Purpose in Optimising the Netherlands Police Office Portfolio
Date: October 2025
Version: P5 Report

Author(s)

M.F.A (Martijn) Eversdijk
5945925



Educational institution

University: Technical University of Delft
Faculty: Architecture and the Built Environment
Degree: MSc Architecture, Urbanism and Building Sciences
Master Track: Management in the Built Environment
Academic year: 2024/2025

Supervisors

First Mentor: Dr. Ir. M.H. (Monique) Arkesteijn
Management in the Built Environment
Real Estate Management

Second Mentor: Dr. Ir. V. (Vitalija) Danivska
Management in the Built Environment
Real Estate Management

Third Mentor (PhD): Dr. Ir. F. (Hedieh) Arfa
Management in the Built Environment
Heritage & Architecture

Company Supervisor: Ir. C. (Casper) Bovy
Police of the Netherlands
Senior Real Estate Portfolio Advisor

Graduation Organisation

Company: The Netherlands Police
Departement: Politiedienstencentrum (PDC) Rotterdam – Landelijk Portefeuille Management (Huisvestiging)
Location: Marten Meesweg 35
3068 AV Rotterdam

PREFACE

In front of you lies my master's thesis, 'Hybrid Office Portfolio Optimisation – PAS Method'. This thesis was written as the end research for the master's Management in the Built Environment program at the Technical University of Delft. The research was conducted between February and October 2025.

During my search for a graduation topic, I became increasingly interested in the impact of hybrid working on real estate portfolios. In a conversation during the introduction of the graduation themes, I spoke with Monique Arkesteijn, who further sparked my enthusiasm. The changing way of working and the diversity of preferences call for a new approach to portfolio optimisation. This inspired the idea to dive deeper into the Preference-based Accommodation Strategy (PAS) and integrate this new way of working into office real estate portfolios.

The process of conducting this thesis has been an intensive and rewarding experience in which I learned a great deal about conducting research, modelling, and incorporating multiple perspectives within the complex context of the Netherlands Police. In particular, finding the right balance between developing the model and then evaluating and improving it through stakeholder involvement and practical application in a real-life pilot study significantly enriched the research. It taught me how to work with a decision-making model and how its implementation can offer valuable insights into the complexity of portfolio management.

I would like to express my sincere gratitude to my TU Delft supervisors, Monique Arkesteijn and Vitalija Danivska, for their critical feedback and constructive guidance. I am also thankful to Hedieh Arfa for her support and supervision throughout the entire process. My thanks further go to Casper Bovy for the opportunity to conduct a pilot study and for sharing his valuable insights. I am also grateful to the participants from the police organisation for their openness and involvement during the intensive research process. In addition, I thank the extern Center for People and Buildings, Bart Valks, and Ziyao Cheng for their willingness to provide additional insights. Lastly, I want to thank my girlfriend, family, and friends for their support and patience over the past months.

This research would not have been completed without everyone's involvement and support. I hope you enjoy reading it!

Martijn Eversdijk
Delft, October 2025

ABSTRACT

The growing adoption of hybrid working has transformed the workplace, creating both opportunities and challenges due to the diverse and conflicting values of employees and organisations. This shift has also influenced the demand for office space, which has become more flexible, uncertain, and unpredictable. As a result, there is a driving need to reduce office space demand more effectively. In the literature, several instruments exist that each address parts of this problem; however, their integration has not been tested. Although the Preference-based Accommodation Strategy design and decision-making approach (Arkesteijn, 2019) could potentially be applied in this context, it is currently a general method that does not explicitly address hybrid working preferences or demand.

This research addresses this gap by adapting the Preference-based Accommodation Strategy (PAS) method to test the fit-for-purpose design and decision-making of the integrated research instrument. The research instruments are referred to as the Hybrid Office Portfolio Optimisation (HOPO) model, which aims to identify preferences for implementing goals and criteria, and to stimulate portfolio optimisation through the demand model. The research follows the ten design steps that allow for an iterative, prescriptive approach that combines literature review, model development, and the application of the PAS with interviews and workshops.

Three reference models (Hybrid Working Trends based on literature, Knowledge Workers based on survey data, and Policy Accommodation based on policy documents) were developed to capture general, user and organisational preferences, complemented by a development portfolio demand model. These instruments were integrated into the PAS method and empirically tested through a pilot study with the Netherlands Police, one of the largest public real estate owners in the Netherlands. The pilot included three stakeholder perspectives: user, organisational, and real estate. The reference models are tested in the interviews, and the demand model in the workshops.

The findings show that the reference models added limited value due to the expertise of stakeholders, timing of communication and the quality and completeness. The policy accommodation had the most potential, as it directly linked organisational strategy to decision variables. The demand model successfully quantified the hybrid working preferences of demand, but was constrained by the scenario thinking in the outcome.

The research concludes that although the integration of hybrid working demands into the PAS method was not so successful, however, it cannot be concluded that it will never work. Future research should focus on making the reference models more comprehensive and improving the way of communication to present earlier. The HOPO-PAS model thus provides a foundation for further development in enhancing the PAS design and decision-making method with the integration of research instruments.

Keywords: Hybrid working, Reference model, Strategy implementation, Office portfolio demand model, Portfolio optimisation, Preference-based Accommodation Strategy (PAS) design and decision-making approach, Real estate management.

EXECUTIVE SUMMARY

Introduction

I. Context

Workplace environments have significantly evolved over recent decades, accelerated by technological advancements, demographic shifts, and changing societal expectations (Sokolic, 2022). The COVID-19 pandemic further accelerated this evolution, prompting rapid adoption of remote and hybrid working practices. Hybrid working, offering flexibility in location, time and space, has become a preferred model for many employees due to improved work-life balance, autonomy, and reduced commuting (Appel-Meulenbroek et al., 2022). However, it also introduced challenges such as increased isolation, unclear work-life boundaries, and varying levels of employee motivation and productivity (Höcker et al., 2022).

Organisations adapting to hybrid working models are rethinking traditional real estate strategies (Harris, 2015). These strategies increasingly involve reducing fixed office spaces to optimise costs, increase agility, and meet changing employee expectations. However, challenges remain in maintaining organisational culture, collaboration, and employee engagement within these ways of working. This shift has led to substantial changes in demand for office space, notably decreased occupancy rates and an emerging preference for high-quality, flexible office environments (Cooke et al., 2022). Organisations are actively adjusting their real estate portfolios, with some reducing their office footprint significantly (van Rein, 2024).

II. Problem Statement

The rise of hybrid working creates both opportunities and challenges, especially at the portfolio level, in balancing the diverse preferences with fluctuating office demand. As a result, many organisations prioritise portfolio optimisation, yet the decision-making behind it remains unclear and lacks transparency. Existing tools, such as surveys (CfPB, 2023; Leesman, 2025), demand model (Cheng, 2022), and Preference-Based Accommodation Strategies (PAS) design and decision-making method (Arkesteijn, 2019), partly address this issue, but their integration has not yet been tested.

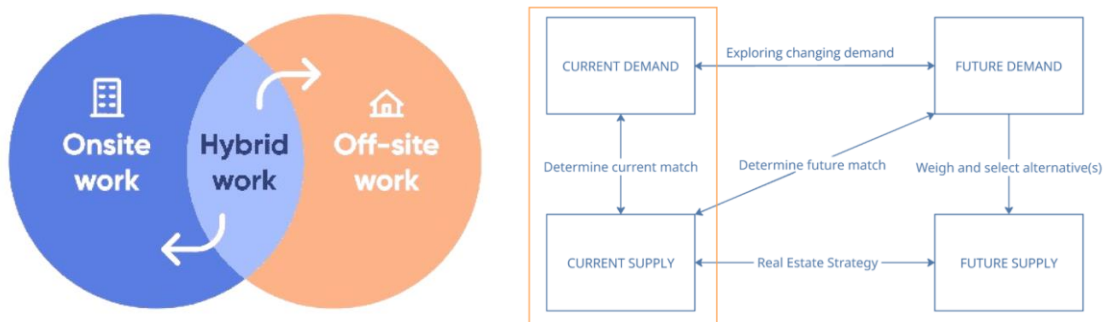


Figure 1 Hybrid Work (Miroslavov, 2024) with current mismatch according to the DAS framework (De Jonge et al., 2009)

This research addresses this gap by adapting the PAS method to integrate hybrid working preferences and demand into a fit-for-purpose design and decision-making for office portfolio optimisation. The integration of hybrid working preferences is structured into reference models to capture the diverse and sometimes conflicting needs of hybrid working, while hybrid working demand is addressed by further developing the model of Cheng (2022). The adapted PAS method will be tested in a pilot study with the Netherlands Police to evaluate how the research instruments are integrated and assess whether the resulting approach is fit for purpose in supporting decisions regarding hybrid working and office portfolio management.

III. Hybrid Office Portfolio Optimisation – PAS Method

Hybrid Office Portfolio Optimisation (HOPO) *integrates* hybrid working preferences and office space demand into the PAS method to achieve maximum added value to support portfolio optimisation in the context of hybrid working. The research first focuses on conceptualising and modelling the HOPO model. Subsequently, its instruments are tested for their *fit-for-purpose* within the PAS method through a pilot study with the Netherlands Police. This enables the research to reflect on the *adapted* PAS method and evaluate its application to the HOPO-PAS. The main research question is:

How can the PAS design and decision-making method be adapted into a fit-for-purpose design and decision-making model that integrates hybrid working demands for optimising office real estate portfolios?

To answer the main research question, this research has been divided into three parts: part A 'input', part B 'Process' and part C 'output'.

- PART A INPUT: What hybrid working demands can be developed, and how can they be integrated?
- PART B PROCESS: What is the relationship between the integrated hybrid working demands and the application of the PAS design and decision-making method?
- PART C OUTPUT: How can the PAS model be adapted, and what needs to be changed to support a fit-for-purpose design and decision-making?

Research Method

The research employs an operations research approach, developing an artefact that does not yet exist. Operational research alone is insufficient, as the model will also be tested through empirical research (Barendse et al., 2012). Through an iterative and prescriptive design process, the research integrates instruments into the PAS method to test the fit-for-purpose in the design and decision-making.

The research design is structured in ten iterative steps, aligning with the frameworks of Dym & Little (2004) and Hevner (2010). The initial knowledge base is established, where the foundations of scientific theories are explained to enable the formulation of the client statement. The development of the conceptual design comprises three reference models: Hybrid Working Trends (based on a literature study), Knowledge Workers (survey data from CfPB, 2023), and Policy Accommodation (the office accommodation policy framework of Swens, 2024), as well as the demand model (Cheng, 2022). The preliminary design tests their first integration into the PAS method, where the reference models are used during the interviews and the demand model during the workshop. The detailed design phase includes interviews to reflect on and adjust the input, followed by a second workshop

A pilot study with the Netherlands Police tests the applicability of the HOPO-PAS model. The PAS method follows a six-step iterative process (Arkesteijn, 2019): Interview I, Workshop I, Interview II, Workshop II, and Interview III. In total, three stakeholders were selected representing the user, organisational and real estate perspectives (Den Heijer, 2011). The financial perspective was not directly represented but is incorporated as a boundary condition within the portfolio's design.

Knowledge Base: Client Statement

The client statement establishes the foundation and is derived from three studies: real estate management (why), the Preference-based Accommodation Strategy method (how), and its adoption in response to hybrid working (what).

I. Real Estate Management

The review highlights the distinctions between Corporate Real Estate Management (CREM) and Public Real Estate Management (PREM), showing how value is defined differently across corporate and public domains. While CREM emphasises financial returns and competitive advantage, PREM prioritises public values such as accessibility, accountability, and social benefit. Both perspectives underline the strategic role of real estate in delivering organisational performance and user value.

II. The Preference-based Accommodation Strategy design and decision-making approach

The PAS method is identified as the most comprehensive approach to design and decision-making for the development of preference-based portfolio design (Arkesteijn, 2019, p. 35). The method consists of a structured set of activities, involved stakeholders, a series of steps, and an underlying decision-making model (Arkesteijn, 2019).

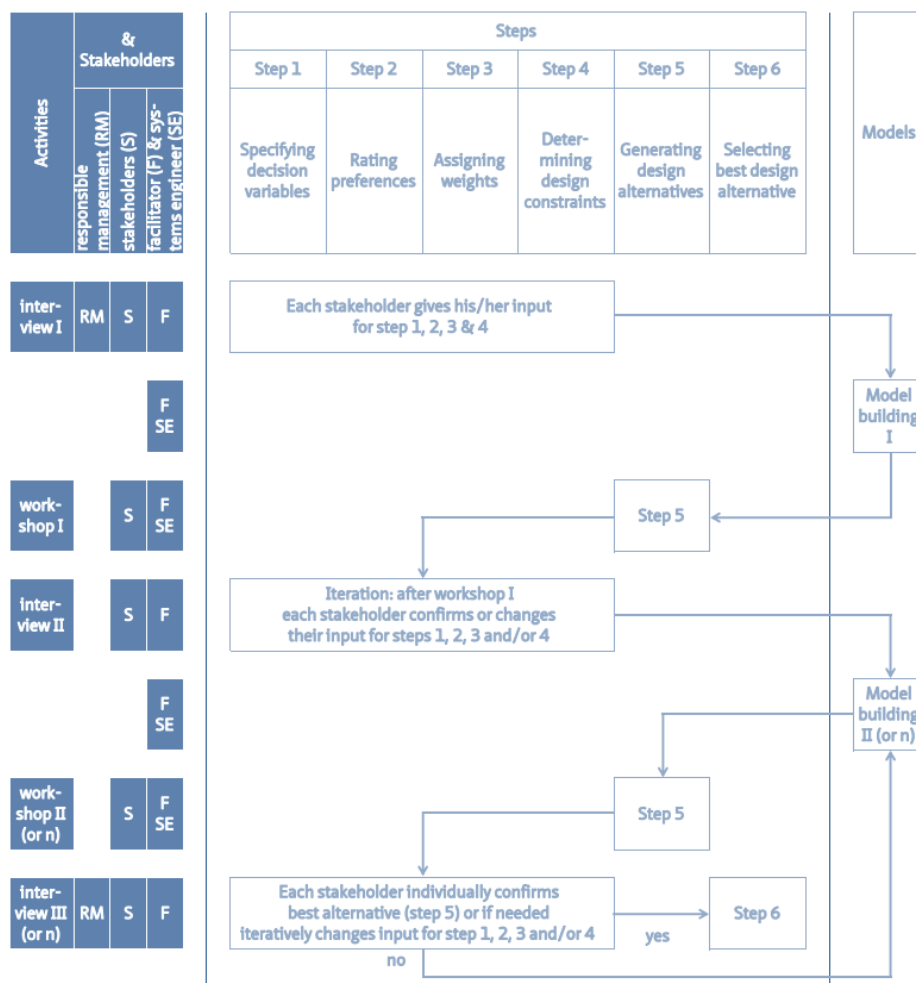


Figure 2 The flow chart of the PAS method (Arkesteijn, 2019, p. 237)

III. Instruments

Reference models

Reference models provide simplified yet structured representations of complex systems that help organisations understand relationships, define objectives, and guide decision-making. They can serve a normative role, prescribing ideal elements based on theory or best practices, or a descriptive role, capturing observed patterns (De Leeuw, 2002). Within the PAS method, reference models are especially valuable in the initial step, as they support stakeholders in providing additional information.

The demand model

In real estate management, one of the main challenges is bridging the gap between dynamic demand and static supply, which has become more pressing with hybrid working. To address this, Cheng (2022) developed a quantitative demand model that links hybrid working preferences directly to office space demand. The formula consists of:

$$D = \sum \Delta D = \sum \Delta \gamma \times \Delta \beta \times \Delta \theta$$

Where:

- D = Total demand of office space
- γ = ABW implementation plan
- β = 1/share-ratio
- θ = The employment headcount classified by different employee groups

Figure 3 Mathematical formula of office space demand forecasting for corporate real estate in the post-pandemic (Cheng, 2022, p.100)

The client statement clarifies the first four steps of the design process (Dym & Little, 2014):

1. Objectives: integrate reference and demand models into the adapted PAS to test their fit-for-purpose relationship.
2. User requirements: empower stakeholders to iteratively apply these models to define decision variables and stimulate portfolio optimisation.
3. Constraints: operate within organisational boundaries, scope of the project, and regulatory frameworks.
4. Functions: translate hybrid working preferences into structured decision variables, and portfolio demand to stimulate optimisation.

Conceptual Design

The conceptual design introduces reference models and the demand model. These reference models serve as structured input for the first two steps of the PAS method: defining decision variables and scoring preferences. They offer stakeholders an overview of potential variables without prescribing choices to make use of the knowledge that already exists, and do not start from scratch in each step.

Insights from the user preferences are transformed into the demand model adapted from Cheng's (2022) office space formula. By combining headcount, share ratios, and ABW parameters with survey-based hybrid working patterns and organisational needs, the model translates these preferences into portfolio demand. Applied in the PAS workshops, it enables stakeholders to design and evaluate office portfolio alternatives transparently and adjust variables to reflect different outcomes.

Preliminary Design

This chapter presents the application of the HOPO model to the PAS method, testing their fit-for-purpose relationship. The police serve as an empirical setting, as one of the largest public real estate owners in the Netherlands, the police provide a complex and relevant context where hybrid working and portfolio optimisation are strategic priorities. The integrated portfolio focuses on the Police Services Centre (PDC), whose offices face overcapacity, high costs, and the challenge of adapting to hybrid work practices.

During the interviews, 20 decision variables were formulated. The reference models provided limited but complementary support:

- Hybrid Working Trends added no new variables, as stakeholders independently articulated objectives.
- Knowledge Workers informed the assignment of preference scores (e.g., satisfaction, occupancy rate).
- Policy Accommodation proved most valuable, aligning with organisational ambitions and policy targets, though its overlap with other models reduced clarity.

In the workshops, stakeholders adjusted variables (e.g., employment headcount) to align demand with supply, resulting in a portfolio alternative that deviated less than 1% from recalculated demand. The model was assessed as highly implementable, offering a transparent and adaptable basis for optimisation.

Detailed Design

The detailed design phase builds upon the previous design by addressing limitations and improving the integration.

During the second round of interviews, stakeholders did not formulate new decision variables but refined a small set of existing ones. Overall, the reference models added little value due to the expertise of the stakeholders, the way of communicating them in the process and the quality or completeness of the reference models.

The demand model was refined for the second workshop by incorporating Cheng's (2022) full modified share ratio. While the output was still valuable, the variables of the formula proved problematic: desk occupancy rates and office days were difficult to use as demand indicators, since they are partly dependent on supply and behaviour. Three improvements were identified: (1) adjusting the formula to avoid distortion, (2) introducing stricter rules for variable use, or (3) applying scenario-based interventions that test directional impacts.

Discussion

I. Interpretation

This research found that reference models were not essential for defining decision variables in the PAS method, as the models on hybrid working and knowledge workers were difficult for stakeholders to interpret. However, the policy-based model proved valuable because it directly reflected strategic goals, helping bridge the gap between strategy formulation and implementation. Reference models still hold

potential to enhance decision-making and alignment if designed more comprehensively or consolidated into a single framework. The demand model, while able to translate user preferences into quantitative outputs, was limited by its flexibility and lack of scenario-based analysis. Integrating scenario thinking and building-level demand could strengthen its strategic usefulness. The facilitator played a crucial role by guiding stakeholders through the PAS process, enabling ownership of decisions without influencing content. Future research should explore the alignment between reference models and real strategic outcomes, and how early integration improves portfolio transparency and effectiveness.

II. Limitations

The development of the reference models was constrained by scope, relevance and complexity. The selected police portfolio was less suited for the PAS application, as concrete plans already existed, and the willingness to explore alternatives was low. The involvement of only three stakeholders limited diversity of perspectives, and end users were not directly represented, creating a potential gap between strategic choices and employee needs. Finally, Workshop II was held online, which constrained interaction, though it remained functional with a small group.

IV. Future research

Future studies could improve reference models by making them more comprehensive or merging them into a single conversation tool. Preparing different portfolio variants in advance, or using AI to generate alternatives, could stimulate creativity, provided transparency is maintained. Integration of real-time data (e.g., occupancy, energy, maintenance) could further improve accuracy and responsiveness.

Conclusion

In this research, the integration of the hybrid working demands was not so successful in the application of the PAS method. However, it cannot be concluded that it will never work. Several improvements are identified in the research, as the models still hold added value for adaptation in the PAS. The fit-for-purpose contribution demonstrated its usefulness with improvements in the way of communicating and the quality and comprehensive of the reference models and the adoption of scenario thinking with the demand model in the PAS dashboard.

List of Figures

FIGURE 1 HYBRID WORK (MIROSLAVOV, 2024) WITH CURRENT MISMATCH ACCORDING TO THE DAS FRAMEWORK (DE JONGE ET AL., 2009)	6
FIGURE 2 THE FLOW CHART OF THE PAS METHOD (ARKESTEIJN, 2019, P. 237)	8
FIGURE 3 MATHEMATICAL FORMULA OF OFFICE SPACE DEMAND FORECASTING FOR CORPORATE REAL ESTATE IN THE POST-PANDEMIC (CHENG, 2022, P.100).....	9
FIGURE 1.1 HYBRID WORK (MIROSLAVOV, 2024) WITH CURRENT MISMATCH ACCORDING TO THE DAS FRAMEWORK (DE JONGE ET AL., 2009)	22
FIGURE 1.2 PORTFOLIO OPTIMISATION STATISTICS	22
FIGURE 1.3 CURRENT AND FUTURE OFFICE PORTFOLIO OF THE POLICE (SWENS, 2024, P.23)	24
FIGURE 1.4 CONCEPTUAL MODEL, POSITIONED IN THE DAS FRAME (OWN ILLUSTRATION, BASED ON DAS FRAME, DE JONGE ET AL. (2009))	26
FIGURE 2.1 STEPS OF DESIGN PROCESS (DYM & LITTLE, 2004, P.24)	29
FIGURE 2.2 FORMAL SCIENCES AND EMPIRICAL SCIENCES PROCESS (BARENDSE ET AL., 2012, P.6)	29
FIGURE 2.3 INDICATION OF THE RESEARCH STEPS IN HEVNER’S DESIGN RESEARCH CYCLE (OWN ILL. BASED ON HEVNER ET AL., 2010)	30
FIGURE 3.1 CLIENT STATEMENT, POSITIONED IN THE DAS FRAME (OWN ILLUSTRATION, BASED ON DAS FRAME, DE JONGE ET AL. (2009))	40
FIGURE 3.2 THE BASIS OF REAL ESTATE MANAGEMENT: REAL ESTATE ADDING TO PERFORMANCE (DEN HEIJER, 2011).	41
FIGURE 3.3 CONCEPTUAL MODEL ORGANISATION (DE VRIES, 2008; PICTURE RETRIEVED FROM SCHEURS, 2019)	41
FIGURE 3.4 THE BASIS OF REAL ESTATE MANAGEMENT: REAL ESTATE ADDING TO PERFORMANCE (DEN HEIJER, 2011).	41
FIGURE 3.5 PUBLIC REAL ESTATE MANAGEMENT MODEL (DEN HEIJER, 2021, PP. 22- 23)	42
FIGURE 3.6 THE ENTRANCE HALL OF THE POLICE STATION IN AMSTERDAM (DETWEEENOEKENARCHITECTUUR, N.D.).....	43
FIGURE 3.7 THE ENTRANCE HALL OF THE OFFICE OF THE EDGE IN AMSTERDAM (ARCHDAILY, 2024)	43
FIGURE 3.8 PUBLIC REAL ESTATE MANAGEMENT MODEL (OWN ILL. BASED ON: DEN HEIJER, 2021, PP. 22- 23)	44
FIGURE 3.9 THE FLOW CHART OF THE PAS METHOD (ARKESTEIJN, 2019, P. 237)	45
FIGURE 3.10 DAS FRAME DEN HEIJER (2011) BASED ON DE JONGE ET AL. (2009).....	46
FIGURE 3.11 THREE COMPONENTS OF THE PAS METHOD (ARKESTEIJN, 2019)	46
FIGURE 3.12 EXAMPLE OF A LANGRANGE CURVE (ARKESTEIJN, 2019, P.159)	47
FIGURE 3.13 MATHEMATICAL FORMULA OF OFFICE SPACE DEMAND FORECASTING FOR CORPORATE REAL ESTATE IN THE POST-PANDEMIC (CHENG, 2022, P.100).....	50
FIGURE 3.14 THE MODIFIED SHARE RATIO PROPOSED BY CHENG (2022).....	51
FIGURE 4.1 CONCEPTUAL DESIGN, POSITIONED IN THE DAS FRAME (OWN ILLUSTRATION, BASED ON DAS FRAME, DE JONGE ET AL. (2009))	56
FIGURE 4.2 SCREENSHOT OF A PART OF THE KNOWLEDGE WORKERS' PREFERENCES IN THE REFERENCE MODEL (CONFIDENTIAL DETAILS ARE LEFT OUT).....	64
FIGURE 4.3 EXAMPLE OF FORMULATED CRITERION BASED ON THE REFERENCE MODEL OF SWENS (2024).....	65
FIGURE 4.4 SCREENSHOT OF PART OF THE REFERENCE MODEL - STRATEGIC ACCOMMODATION (RETRIEVED FROM SWENS (2024))..	67
FIGURE 4.5 MATHEMATICAL FORMULA OF OFFICE SPACE DEMAND FORECASTING FOR CORPORATE REAL ESTATE IN THE POST-PANDEMIC (CHENG, 2022, P.100).....	67
FIGURE 4.6 THE MODIFIED SHARE RATIO PROPOSED BY CHENG (2022).....	68
FIGURE 5.1 PRELIMINARY DESIGN, POSITIONED IN THE DAS FRAME (OWN ILLUSTRATION, BASED ON DAS FRAME, DE JONGE ET AL. (2009))	73
FIGURE 5.2 FOUR OFFICE LOCATIONS OF THE PDC EMPLOYEES FROM THE POLICE. LEGEND: DARK BLUE CIRCLE: OWNED BUILDING AND LIGHT BLUE CIRCLES: RENTED BUILDINGS	75
FIGURE 5.3 BUILDING NUMBER 1, PDC ROTTERDAM	FIGURE 5.4 BUILDING NUMBER 2, PDC EINDHOVEN
75	75
FIGURE 5.5 BUILDING NUMBER 3, PDC ZWOLLE	FIGURE 5.6 BUILDING NUMBER 4, HUB 50.....
75	75
FIGURE 5.7 SCREENSHOT OF THE DASHBOARD WITH POSSIBLE TRANSLATED INTERVENTIONS.....	80

FIGURE 5.8 SCREENSHOT OF DASHBOARD FROM THE PAS MODEL WITH ZOOMED VARIABLES OF INTEGRATION OF THE DEMAND MODEL	80
FIGURE 5.9 POLICY VARIABLES THAT INFLUENCE THE OUTCOME OF MODEL 4 - DEMAND MODEL IN THE WORKSHOP	81
FIGURE 5.10 POLICY VARIABLES THAT INFLUENCE THE OUTCOME OF THE THREE DECISION VARIABLES FROM THE STAKEHOLDERS	81
FIGURE 5.11 THE PORTFOLIO ALTERNATIVE OF THE OFFICE PORTFOLIO FROM THE POLICE DURING WORKSHOP I (LEGEND: DARK BLUE = OWNED BUILDING; LIGHT BLUE = RENTED BUILDING)	82
FIGURE 5.12 TRANSLATED SCREENSHOT OF THE IMPROVEMENTS OF THE INTEGRATED VARIABLES RELATED TO THE DEMAND MODEL..	85
FIGURE 5.13 SCREENSHOT OF DASHBOARD OF THE PAS (ARKESTEIJN, 2019) WITH ZOOMED VARIABLES OF THE IMPROVED DEMAND MODEL	86
FIGURE 5.14 THE POLICY DECISION VARIABLES FROM THE STAKEHOLDERS	86
FIGURE 5.15 BUILDING NUMBER 5, PDC NIEUWEGEIN (PICTURE RETRIEVED FROM GOOGLE EARTH, 2025)	86
FIGURE 5.16 FOUR ADDITIONAL BUILDINGS WITH VARIABLES FOR WORKSHOP II	87
FIGURE 6.1 DETAILED DESIGN, POSITIONED IN THE DAS FRAME (OWN ILLUSTRATION, BASED ON DAS FRAME, DE JONGE ET AL. (2009))	89
FIGURE 6.2 ADJUSTMENT OF PARAMETERS FROM MODEL 4 - DEMAND MODEL DURING WORKSHOP II	91
FIGURE 6.3 THE PORTFOLIO ALTERNATIVE OF THE OFFICE PORTFOLIO FROM THE POLICE DURING WORKSHOP I (LEGEND: DARK BLUE = OWNED BUILDING; LIGHT BLUE = RENTED BUILDING)	92
FIGURE 6.4 OUTCOME OF THE MODIFIED SHARE RATIO IN THE DEMAND MODEL DURING THE WORKSHOPS	93
FIGURE 6.5 OCCUPANCY RATE OF EACH PROFILE, RELATIVE TO THE BUSIEST DAY PER PROFILE (RETRIEVED FROM HOUTVEEN ET AL., 2024, PP.8)	94
FIGURE 6.6 OUTCOME OF THE MODIFIED SHARE RATIO FROM THE DEMAND MODEL BASED ON INPUT OF THE WORK LOCATION PREFERENCE PROFILES (HOUTVEEN ET AL., 2024)	94
FIGURE 6.7 OUTCOME OF SHARE-RATIO BASED ON WORK LOCATION PREFERENCE PROFILE 'DEDICATED HOME WORKER	95

List of Tables

TABLE 2.1 OBJECTIVE AND TASKS DURING INTERVIEW I (ARKESTEIJN, 2019)	35
TABLE 2.2 OBJECTIVE AND TASKS DURING THE WORKSHOPS (ARKESTEIJN, 2019)	36
TABLE 2.3 OBJECTIVES AND TASKS DURING INTERVIEW II (ARKESTEIJN, 2019).....	36
TABLE 3.1 THE THREE MAIN OBJECTIVES IN THIS RESEARCH	52
TABLE 4.1 THE SPECIFICATIONS OF THE THREE KEY TERMS IN THE OBJECTIVES FOR THE REFERENCE MODELS	57
TABLE 4.2 PERFORMANCE SPECIFICATIONS LEVELS OF THE REFERENCE MODELS	57
TABLE 4.3 THE SPECIFICATIONS OF THE THREE KEY TERMS IN THE OBJECTIVES FOR THE DEMAND MODEL	58
TABLE 4.4 PERFORMANCE SPECIFICATIONS LEVELS OF THE DEMAND MODEL	58
TABLE 4.5 SIMPLIFIED VERSION OF THE REFERENCE MODEL - HYBRID WORKING WITH IDENTIFIED VARIABLES	61
TABLE 4.6 EXAMPLE OF REFERENCE DECISION VARIABLE RETRIEVED FROM SURVEY QUESTIONS CFPB (2023A)	62
TABLE 4.7 ALL IDENTIFIED DECISION VARIABLES FROM THE DOCUMENTS OF CFPB (2023AB).....	62
TABLE 4.8 ALL ANALYSED DECISION VARIABLES FROM THE REPORTS AND SURVEY (CFPB, 2023AB; HOUTVEEN ET AL., 2024A; CFPB, 2025)	63
TABLE 4.9 ALL ANALYSED DECISION VARIABLES FROM THE OFFICE ACCOMMODATION POLICY FRAMEWORK (SWENS, 2024) AND CONFIDENTIAL DETAILS (X) ARE LEFT OUT.	66
TABLE 4.10 DISTRIBUTION OF EMPLOYMENT HEADCOUNT AMONG POLICE ‘OFFICE’ EMPLOYEES, WITH FIGURE RETRIEVED FROM CFPB (2024A).....	68
TABLE 4.11 CALCULATION OF THE NUMBER OF DAYS EMPLOYEES WORK IN THE OFFICE IN A WEEK (A) BASED ON SURVEY DATA (CFPB, 2025)	69
TABLE 4.12 AVERAGE WEEKLY OCCUPANCY OF THE OFFICE TARGET GROUP (CFPB, 2023B)	69
TABLE 4.13 SURVEY QUESTIONS (CFPB, 2023A) RELATED TO ABW IMPLEMENTATION PLAN.....	70
TABLE 5.1 OUTCOME OF THE INTERVIEWS FROM THE FIRST FOUR STEPS OF THE PAS METHOD (ARKESTEIJN, 2019)	76
TABLE 5.2 OUTCOME OF THE PERFORMANCE SPECIFICATIONS OF REFERENCE MODEL HYBRID WORKING TRENDS	77
TABLE 5.3 OUTCOME OF THE PERFORMANCE SPECIFICATIONS OF REFERENCE MODEL KNOWLEDGE WORKERS	78
TABLE 5.4 THE RELATIONSHIP BETWEEN THE REFERENCE MODEL, KNOWLEDGE WORKERS, AND THE PAS METHOD (ARKESTEIJN, 2019)	78
TABLE 5.5 OUTCOME OF THE PERFORMANCE SPECIFICATIONS OF THE REFERENCE MODEL POLICY ACCOMMODATION	79
TABLE 5.6 THE RELATIONSHIP BETWEEN THE REFERENCE MODEL, POLICY ACCOMMODATION, AND PAS METHOD (ARKESTEIJN, 2019)	79
TABLE 5.7 ACCESSIBILITY DECISION VARIABLE THAT WAS INTERPRETED DIFFERENTLY	79
TABLE 5.8 OUTCOME OF THE PERFORMANCE SPECIFICATIONS OF THE DEMAND MODEL IN WORKSHOP I	83
TABLE 5.9 THE DECISION VARIABLES WITH A MINIMAL FIT-FOR-PURPOSE RELATIONSHIP BETWEEN THE REFERENCE MODELS AND THE PAS METHOD	84
TABLE 6.1 ADJUSTMENTS OF THE DECISION VARIABLES AFTER INTERVIEW II.....	90
TABLE 6.2 OUTCOME OF THE PERFORMANCE SPECIFICATIONS OF THE DEMAND MODEL IN WORKSHOP II	92

List of Appendix

Appendix A:	Interview and Workshop Protocol
Appendix B:	Interview Questions
Appendix C:	Workshop Outline
Appendix D:	Informed Consent Form
Appendix E:	Pilot study of the preference-based accommodation strategy design and decision approach
Appendix F:	Extra analysis for data in the decision-making
Appendix G:	The Hybrid Office Portfolio Optimisation – PAS model
Appendix H:	Data Management Plan
Appendix I:	HREC Approval

Abbreviations

ABW	Activity-Based Working
CfPB	Center for People and Buildings
CRE(M)	Corporate Real Estate (Management)
DSR	Design Science Research
DW	Different Working (translated from 'Anders Werken')
HOPO	Hybrid Office Portfolio Optimisation
NPM	National Portfolio Management (translated from 'Landelijk Portefeuille Management (LPM)')
PAS	Preference-based Accommodation Strategy (design and decision-making approach)
PDC	Politie Dienstencentrum (translated to Police Services Centre)
PRE(M)	Public Real Estate (Management)

TABLE OF CONTENTS

Colophon	3
Preface.....	4
Summary.....	5
1. Introduction.....	19
1.1 Topic	19
1.2 Problem Analysis.....	22
1.3 Problem Definition.....	23
1.4 Research Objective in the context of the Netherlands Police.....	24
1.5 Research Questions	25
1.6 Conceptual Model.....	26
1.7 Relevance.....	27
2. Research Method.....	29
2.1 Research Type.....	29
2.2 Research Design.....	30
2.3 Knowledge base: The Client statement	31
2.4 Design Science Research: Conceptual Design	31
2.5 Environment: Application Domain	34
2.6 Knowledge Base: The Hybrid Office Portfolio Optimisation (HOPO) - PAS.....	37
2.7 Data Management Plan	37
2.8 Ethical Considerations.....	37
3. Knowledge Base: Client Statement.....	40
3.1 Introduction	40
3.2 Real Estate Management.....	41
3.3 Preference-based Accommodation Strategy design and decision-making method.....	45
3.4 Integration into the PAS Method	49
3.5 Conclusion of the Client statement	52
4. Design Science Research: Conceptual Design	56
4.1 Design development	56
PART I - 'Hybrid Working Preferences'	59
PART II - 'Portfolio Optimisation'	67
4.2 Conclusion of the Conceptual Design	71
5. Environment: Preliminary Design	73
5.1 Design Development.....	73

PART I - 'Hybrid Working Preferences'	76
PART II - 'Portfolio Optimisation'	80
5.2 Conclusion of the Preliminary DESIGN.....	84
6. Environment: Detailed Design	89
6.1 Design Development.....	89
PART I - 'Hybrid Working Preferences'	90
PART II - 'Portfolio Optimisation'	90
6.2 Conclusion of the Detailed Design	96
7. Discussion	100
7.1 Interpretation of the Results.....	100
7.2 Limitations of Research.....	102
7.3 Suggestion for Further Research.....	104
7.4 Implications and impact.....	105
8. Conclusion	107
8.1 PART A 'INPUT'	107
8.2 PART B 'PROCESS'	108
8.3 PART C 'Output'	109
8.4 Main Conclusion	109
9. Recommendations	111
9.1 Recommendations for the Integration of Models into the PAS Method	111
9.2 Recommendations for the Police.....	113
10. Reflection.....	116
10.1 The Product	116
10.2 Process:.....	117
References	119
Appendices	125

01

Introduction

1. INTRODUCTION

This chapter will emphasise the relevance of the study by discussing the context, problem statement, goals and objectives, as well as the societal and scientific relevance. The research logic is outlined through the formulation of research questions and a conceptual model.

1.1 TOPIC

[The Evolving Workplace and Hybrid Working Preferences](#)

The workplace has undergone significant transformation in recent decades due to technological, economic, and social changes (Sokolic, 2022). These changes have influenced work styles, particularly in office environments, resulting in more flexible and dynamic workspaces (Harris, 2015). The evolution of the workplace has been accelerated by demographic shifts, the rise of knowledge-intensive jobs, and rapid technological advancements that allow for location-independent work (Yang et al., 2019). In particular, technological innovations, such as mobile technologies and improved network connections, have expanded the traditional boundaries of the workplace, enabling employees to work from anywhere (Höcker et al., 2022).

The COVID-19 pandemic further catalysed these shifts, forcing organisations and employees alike to adapt quickly to remote work. What began as a temporary solution to lockdowns and social distancing measures soon became a more permanent fixture in workplace culture. For many employees, the transition to working from home revealed benefits such as improved work-life balance, greater autonomy, and reduced commuting times (Appel-Meulenbroek et al., 2022). Studies indicate that flexibility and autonomy are often considered more important than salary in determining job satisfaction and loyalty (Sokolic, 2022). However, the rapid shift to remote work during the COVID-19 pandemic was not without its challenges. Many struggled with inadequate infrastructure, limited experience, low motivation, and organising work in family settings (Höcker et al., 2022). Additionally, reduced social interaction, lack of productivity, technology-related problems, health and safety risks, and unclear boundaries between work and personal life contributed to increased stress, exhaustion, and burnout (Sokolic, 2022). Despite these challenges, the benefits of flexibility, particularly the ability to choose where and when to work, have led to the growing popularity of hybrid work models (Sokolic, 2022).

For organisations, the shift to hybrid working has necessitated a rethink of traditional workplace strategies. Organisational agility and adaptability (Harris, 2015) have become increasingly important in responding to market uncertainty and external shocks, such as the COVID-19 pandemic. Flexible workplace arrangements, including hybrid working, allow companies to quickly adapt to changing conditions while maintaining team collaboration and knowledge sharing (Höcker et al., 2022). Incorporating hybrid working models into corporate real estate (CRE) strategies presents both challenges and opportunities for organisations. On the one hand, hybrid working reduces the need for large, fixed office spaces, allowing organisations to downsize their physical footprint and save on costs (Gupta et al., 2022). On the other hand, organisations preserve culture, enable collaboration, and support engagement in a decentralised setting (Sokolic, 2022). This requires a strategic approach to office design, focusing on creating spaces that foster social interaction and teamwork while providing flexibility for individual work needs, such as concentrated work (Harris, 2015; Appel-Meulenbroek et al., 2022).

Shifting Demand for Office Space

A key component of this transition is the ability to attract and retain skilled and high-value staff, who increasingly prioritise flexibility and work-life balance when choosing employers (Harris, 2015). Companies that integrate these elements into their workplace policies are not only more likely to retain talent but also enhance productivity by fostering a work environment that supports user control and accommodates individual needs (Sokolic, 2022).

As a result, workplace preferences for hybrid working are shaping organisational strategy, whereby some companies have implemented stricter office attendance policies. For example, Amazon now requires employees to work on-site five days a week to increase the productivity and interaction of employees (van Rijswijk, 2024), while Wolters Kluwer mandates a minimum of eight office days per month for employees and two days per week for managers (Knoop & van Rein, 2024a). However, the response from Dutch companies seems to favour hybrid working with 87% implementing it as a standard practice, citing benefits such as higher productivity, improved employee retention and reduced costs (Vlaming, 2024).

The changes in work styles and organisational needs have had a profound impact on the demand for office space. Hybrid working has led to a decline in office occupancy rates, particularly on days when employees are less likely to come into the office, such as Fridays (van Rein, 2024). Companies are exploring alternative workspace models, such as co-working spaces and shared office environments, which provide the flexibility needed to adapt to fluctuating space requirements (Cooke et al., 2022). As hybrid working has become more widespread, many large organisations have begun reducing their office space requirements (Knoop & van Rein, 2024b). It is expected that many companies will adopt hybrid working patterns, with employees working in the office for two or three days per week and the rest from home (van Rein, 2024). Moreover, there has also been a notable flight-to-quality in the office market, with higher-quality office spaces retaining their value or even seeing rent increases, as companies seek to improve office environments to attract employees back to the workplace. While lower-quality buildings face declining demand and growing pressure for repurposing (Gupta et al., 2022). This is anticipated to result in a reduction of office space by 20-30% (Cooke et al., 2022). In the Netherlands, for example, large employers continue to downsize their office portfolios, with some companies reducing their office space by up to 20% (Knoop & van Rein, 2024b).

Portfolio Optimisation

This presents substantial challenges for organisations in managing their real estate portfolios. Organisations are increasingly seeking to optimise their portfolios by balancing the need for flexible workspaces with the financial and operational efficiencies that come from reducing their physical footprint (Echeverri, 2020; Gibson, 2003; Haynes & Nunnington, 2010). Cooke et al. (2022) highlight the shifting attitudes of corporate occupiers toward flexible office arrangements, with many seeking to adopt more adaptive strategies in the wake of the COVID-19 pandemic. The workplace is no longer perceived as a single or one-size-fits-all entity but is evolving into a diversified set of spaces and capabilities that support a range of work activities (Mahoutchian et al., 2023). These challenges are compounded by the need to address underutilised office space and fluctuating occupancy levels (van Rein, 2024).

To effectively manage this transition, organisations consider multiple dimensions of flexibility. Van Vliet et al. (2004) emphasise the importance of shifting towards alternative workplace strategies within CRE management, advocating for enhanced physical, technical, organisational, and juridical-financial flexibility. The location has the most significant implications for the office portfolio at both the micro and macro levels in terms of place, space and use (Gibson, 2003). In addition, Miller (2014) emphasises the need for more efficient space utilisation, with organisations reducing their office footprints and adopting flexible working policies, though entrenched workplace cultures persist, leaving large public firms particularly vulnerable to the impacts of downsizing.

Hybrid working is considered a structural shift rather than a temporary trend, requiring portfolio optimisation through a recalibration of space per employee, location accessibility, flexibility in use and sustainability (CBRE, 2023). While 87% of business leaders believe the right workplace model development is important, only 24% feel ready to address it (Mahoutchian et al., 2023). To achieve this, it is important to understand the demand for space by analysing office attendance and space utilisation patterns (CBRE, 2024). Many organisations are rethinking their work environments, yet often without a clear strategy or understanding of what the work truly requires. A future-proof workplace strategy should be driven by the nature of the work itself, focused on desired outcomes, and aligned with both organisational goals and employee needs (Mahoutchian et al., 2023). The rise of hybrid working creates opportunities for the decentralisation of office portfolios, with organisations increasingly investing in satellite offices and mixed-use locations closer to where employees live (Gardner & Gujral, 2025). This means the real estate sector reimagines both supply and demand by adapting the types and locations of spaces it offers while responding to changing expectations about how people want to work (McKinsey, 2025).

1.2 PROBLEM ANALYSIS

The growing adoption of hybrid working has significantly impacted workplace dynamics, particularly for employees and organisations in the knowledge-intensive industry (Harris, 2015; Yang et al., 2019). This transformation has created both opportunities and challenges due to differing hybrid working preferences. While it offers autonomy, reduced commuting, and better work-life balance, it also results in less social interaction, communication and coordination issues, and a weakening of organisational culture (Appel-Meulenbroek et al., 2022; CBRE, 2023). These changing preferences have also influenced the demand for office space, which has become more flexible, uncertain and unpredictable. Office attendance fluctuates, and occupancy levels are unevenly distributed throughout the week, making it difficult to predict how much and what kind of office space is required. This is particularly evident in broader applications at the portfolio level regarding where, when, and how knowledge workers feel most comfortable working. Consequently, there is a growing demand for fewer but higher-quality and more sustainable offices, often located in areas that are easily accessible by public transportation (CBRE, 2023). As a result, many organisations are reassessing their office real estate portfolios, aiming to reduce office space, improve alignment with work processes, and increase flexibility in terms of size, layout, and location (Gupta et al., 2022).

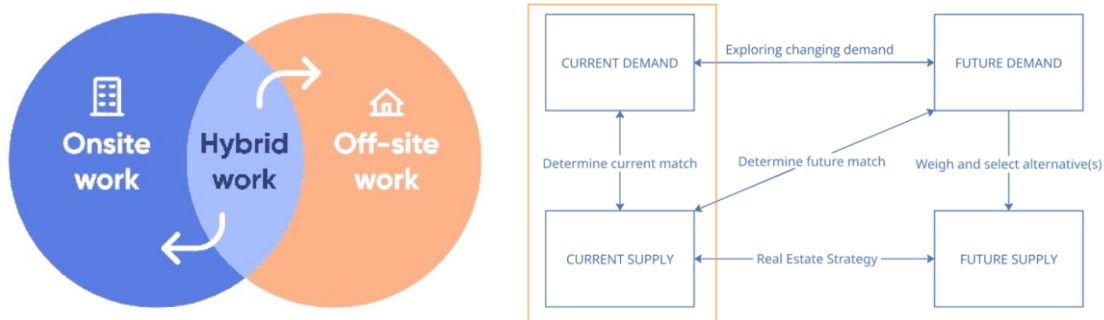


Figure 1.1 Hybrid Work (Miroslavov, 2024) with current mismatch according to the DAS framework (De Jonge et al., 2009)

Organisations recognise the necessity and benefits of reassessing their office space, with 73% identifying portfolio optimisation as their top goal for 2025 and placing particular focus on reducing space in response to changing work patterns and employee preferences (JLL, 2025). Optimisation can lead to a more efficient use of space with global utilisation now at 54%, lower operational costs, and better alignment with strategic organisational goals (CBRE, 2023; JLL, 2025). Especially larger companies, particularly in the Netherlands, that are currently embracing hybrid working, have already begun optimising their real estate portfolios (Knoop & van Rein, 2024b). These companies have carried out optimisation by merging locations, establishing offices with lower commute times, and reconfiguring existing buildings (JLL, 2025; McKinsey, 2025). Some organisations have downsized their portfolios by up to 20%, and future projections indicate a structural reduction in office space demand by 20 to 30% (Knoop & van Rein, 2024b; Cooke et al., 2022).

THE FUTURE OF HYBRID WORK

Companies are no longer just discussing hybrid working, they're taking action.



Figure 1.2 Portfolio optimisation statistics

Despite extensive reporting of results, it remains unclear how optimisation is achieved. Reports present outcomes without explaining how space requirements were determined, thereby omitting decision-making information. This lack of transparency limits the application of portfolio optimisation.

To map changing office demand from hybrid working, organisations often use surveys (CfPB, 2024; Leesman, 2025). Surveys, such as 'Work in Transition' (CfPB, 2024), provide valuable insights into employee experiences and preferences (e.g., home rated 8.2, office rated 6.2), and preferred locations for certain activities. However, these results remain descriptive and behavioural as they do not quantify space needs in terms of square meters, workplaces, or capacity per location. For this purpose, Cheng (2022) developed a demand model within his scenario planning method to quantitatively calculate office space needs based on hybrid working preferences. This demand model is the most recent study that explicitly makes the connection between user preferences and space requirements. However, the outcome remains limited to the building level. To support decision-making regarding accommodation, Arkesteijn (2019) developed a design and decision-making approach, known as the Preference-based Accommodation Strategy (PAS). Based on a comparative study of several decision-making models, Swens (2024) concluded that the PAS method is the most suitable method for supporting a real estate portfolio design. This makes the PAS method currently the most comprehensive method because it translates stakeholder preferences into quantifiable decision variables, applies mathematically grounded preference scoring, and enables the iterative design of portfolio alternatives that align with organisational strategy (Arkesteijn, 2019). Although the PAS integrates preferences and strategic considerations, providing insight into decision-making, this method is not explicitly aimed at solving hybrid working and optimisation problems within office portfolios.

1.3 PROBLEM DEFINITION

Literature indicates that hybrid working has the potential to optimise real estate portfolios. However, there is a lack of research detailing how such optimisation can be effectively achieved. While several existing research instruments, such as surveys (CfPB, 2024; Leesman, 2025), Cheng's (2022) office space demand model, and the PAS method (Arkesteijn, 2019), each address this issue, none provide an integrated approach that translates hybrid working demand towards the supply for office portfolio optimisation. Although the PAS method could potentially be applied in this context, it is currently a general design and decision-making method that does not explicitly address hybrid working preferences or demand.

Therefore, this research addresses this gap by **adapting** the PAS method to **integrate** hybrid working preferences and demand into a **fit-for-purpose** design and decision-making for office portfolio optimisation. In this context, adapting is defined as "to change something to suit different conditions or uses." The term integrating means "to combine two or more things in order to become more effective." Fit for purpose means being "suitable and good enough to do what it is intended to do" (Cambridge University Press, n.d.). The integration of hybrid working preferences is structured into reference models to capture the diverse and sometimes conflicting needs of hybrid working, while hybrid working demand is addressed by further developing the demand model (Cheng, 2022) at the portfolio level. Together, these models constitute the research instruments for integration into the PAS method. The adapted PAS method will be tested in a pilot study with the Netherlands Police to evaluate how the research instruments are integrated and assess whether the resulting approach is fit for purpose in supporting decisions regarding hybrid working and office portfolio management.

1.4 RESEARCH OBJECTIVE IN THE CONTEXT OF THE NETHERLANDS POLICE

Dewulf, De Jonge and Krumm (2000) define the objective of Corporate and Public Real Estate Management as:

“The objective of Corporate & Public Real Estate Management is the alignment of the real estate portfolio of a corporation or a public authority to the needs of the core business, in order to obtain maximum added value for the business and to contribute optimally to the overall performance of the organisation.”

This graduation research aligns with that objective by focusing on how an office real estate portfolio can achieve maximum added value to support optimisation in the context of hybrid working. Therefore, the existing Preference-based Accommodation Strategy (PAS) method (Arkesteyn, 2019) is adapted for hybrid working to achieve this. The PAS method provides the foundation for aligning the office real estate portfolio with organisational needs. The integrated research instruments are referred to as the Hybrid Office Portfolio Optimisation (HOPO) model to add value and assess hybrid working preferences and office space demand. Each instrument offers insights into the changing demand for hybrid working, and its integration into the PAS is intended to support fit-for-purpose design and decision-making by utilising informed data. The research first focuses on conceptualising and modelling the HOPO model, after which its application is evaluated in the PAS through a pilot study within the Netherlands Police, with the aim of refining the model for practical use and ultimately developing the HOPO-PAS.

The police are one of the largest public organisations in the Netherlands, managing a real estate portfolio of 813 buildings (Police, 2023). This research focuses specifically on their office space portfolio. The shift towards hybrid work has reduced the need for large, centralised offices, prompting the police to rethink their accommodation strategy. Through the so-called ‘Anders Werken’¹ programme, the organisation aims to transition to activity-based and location-independent working, supported by decentralised hubs located closer to employees’ homes to enhance efficiency and well-being (Projectteam Anders Werken, 2022b). This transition is also part of a broader effort to reduce costs, as public organisations are increasingly required to cut back on their real estate portfolios while maintaining strategic objectives (Theloesen, 2025) With a current office portfolio of 692,000m², the organisation aims to reduce its footprint by approximately one-third by 2040 (Directie FM en sector Huisvesting, 2023).

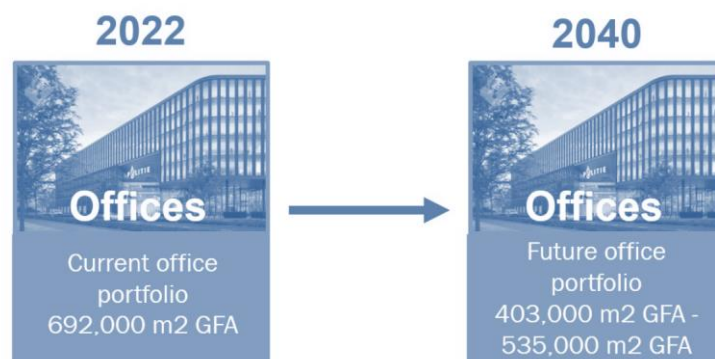


Figure 1.3 Current and future office portfolio of the police (Swens, 2024, p.23)

¹ ‘Anders Werken’ is an internal policy of the Netherlands Police aimed at implementing hybrid working practices, literally translated as Different Working.

1.5 RESEARCH QUESTIONS

Based on the problem statement and research objective, this graduation research aims to address the following main research question:

How can the PAS design and decision-making method be adapted into a fit-for-purpose design and decision-making model that integrates hybrid working demands for optimising office real estate portfolios?

To answer the main research question, this research has been divided into three parts: part A 'input', part B 'Process' and part C 'output'.

PART A INPUT

In this part, the identified hybrid working demands are developed for their integration into the Preference-based Accommodation Strategy design and decision-making method (Arkesteijn, 2019). This involves the development of the Hybrid Office Portfolio Optimisation (HOPO) models, consisting of reference models for hybrid working preferences and a further developed demand model (Cheng, 2022), which together form the research instruments.

- What hybrid working demands can be developed, and how can they be integrated?

PART B PROCESS

In the second part, the PAS method is applied, which consists of two activities, where in the interviews, the first four steps are executed with different stakeholders that serve as input for the design and decision-making of the office portfolio. For the second activity, the workshop is carried out in the fifth step, and interviews are conducted in the sixth step to design and select portfolio alternatives based on stakeholder preferences, using the decision-making model. The PAS method includes a second workshop to evaluate and refine the input between workshops with a second round of interviews. This is tested during a pilot study with the Netherlands Police. In this phase, the hybrid working demands identified in Part A are integrated into the PAS interviews and workshops, allowing the research to explore how these inputs interact with the method.

- What is the relationship between the integrated hybrid working demands and the application of the PAS design and decision-making method?

PART C OUTPUT

In the last part, the research synthesises the findings from the previous phases to reflect on the integration of hybrid working demands within the PAS method. It evaluates whether the changes to the PAS method align better with the new context and assesses the extent to which the HOPO model supports the PAS method in achieving its intended purpose.

- How can the PAS model be adapted, and what needs to be changed to support a fit-for-purpose design and decision-making?

1.6 CONCEPTUAL MODEL

The Designing and Accommodation Strategy (DAS) frame (De Jonge et al., 2009) is applied to outline the integration of the research instruments and the PAS method. “The DAS frame is a cyclic and iterative process that moves along two axes, from demand to supply and from current to future, and can be started at different points” (Arkesteijn, 2019, p. 71). Within the current supply of the office portfolio, a mismatch exists in addressing the current demand for hybrid working. The changing demand for hybrid working is addressed by first identifying the hybrid working preferences in the reference models. Some of these preferences are then used to estimate the future office portfolio space demand, enabling a more accurate assessment of the portfolio needs. This is applied in the design and decision-making model of the PAS, in which these elements are integrated to design and optimise portfolio alternatives. The scope of the research is limited to adapting this model and does not include implementing a plan to transform the current supply into the future supply. The conceptual model in Figure 1.4 illustrates the relationship between the changing demand for hybrid working and its translation into the office portfolio.

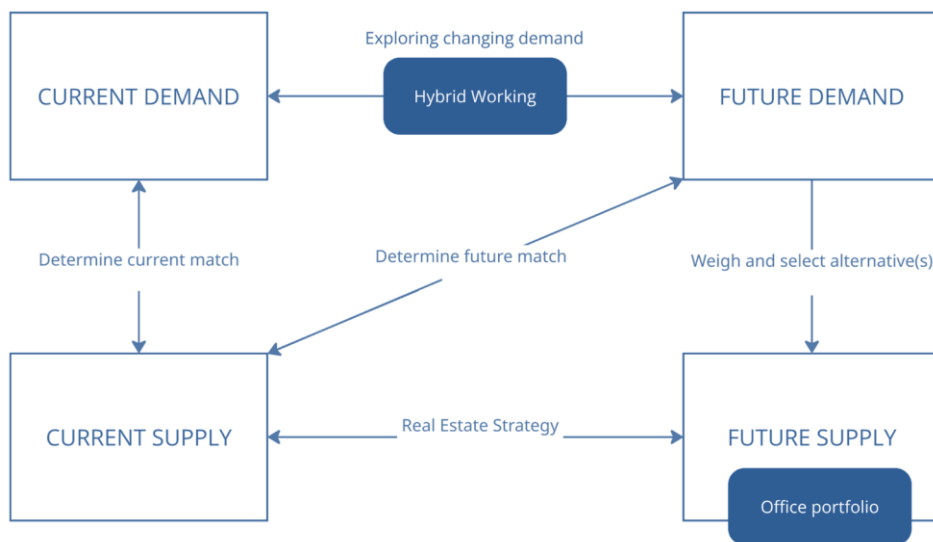


Figure 1.4 Conceptual model, positioned in the DAS frame (Own illustration, based on DAS frame, De Jonge et al. (2009))

1.7 RELEVANCE

1.7.1 SOCIAL RELEVANCE

The relationship between supply and demand is constantly evolving, creating a mismatch between the current office portfolio and what the organisation actually needs under hybrid working. Through the introduction of hybrid working, the existing stock can be optimised, which in turn lowers the demand for future supply. This optimisation generates several positive outcomes. First, it helps to reduce carbon emissions when employees are enabled to work from multiple locations closer to home, commuting distances are shortened, and the overall travel demand is reduced. Research by Regus (2018) estimates that such flexible working could reduce worldwide carbon dioxide emissions by 214 million tonnes per year by 2030. That is equivalent to the carbon absorbed by 5.5 billion trees over a period of ten years and could save around 3.53 billion hours of commuting each year by 2030 (Regus, 2018). Second, hybrid working has led to a significant reduction in energy consumption, with companies reporting an average decrease of 20% in their energy use, while 84% state that adopting a hybrid model has been crucial in cutting both their energy consumption and carbon footprint (IWG, 2024). At last, hybrid working can improve social mobility, which could boost Europe's GDP by up to 9%, driven by better skills matching, reduced health disparities, and enhanced productivity (McKinsey, 2025).

1.7.2 SCIENTIFIC RELEVANCE

This research contributes to the goals and objectives of Real Estate Management by addressing the gap in integrating quantitative and qualitative methods for optimising office portfolios under hybrid working conditions. In addition to surveys from institutions such as the Center for People and Buildings (2024) and Leesman (2025), which capture user preferences for hybrid working, scientific studies like Cheng (2022) provide a demand model to quantify spatial needs based on these preferences, while the Preference-Based Accommodation Strategy (PAS) method (Arkesteijn, 2019) integrates stakeholder preferences into portfolio design. However, their combined application remains underexplored. This research advances theoretical understanding by integrating both methods into a comprehensive optimisation framework using the PAS method. By focusing on a public sector organisation, it extends corporate real estate theory to address long-term policy objectives, constrained financial resources, and public accountability. The findings contribute to academic discourse on hybrid working, strategic real estate decision-making, and public sector portfolio management, providing a foundation for future research in similar contexts

1.7.3 SECTOR RELEVANCE

This research addresses the challenges faced by the Netherlands Police in aligning their office space portfolio with evolving workplace dynamics brought about by hybrid working. As a vital public institution with over 63,000 employees, the police depend on effective accommodation to fulfil their mission of ensuring safety and upholding the rule of law (Directie Facility Management, 2023). Not only have the police, but many large companies also embraced hybrid working, with multiple companies like CBRE, JLL, and McKinsey indicating the growing demand. CBRE (2024) indicates that 80% of current occupiers have adopted hybrid working, and three out of four world regions have seen a consistent decline in the demand for traditional office space since mid-2022, indicating a structural shift towards hybrid work models (RICS, 2024). Tsipursky (2025) demonstrates that structured hybrid work has become mainstream, urging businesses to rethink their office strategies as a critical shift rather than a passing trend.

02

Research Method

2. RESEARCH METHOD

This chapter outlines the selected research method and explains the structure and approach taken throughout the graduation project.

2.1 RESEARCH TYPE

This research aims to **adapt** the existing Preference-based Accommodation Strategy (PAS) method (Arkesteijn, 2019) by **integrating** research instruments to provide a more **fit-for-purpose** design and decision-making in this research. This involves the development of a so-called artefact, which is a designed object, model, or system created to address a specific problem through a structured, iterative process (van Stijn, 2023). According to Barendse et al. (2012), operations research focuses on designing new artefacts that do not yet exist, contrasting with empirical research, which aims to generate knowledge and formulate explanations. This research builds upon the existing PAS artefact to adjust specifically for hybrid working. By following an operations research approach, it integrates the research instruments into the PAS artefact as part of the overall design process, aiming to improve the future situation through a prescriptive method.

The operations research approach involves designing new artefacts, so it should follow a design process, as it relates to a design problem (Barendse et al., 2012). In order to adapt the PAS method for hybrid working, several design steps are followed. A structured representation of this process is shown in Figure 2.1. This figure presents an iterative design approach, initially inspired by the operations research framework of Ackoff and Sasieni (1968) but further elaborated by Dym and Little (2004) into a more comprehensive sequence. Each phase of the design process includes a set of activities that require empirically derived input to move forward effectively. These steps are not strictly linear, as the process allows for iteration and continuous refinement.

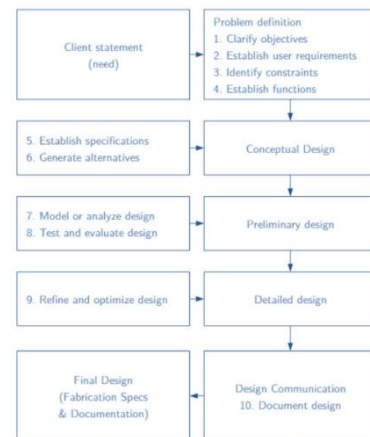


Figure 2.1 Steps of design process (Dym & Little, 2004, p.24)

Operational research (formal) alone is not sufficient to solve the identified problem and answer the main research question, as the model will also be tested through empirical research. The framework of Barendse (2012) presents the interrelationship between the two research processes. Both research processes are cyclical, forming two iterative loops that are interconnected at four specific points. The outer cycle in Figure 2.2 outlines the design process. This outer cycle reflects the iterative nature of design activities, where a continuous interaction between conceptualisation, modelling, evaluation, and refinement is required to address complex decision problems effectively. It also demonstrates that the design process cycle can be repeated several times until there is no 'clash' between the design and the problem (Barendse et al., 2012).

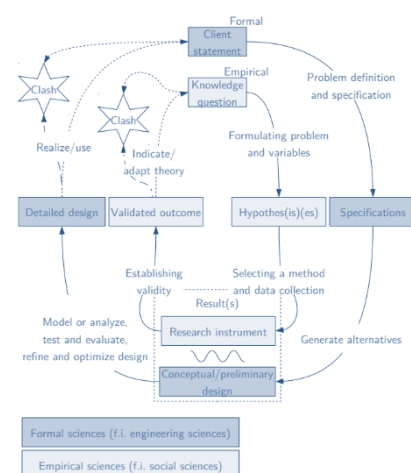


Figure 2.2 Formal Sciences and Empirical Sciences Process (Barendse et al., 2012, p.6)

2.2 RESEARCH DESIGN

This research has interconnected iterative design cycles with several steps of the design cycle to answer the main research question. The approach of this research consists of 10 design steps that align with the framework of Dym & Little (2004). The design research cycles of Hevner (2010) illustrate the design process, including all its steps and their interrelationships, within three iterative loops. The design steps are visualised in the cycles of Hevner, as shown in Figure 2.3.

Knowledge Base

- Step 1-4: Client Statement formulated as problem definition
Client Statement [Chapter 3]

Design Science Research

- Step 5: Specifications
- Step 6: Development Part I (PAS method Interviews)
6a. Reference model Hybrid Working with input Literature Study
6b. Reference model Knowledge Workers (KW) with input Center for People and Buildings survey data (CfPB, 2023)
6c. Reference model Policy Accommodation with input Office Accommodation Policy Framework (Swens, 2024)
Development Part II (PAS method Workshops)
6d: Demand model with input Office space demand model (Cheng, 2022)
Conceptual design [Chapter 4]

Environment

- Step 7: Analysing the client for the pilot study
- Step 8: Interview I and Workshop I of the PAS method (Arkesteijn, 2019)
Preliminary design [Chapter 5]
- Step 9: Interview II and Workshop II of the PAS method (Arkesteijn, 2019)
Detailed design [Chapter 6]

Knowledge Base

- Step 10: Discussion, conclusions and recommendations
[Chapter 7, 8 & 9]

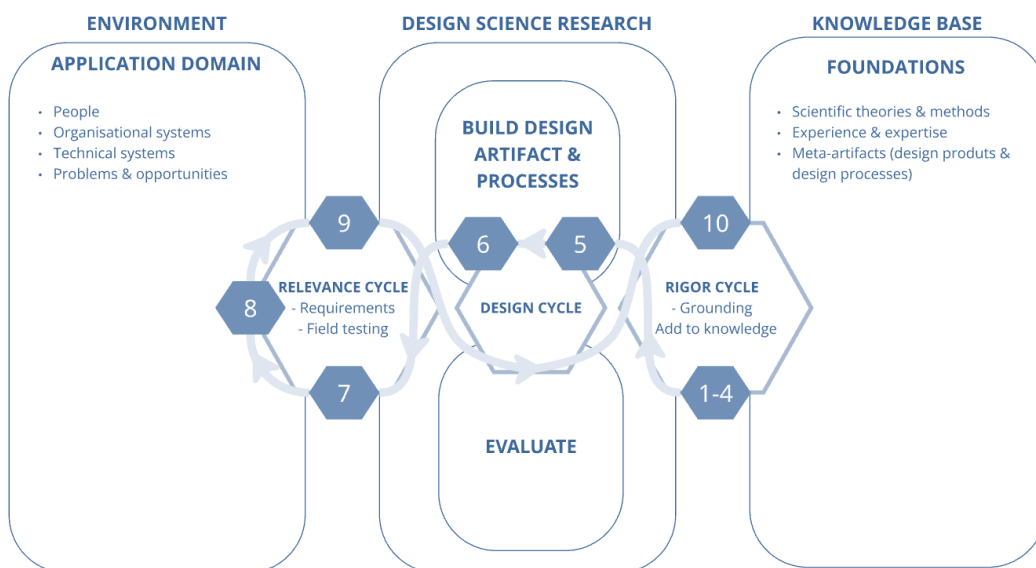


Figure 2.3 Indication of the research steps in Hevner's design research cycle (Own ill. based on Hevner et al., 2010)

2.3 KNOWLEDGE BASE: THE CLIENT STATEMENT

2.3.1 THE CLIENT STATEMENT

As formulated in the problem statement [§1.2–§1.3], the initial knowledge base is established and further elaborated in Chapter 3, where the foundations from scientific theories are explained to enable the formulation of the client statement. For this reason, the client statement is formed based on a literature review to establish a foundation of knowledge on the topic. This review outlines existing knowledge and examines the concepts, theories, and methods that have been applied to it. It also identifies controversies surrounding the topic and how it is studied, including clashes of evidence and the key contributors to research on the topic (Bryman, 2016, p. 8).

The client statement is formed based on the problem definition derived from the literature study of the knowledge base, as shown in Figure 2.3. The literature review comprises three studies that, in the end, contribute to the formulation of the client statement for this graduation research.

- *Study 1*: Real estate management. A study aimed at understanding how real estate contributes to organisational performance and its value from different stakeholder perspectives.
- *Study 2*: PAS method. A study that analyses the PAS method to identify opportunities for its adoption beyond a generic application.
- *Study 3*: Integration into the PAS method. A study aimed at integrating supplementary insights and frameworks to support the adoption of the PAS method in response to the changing demand for hybrid working.

The client statement consists of the method of the model that outlines the requirements for adapting the PAS method for future use, and how the model(s) should be structured. The outcomes are used to develop the conceptual design.

2.4 DESIGN SCIENCE RESEARCH: CONCEPTUAL DESIGN

2.4.1 MODELLING PART I

Literature study

The first reference model utilises a literature study to identify hybrid working preferences of trends. It examines the main concepts of hybrid working and portfolio management to identify relevant literature that explores their relationship of preferences.

A narrative literature review was conducted to provide a conceptual overview by using the following search query: "hybrid Work" OR "Flexible workspace" OR "Remote Work" OR "Work-life balance" OR "Workplace" AND "Corporate real estate portfolios" OR "Portfolio management" OR "Office space" OR "Workspace optimisation" OR "flexible strategies". Moreover, additional papers were identified through the use of the same search terms in Google Scholar, with selected papers chosen by the researcher, and through recommendations provided by mentors based on their expertise.

To conduct the review of the literature, the Scopus database was utilised. The search was performed on 12 December 2024 and initially yielded 343 papers. To narrow the scope further, specific filters were applied in Scopus. The subject areas were restricted to Engineering, Social Sciences, Business, Management and Accounting, Environmental Science, Economics, Econometrics and Finance, and

Decision Sciences, and only papers written in English were included. This refinement reduced the number of documents to 264.

The next step involved screening the titles and abstracts to identify studies directly aligned with the research objectives. The inclusion criteria focused on papers that addressed hybrid working impacts in the context of offices or discussed portfolio management strategies. After applying these criteria, only the most relevant ones were selected for the research focus. These articles were chosen for their alignment with the study's objectives and their contributions to understanding how hybrid working influences corporate real estate management strategies and decision-making processes.

Survey data

This research makes use of secondary data derived from an existing survey conducted by the Center for People and Buildings (CfPB, 2023) as part of the Work in Transition Monitor. The original survey was carried out in collaboration with Delft University of Technology and Eindhoven University of Technology and investigates various aspects of hybrid working preferences among police office employees. In this research, the survey data are used to identify hybrid working preferences from the employees, which are transformed into a reference model and could serve as input for the demand model.

The survey specifically targeted police employees engaged in hybrid work practices, as defined in the 'Anders Werken¹' policy (Projectteam Anders Werken, 2022b), with the aim of generating broader knowledge in the field of hybrid working. Although this study does not involve the collection of primary empirical data, the secondary dataset provides structured, quantitative insights into perceptions, behaviours, and experiences of hybrid working.

Surveys are a widely recognised method for collecting generalisable data from large populations (Dillman et al., 2014). In this case, the CfPB survey was digitally distributed to a random sample of 6,000 police employees across various organisational units, resulting in 1,927 responses and a response rate of 32%. This exceeds the minimum threshold of 374 participants required to ensure statistical validity and reliability.

The original dataset includes an internal benchmark that distinguishes five police target groups: Intelligence Organisation, Recherche, Local Police Service (GGP), Office, and Others. For the purpose of this study, only the responses from knowledge workers of the office target group were analysed to extract reference decision variables relevant to office portfolio optimisation. Access to the anonymised dataset was granted in SPSS format by CfPB. The analysed survey items focus on workspace preferences, such as preferred locations (home, office, or other), and factors influencing those choices.

Office Accommodation Policy Framework

This research also makes use of secondary data derived from the thesis by Swens (2024). The framework developed in the research is the Office Accommodation Policy Framework, which is the result of an in-depth document analysis of three strategic policy documents from the Netherlands Police: Accommodation Vision 2040, Target Portfolio & Real Estate Strategy, and Framework & Rules. These internal documents are later outlined in step 7 to conceptualise the client of the pilot study. As part of this research, the existing Office Accommodation Policy Framework developed by Swens (2024) is applied as a reference model.

This framework represents the accommodation strategy for both the overall real estate portfolio and the office portfolio. The number of identified decision variables is extensive and includes direct references to the original descriptions found in the analysed policy documents. For their application, the decision variables were further examined to assess their relevance and suitability for integration into a hybrid portfolio optimisation context. With this analysis, a deeper understanding of the underlying policy goals was achieved, enabling the effective use of the reference model as a supporting tool during stakeholder interviews.

2.4.2 MODELLING PART II

Office space demand model

This research applies a mathematical modelling technique based on Cheng's (2022) office space demand model, which is further adapted to estimate the total office space demand within the organisation's office real estate portfolio. Cheng's (2022) demand model provides a framework for estimating future office space demand within a single office building, based on varying hybrid working preferences. Although Cheng (2022) notes that the formula may need adaptation for different organisational contexts, its robustness and flexibility make it a valuable tool for this study. Therefore, the model is extended and applied at the portfolio level to support optimisation of the office real estate portfolio in response to diverse hybrid working preferences.

For the identification of the different hybrid working preferences, the demand model of Cheng (2022) consists of a formula with three elements of employment headcount, share ratio, and the ABW (Activity-Based Working) implementation plan. The employment structure of the organisation categorises employees into task groups and persona groups, tailoring workspace demand for each group based on their specific needs and activity types. The share ratio reflects the relationship between employees and desks per persona group, while the ABW implementation plan specifies the types and distribution of workspaces required for the whole employee group. To identify the elements of the formula, this research makes use of survey data from CfPB (2023) and organisational needs derived from document analysis.

Within the police, traditional tools have been used to determine the demand at the building level. The demand model of this research builds upon this by offering demand on a portfolio level based on the different hybrid working preferences. This ensures that estimation aligns with the current demand of office space patterns from the employees and the organisation's spatial needs per group. The demand model is then further adapted to integrate into the PAS method to assess the support of portfolio optimisation.

2.4.3 CONCEPTUAL DESIGN

The development of the conceptual design is the result of the three reference models and the office space demand model at the portfolio level. The design serves as input for the design and decision-making of the PAS method to test the different reference models during the interviews and the demand model in the workshops. The conceptual design is presented in Chapter 4.

2.5 ENVIRONMENT: APPLICATION DOMAIN

2.5.1 PREFERENCE-BASED ACCOMMODATION STRATEGY DESIGN AND DECISION-MAKING METHOD

The evaluation of the conceptual design is tested through a specific application of the PAS method (Arkesteijn, 2019). This application is considered specific because the research integrates the conceptual design into the PAS method, allowing for its adaptation while still following the original steps of the PAS method. The PAS is a design and decision-making method that enables stakeholders to collaboratively develop and evaluate real estate portfolio alternatives based on quantified preferences and constraints. The PAS method follows a six-step iterative process that combines interviews and workshops (Arkesteijn, 2019):

- Interview I
- Workshop I
- Interview II
- Workshop II
- Interview III

The PAS method is used to iteratively refine and evaluate the HOPO model developed in previous research phases. By integrating feedback from individual interviews and collaborative workshops, the method ensures that the model evolves in line with stakeholder preferences. Ultimately, it also enables stakeholders to develop the office portfolio alternative that delivers the highest added value.

2.5.2 PILOT STUDY

For the application of the PAS method, the conceptual design is tested in a pilot study of the Netherlands Police. The reason for choosing a pilot study in this research is that it allows for a small-scale, preliminary investigation to test the research design, refine methodologies, and assess feasibility (Van Teijlingen & Hundley, 2001). It serves as an essential step in applied research, particularly when developing new models, as it allows for iterative refinement and evaluation within a controlled setting before broader implementation (Thabane et al., 2010).

Pilot selection

The Netherlands Police is selected as a testing ground for the model, providing a real-world context in which the integrated models are tested within the following steps of the PAS method (Arkesteijn, 2019). The research is “concerned with the complexity and particular nature of the case” as it focuses on a single organisation (Bryman, 2016, p. 60). A pilot study is designed to evaluate the effectiveness of the research approach itself. The suitability of the selected case is assessed based on its ability to meet the research design criteria of reliability, replicability, and validity (Bryman, 2016). In this regard, the police can be considered a representative or typical case, as it does not exhibit extreme or unusual ways but instead reflects a broader category of public organisations with similar challenges in real estate portfolio management, which enhances the relevance and potential transferability of the findings (Bryman, 2016).

2.5.3 INTERVIEW I

In the first round, semi-structured interviews are conducted to explore and refine the decision variables, aligned with the first four steps of the PAS method (Arkesteijn, 2019). This method allows for flexibility while capturing in-depth insights into participants’ contextual interpretations and experiences (Hennink

et al., 2011). Between steps one and two, the reference models are evaluated with an open exploration, asking stakeholders to reflect on their objectives and challenges based on their knowledge. This ensured an unbiased input without relying on the reference models. The purpose of this is to stimulate discussion, suggest new objectives, or compare them with formulated goals to aid in the scoring process in step two. The outcomes of the interviews are used to adjust and refine the decision variables and are integrated into the workshop. Table 2.1 presents the first four steps of the PAS method as the formal objective, alongside the integration of the reference models as the empirical objective.

Table 2.1 Objective and tasks during interview I (Arkesteijn, 2019)

Formal objective	Empirical objective
1. Specify decision variable(s)	- Evaluation of the three reference models
2. Assign preference scores	
3. Determine weights	
4. Determine design constraints	

Selection of the participants

The selection of participants is based on the four perspectives of Den Heijer (2011): user, organisational, real estate, and financial perspectives. Ultimately, three stakeholders were selected and interviewed, each representing one of the first three perspectives. The financial perspective was not directly represented but is incorporated as a boundary condition within the portfolio's design. Each interview lasts approximately 45 minutes to one hour, and the workshop later would take one to one and a half hours.

Participants are chosen using purposive sampling (Blaike & Priest, 2019), a targeted approach where respondents are selected based on their expertise, experience, and relevance to the research topic. This method ensures the collection of high-quality data that is both applicable and insightful in the context of real estate management within the police organisation. To ensure the reliability of the input, candidates are selected based on the following criteria:

1. Demonstrated expertise in strategic and operational office real estate decision-making within the police.
2. A minimum of five years of experience working within the police or significant familiarity with the organisation

All interviews and workshops are recorded with the participants' consent to capture detailed responses and maintain the integrity of the data. The analysis focuses on extracting actionable insights that enhance the validity and applicability of the findings.

2.5.4 WORKSHOP I

During the workshops, the demand model is tested in practice to evaluate its applicability and alignment with stakeholder expectations, with the outcomes of the previous interview. In total, two workshops are conducted. The first workshop primarily serves to familiarise stakeholders with the structure and functioning of the model, allowing them to explore the system and understand how input variables and the demand model influence portfolio outcomes, ultimately enabling them to design a portfolio alternative. Table 2.2 shows the conversion of the empirical and formal objectives of the workshops.

Table 2.2 Objective and tasks during the Workshops (Arkesteijn, 2019)

Formal objective	Empirical objective
5. Creating the Portfolio Alternatives	Testing the demand model
6. The Selection and Validation of the Design Alternative	

Selection of the participants

The workshops involved the same participants as the interviews, selected based on Den Heijer’s (2011) four perspectives. In total, three stakeholders participated, each representing the user, organisational, and real estate perspectives within the police organisation. The financial perspective was not directly represented but incorporated as a boundary condition in the model. Each workshop session lasted approximately 60 minutes.

2.5.5 PRELIMINARY DESIGN

The preliminary design is the result of the first integration of the reference models and demand model, developed by conducting steps one to six of the PAS method (Arkesteijn, 2019). For the development of the preliminary design, a second round of interviews is conducted, allowing stakeholders to make adjustments in the decision variables for the application of the second workshop. This is part of the PAS method to ensure the refinement and evaluation of both the HOPO model and its integration within the PAS. The preliminary design is outlined in Chapter 5.

2.5.6 INTERVIEW II

The second round of semi-structured interviews, conducted after the first workshop, serves to reflect on and further elaborate on the aspects of the HOPO model. In this phase, the results of the workshop are reviewed to improve and refine the decision variables and the demand model. As stakeholders have gained a better understanding of the PAS method (Arkesteijn, 2019) through their prior participation in the workshop, they are now better positioned to critically reflect on these components. The improved version of the reference models is used for the refinement of the decision variables, and the demand model is refined accordingly. This phase simultaneously fulfils both a formal and an empirical objective as stated in Table 2.3.

Table 2.3 Objectives and tasks during interview II (Arkesteijn, 2019)

Formal objective	Empirical objective
1. Specify additional decision variable(s)	- Applying the improved version of the previously reference models
2. Assign/adjust preferences scores	
3. Adjust weights	- Refining the demand model based on added insights.
4. Determine/adjust design constraints	

2.5.7 WORKSHOP II

The second workshop builds upon the first one and incorporates feedback from the second round of interviews to refine and improve the mathematical model. The focus shifts from understanding and adjusting inputs to designing and evaluating portfolio alternatives using the updated demand model. The empirical objective is to test the usability, clarity, and perceived effectiveness of the demand model in the PAS method.

2.5.8 DETAILED DESIGN

The detailed design is the result of the second integration of the reference models and demand model with the second round of interviews and workshop from the PAS method. The detailed design is presented in Chapter 6.

2.6 KNOWLEDGE BASE: THE HYBRID OFFICE PORTFOLIO OPTIMISATION (HOPO) - PAS

2.6.1 CONCLUSION, DISCUSSION AND RECOMMENDATIONS

This research explores design and decision-making aimed at optimising office real estate portfolios in response to the increasing demand for hybrid working. To achieve this, the PAS method is adapted, and instruments from the HOPO model are tested for their integration, resulting in a fit-for-purpose assignment with the HOPO-PAS model of this research.

In chapter 7, the research results are discussed with input from the third round of semi-structured interviews from the PAS method. The conclusion is presented in Chapter 8, bringing together the findings from the sub-questions to formulate an answer to the main research question. The recommendations are provided in Chapter 9 with an additional expert interview.

2.7 DATA MANAGEMENT PLAN

The Data Management Plan (DMP) for this research ensures adherence to ethical and legal standards while applying the FAIR principles to make the data findable, accessible, interoperable, and reusable (Wilkinson et al., 2016). Since the study involves the Netherlands Police organisation, interviews, workshops and internal documents were handled in Dutch to ensure relevance and accuracy. The findings and final reports are translated and presented in English. The DMP was developed using TU Delft's data management tool (www.dmponline.tudelft.nl) and is attached in Appendix H. Informed consent was obtained from all participants before data collection, with participants explicitly informed about the research purpose, their rights, and the voluntary nature of their participation. Anonymity is ensured by removing identifiable details, and data that is not anonymised will be shared publicly.

2.8 ETHICAL CONSIDERATIONS

Adherence to the ethical principles outlined by Blaikie and Priest (2019, p. 67) ensures the protection of all research participants by safeguarding their rights, well-being, and autonomy throughout the study. Before any data collection begins, the research objectives, procedures, and potential risks are explained to participants, and informed consent is obtained. This ensures participants understand their role and can make an informed decision about their involvement, with the freedom to withdraw at any time. Participants are informed of the possibility of data breaches, but it is explicitly stated in the consent forms that only anonymised data will be processed, and no identities will be linked to the data they provide. If quotes from anonymised interview transcripts are used, care will be taken to ensure these do not contain statements that could harm participants or their organisation. In cases of doubt, explicit consent will be sought from the participant before using their statements.

The research questions are formulated clearly and are directly aligned with the study's objectives. The questions in the research instruments are structured to gather specific, relevant data from participants. By employing a mixed-method approach, including interviews, document analysis, and quantitative modelling, the research gathers data from multiple sources, which strengthens its reliability. Feedback

from TU Delft supervisors and peer reviews further ensures that the research meets the standards of the scientific community and maintains academic rigour. The researcher acknowledges prior knowledge of corporate real estate management and addresses potential biases through transparent documentation, triangulation of methods, and self-reflection. Interviews are recorded, transcribed, anonymised, and securely deleted after analysis to ensure privacy.

Compliance with ethical considerations is ensured through a structured evaluation of potential risks to participants and data privacy. The Human Research Ethics Committee (HREC) template provided by TU Delft was completed to align the research with institutional and legal standards for studies involving human participants (HREC, 2024). Confidential documents obtained from the police were used during this research. Access to these documents was granted upon signing a non-disclosure agreement. Ensuring the protection of this confidential information always remains a priority. The approval of HREC is provided in Appendix I.

03

Client Statement:

Step 1: Objectives

Step 2: User Requirements

Step 3: Constraints

Step 4: Functions

Knowledge Base

3. KNOWLEDGE BASE: CLIENT STATEMENT

This chapter presents the client statement, forming the basis for the design types in the following chapters, and builds on the problem statement [§1.2–§1.3] through a literature study addressing three aspects.

3.1 INTRODUCTION

A literature review is used to establish a foundation of knowledge on the topic. This review outlines existing knowledge and examines the concepts, theories, and methods that have been applied to it. It also identifies controversies surrounding the topic and how it is studied, including clashes of evidence and the key contributors to research on the topic (Bryman, 2012, p. 8). The literature review is structured around three studies:

- *Study 1 'Why'* - Real estate management: A study aimed at understanding the added value of real estate on organisational performance and its various stakeholder perspectives.
- *Study 2 'How'* - PAS method. A study that analyses the PAS method to identify opportunities for its adoption beyond a generic application.
- *Study 3 'What'* - Integration into the PAS method: A study aimed at integrating supplementary instruments in response to the changing demand for hybrid working.

All studies contributing to the client statement reflect current demand (Figure 3.1), which corresponds to the first design phase described by Dym and Little (2004) as outlined at the end of the chapter.

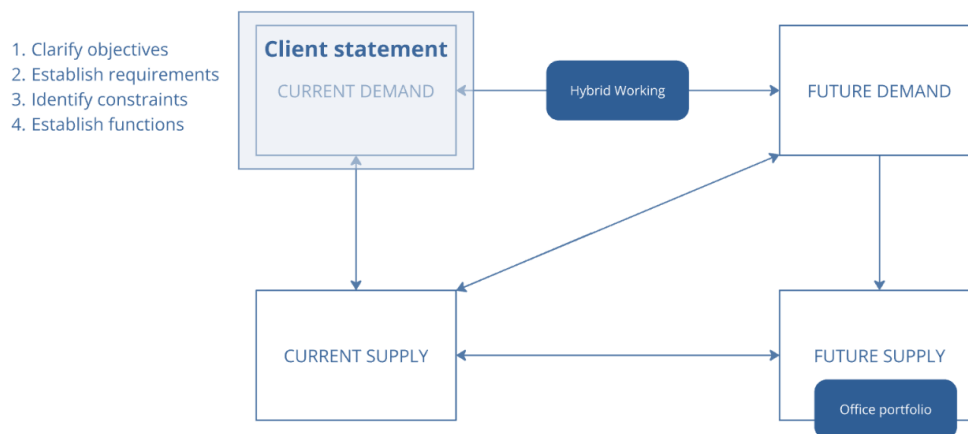


Figure 3.1 Client statement, positioned in the DAS frame (Own illustration, based on DAS frame, De Jonge et al. (2009))

3.2 REAL ESTATE MANAGEMENT

This research focuses on portfolio management, which can be part of both corporate and public real estate; therefore, it is essential to gain a deeper understanding of their differences and similarities.

3.2.1 REAL ESTATE MANAGEMENT PERFORMANCE

Real Estate Management from the perspective of the end user, focusing on the demand side, involves managing buildings and portfolios for organisations where real estate is not the core business but serves as an asset to facilitate their business processes (Gibler & Black, 2004). The basis lies in the presumed added value of real estate on performance, whether positive or negative (Figure 3.2). If real estate had no impact on performance, no organisation, individual, or society would invest resources in it. ‘Performance’ extends beyond financial outcomes, encompassing social objectives such as individual well-being, organisational effectiveness, and environmental sustainability.

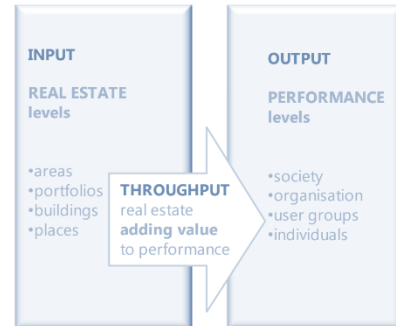


Figure 3.2 The Basis of real estate management: real estate adding to performance (Den Heijer, 2011).

3.3.2 CORPORATE REAL ESTATE MANAGEMENT

Corporate Real Estate Management (CREM) is defined as “The management of a corporation’s real estate portfolio by aligning the portfolio and services to the needs of the core business (processes), in order to obtain maximum added value for the business and to contribute optimally to the overall performance of the corporation” (Dewulf et al., 2000, p. 32). Originally from the strategic alignment model of Henderson and Venkatraman (1989), CREM recognises aligning real estate strategies with organisational objectives to optimise performance. Joroff et al. (1993) introduced real estate as the fifth corporate resource, alongside human resources, capital, information, and technology. A theoretical model (Figure 3.3) presents linking organisational input, processes, and output to overall performance, expressed through productivity, profitability, and competitive advantage (De Vries, 2008).

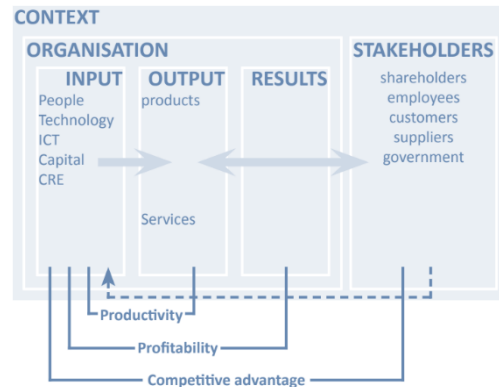


Figure 3.3 Conceptual model organisation (De Vries, 2008; picture retrieved from Scheurs, 2019)

Dewulf et al. (2000, p. 32) developed a model to understand and apply CREM, visualised in Figure 3.4. The model encompasses four types of management: General Management, Asset Management, Facility Management, and Cost Control. Each dimension ensures effective real estate management aligned with business objectives, combining strategic and operational, as well as business and real estate perspectives. The model accommodates various applications for structuring CREM activities within organisations, serving as a tool for identifying misalignments.

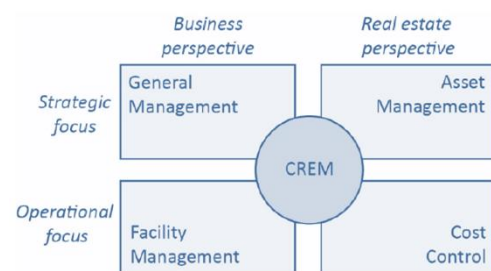


Figure 3.4 The Basis of real estate management: real estate adding to performance (Den Heijer, 2011).

3.2.3 PUBLIC REAL ESTATE MANAGEMENT

Public real estate management (PREM) is introduced as a distinct concept, and defined as “Public Real Estate Management is the management of a government’s real estate portfolio and services to (1) the needs of the users, (2) the financial policy set by the Treasury and (3) the political goals that the government wants to achieve” (Van Der Schaaf, 2002, p.6). The CREM framework of Dewulf et al. (2000) is transformed by Den Heijer (2005) to elaborate on the different stakeholders' perspectives to link, distinguishing four quarters: the horizontal axis contrasts the demand (institutional) and supply (real estate) sides, while the vertical axis distinguishes between strategic and operational levels. The conceptual model adds a structured approach to classifying four stakeholders' perspectives: organisational, financial, functional, and physical (Den Heijer, 2005). The physical perspective concerns the quantity, quality, and lifecycle of assets; the functional focuses on users' needs; the financial addresses feasibility, costs, and value; and the strategic ensures alignment between real estate and organisational goals (Den Heijer, 2005). The PREM model (Figure 3.5) balances and considers all four perspectives and ensures that all four dimensions are accounted for when making real estate decisions.

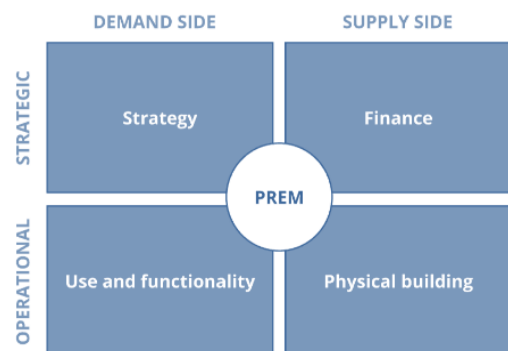


Figure 3.5 Public Real Estate Management Model (Den Heijer, 2021, pp. 22- 23)

3.2.4 THE DIVERSE PREFERENCES AND ADDED VALUE

CREM and PREM frameworks both emphasise that real estate is a strategic resource that can add value to an organisation’s core business and stakeholders (Den Heijer, 2011). Despite this shared perspective, the distinct differences between corporate and public contexts emerge clearly in how stakeholder preferences are evaluated and prioritised in terms of the concept of added value.

In corporate environments, added value typically translates into competitive advantage by focusing on profitability and differentiation. Differentiation is a strategy achieved through continuous innovation and improvement in products and services, thereby enhancing organisational distinctiveness and market position (Porter, 2008). Corporate organisations aim to support the core business by enhancing added value such as productivity, employee satisfaction, innovation, risk control and corporate image (Lindholm & Levänen, 2006). In contrast, public organisations value different preferences and manage real estate from a non-profit perspective without return-on-investment requirements, prioritising social and public values, accessibility, and responsible use of public resources (Van der Schaaf, 2002). As a result, public real estate decisions are often guided by policy objectives and budgetary frameworks rather than profitability (Den Heijer, 2011).

A clear illustration of the outcome of the preferences in real estate strategy can be observed through building location and interior design choices. Corporate headquarters are often located in central, high-status areas with luxurious interiors to enhance brand and client confidence. Conversely, public organisations like police offices prioritise accessibility, efficiency, and modest, functional design due to public accountability and budget limits. An example of an entrance hall illustrates these contrasts in Figures 3.6 and 3.7.



Figure 3.6 The entrance Hall of the Police station in Amsterdam (DeTweeSnoekenArchitectuur, n.d.)



Figure 3.7 The entrance hall of the Office of The Edge in Amsterdam (Archdaily, 2024)

Values are changing over time, leading to a shift from a financial perspective to a broader value-driven perspective of the organisation (Jylhä et al., 2019). This shift means that decisions about workplaces and portfolios now explicitly consider the needs and preferences of various stakeholders, including not only owners and investors but also end users, employees, customers, and society at large (Evers et al., 2002). A user-centred approach has become increasingly important to align workplaces with employee needs and expectations that support their comfort and productivity. If these conditions are not met, they are more likely to choose to work from home or alternative locations (Appel-Meulenbroek et al., 2022). However, these user preferences often conflict with organisational priorities. Standardised office layouts may support flexibility and a consistent image but can undermine employees' need for personalisation and belonging (Elsbach, 2003). Balancing efficiency with user satisfaction is therefore essential for effective workplace strategies that support both satisfaction and performance (Van der Voordt et al., 2022).

In the public domain, the different perspectives become even more complex, as managers balance internal (employees and departments) and external (policymakers, local communities and advocacy groups) stakeholders. This complexity is amplified by the presence of public values, which are often difficult to quantify or compare, an issue known as internal value pluralism (Kuitert, 2021). Public values exist both horizontally, across departments with differing needs, and vertically, in the tension between top-down and bottom-up decision-making. This vertical tension arises when short-term project goals conflict with the organisation's long-term ambitions. Public values can be grouped into values that focus on performance, such as efficiency, safety and effectiveness, and values that relate to the process, such as transparency, fairness and integrity (De Graaf & Paanakker, 2014). Effective real estate decision-making requires balancing multiple, often conflicting values through dialogue, compromise, and strategic choice (Jarzabkowski et al., 2013).

3.2.4 SUB-CONCLUSION STUDY 1 'WHY'

The first literature study addressed the 'why' by exploring the concept of Real Estate Management, specifically its role in aligning real estate with business processes. In this context, the four stakeholder perspectives (Figure 3.8) are essential and integrated into the conceptual design to ensure that both the hybrid working preferences and diverse and often conflicting demands are supported. Ultimately, the identification and prioritisation of adding value depend on the specific preferences of stakeholders within CREM and PREM contexts, guiding organisations to integrate these preferences effectively into their real estate management strategies.

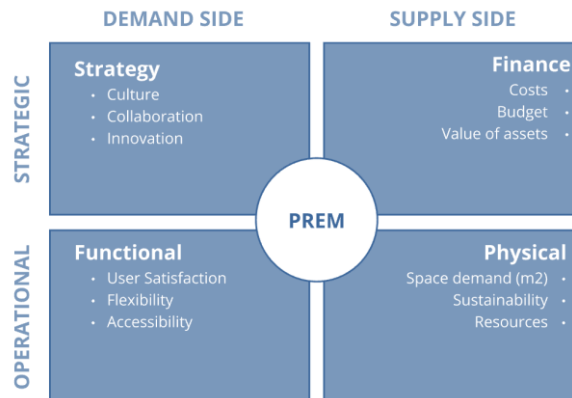


Figure 3.8 Public Real Estate Management Model (Own ill. based on: Den Heijer, 2021, pp. 22- 23)

3.3 PREFERENCE-BASED ACCOMMODATION STRATEGY DESIGN AND DECISION-MAKING METHOD

Before the research instruments can be integrated into the Preference-based Accommodation Strategy (PAS) method (Arkesteijn, 2019), it is essential to understand the method's application and each of its procedural steps.

3.3.1 WHY THE PAS METHOD?

When faced with a complex decision that goes beyond personal experience or intuition, stakeholders can benefit from the use of models to guide and support their choices (Anderson et al., 2014). In the literature review conducted by Swens (2024), four main approaches to preference measurement in the built environment were identified. All of these approaches build on Barzilai's (2010) Preference Function Modelling (PFM) theory, which quantifies stakeholder preferences as measurable functions. Among these models, the PAS stood out as "the only preference measurement model applicable to real estate portfolio design" (Swens, 2024, p.10).

The Preference-based Accommodation Strategy (PAS) is described as "a preference-driven approach to the design and decision-making process for the development of an accommodation strategy" (Arkesteijn, 2019, p. 35). In the PAS method, stakeholder preferences are the foundation for determining the design option that results in the highest value portfolio for the organisation. This is particularly relevant in public real estate management, where diverse and sometimes conflicting interests should be reconciled. PAS enables stakeholders to iteratively design, assess, and compare alternatives by quantifying preferences into an overall performance score. Through this method, stakeholders can determine which accommodation strategy creates the highest added value for the organisation, given its ability to incorporate both tangible and intangible values into a transparent and rational process. The method consists of a structured set of activities, involved stakeholders, a series of steps, and an underlying decision-making model (Arkesteijn, 2019), as illustrated in Figure 3.9.

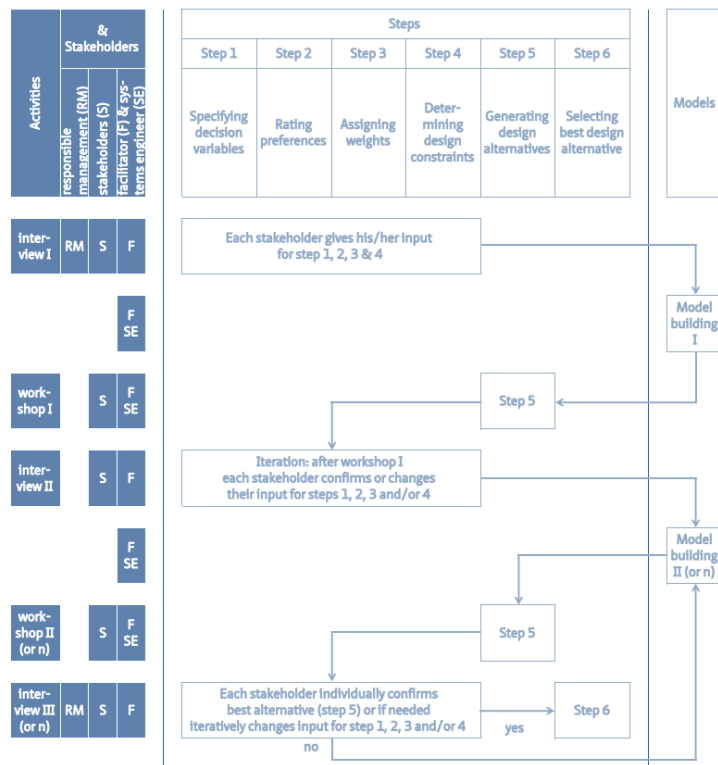


Figure 3.9 The flow chart of the PAS method (Arkesteijn, 2019, p. 237)

3.3.2 DEVELOPMENT OF THE PAS

The development of the PAS builds upon the practical application of the Designing an Accommodation Strategy (DAS) framework (de Jonge et al., 2009). The strength of the DAS framework lies in its simplicity and clarity, as noted by Heywood and Arkesteijn (2017) and Van der Zwart et al. (2009). The DAS framework supports accommodation decisions by aligning real estate supply and demand with organisational strategy. It follows a cyclical, iterative process that assesses the current and future relationship between demand and supply, allowing the process to start at any point (de Jonge et al., 2009). The framework in Figure 3.10 outlines the necessary steps for designing an accommodation strategy, making it accessible and actionable for CRE professionals (Arkesteijn, 2019).

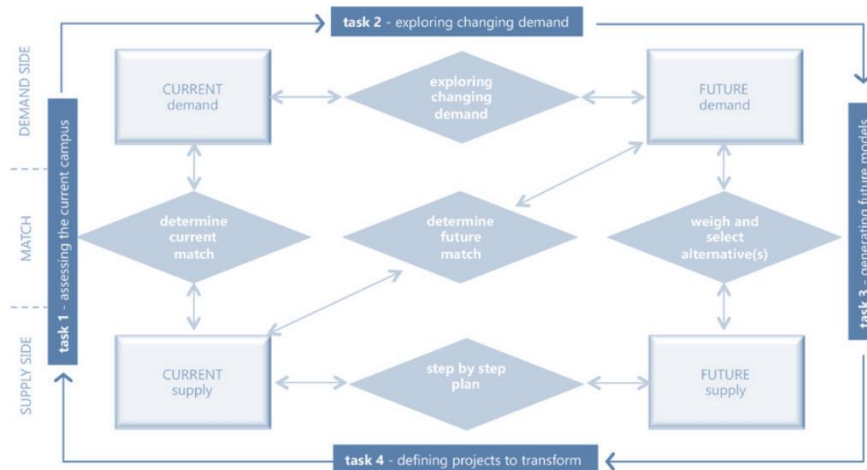


Figure 3.10 DAS frame Den Heijer (2011) based on De Jonge et al. (2009)

The DAS framework lacks a clear method to calculate overall real estate portfolio preference scores and to quantify stakeholder preferences. Arkesteijn (2015) and Arkesteijn & Binnekamp (2012) showed that existing preference scales in accommodation models lacked mathematical foundations like calculus and linear algebra. These limitations motivated the development of a more practical and mathematically supported approach called the Preference-based Accommodation Strategy (PAS).

3.3.3 THREE COMPONENTS OF THE PAS METHOD

The PAS method consists of three main components (Arkesteijn, 2019), as illustrated in Figure 3.11, which together support a structured and value-driven decision-making process between different steps. The process begins by identifying stakeholder criteria, which form the basis for shaping the accommodation strategy. Through a series of iterative sessions, these criteria are tested and refined, leading to the development of various portfolio alternatives. During workshops, stakeholders adjust and improve these options. In the final step, the portfolio that offers the greatest added value is selected, ensuring alignment with the organisation’s strategic goals (Arkesteijn, 2019). Throughout the process, stakeholders participate through activities such as interviews and workshops, while a model builder integrates their criteria into a preference-based decision model (Arkesteijn, 2019).

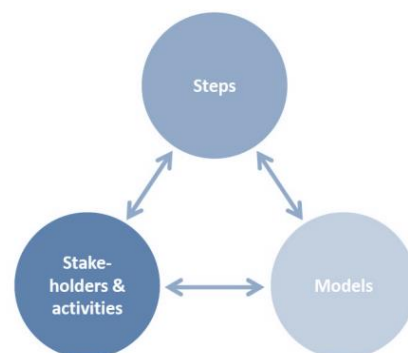


Figure 3.11 Three components of the PAS method (Arkesteijn, 2019)

3.3.4 STEPS OF THE PAS METHOD

To ensure all relevant values are accounted for, PAS begins by involving stakeholders representing the perspectives of real estate management. Arkesteijn (2019, p. 167) recommends selecting stakeholders based on the four perspectives defined by Den Heijer (2011). Including all stakeholder perspectives ensures that relevant information is incorporated into the decision-making process, supporting the creation of maximum added value. The final PAS version consists of six steps (Arkesteijn, 2019, p.164), which are illustrated in Figure 3.9 and explained in the following paragraph.

Step 1. Defining the Decision Variables

The PAS method begins by defining decision variables together with stakeholders, who specify relevant aspects based on their interests and expertise. These variables form the foundation for the entire process and remain the only ones used throughout the method. An example of a decision variable is accessibility may be defined as the walking time from the nearest public transport station.

Step 2. Stakeholders Score Their Preferences

In the second step, stakeholders score their preferences for each decision variable. The PAS method uses Lagrange curves, based on three reference points: the most preferred, the least preferred, and an intermediate preferred value (see Figure 3.12). The specific shape of the curve is derived through the following mathematical formula:

$$P(x) = \left(\frac{(x - x_1)(x - x_2)}{(x_0 - x_1)(x_0 - x_2)} \right) * y_0 + \left(\frac{(x - x_0)(x - x_2)}{(x_1 - x_0)(x_1 - x_2)} \right) * y_1 + \left(\frac{(x - x_0)(x - x_1)}{(x_2 - x_0)(x_2 - x_1)} \right) * y_2$$

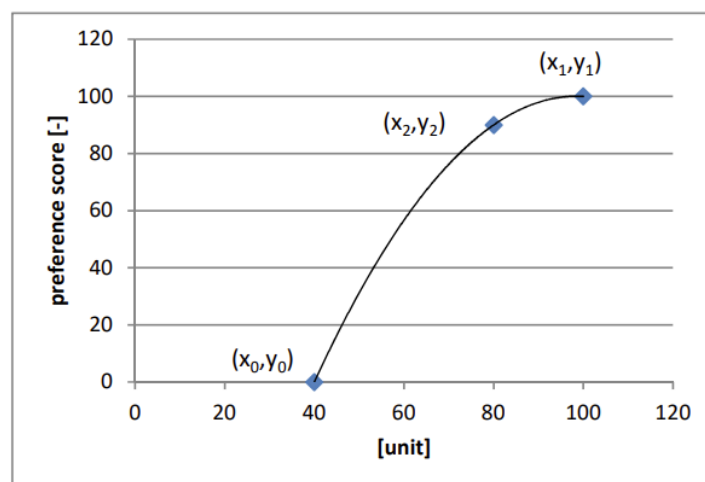


Figure 3.12 Example of a Lagrange curve (Arkesteijn, 2019, p.159)

Each stakeholder expresses their preferences for every decision variable as follows (Arkesteijn, 2019):

- a. The stakeholder specifies the two outer reference points on the Lagrange curve:
 - The first point, referred to as the lower reference alternative (x_0, y_0), represents the least favourable value for the decision variable and is given a score of 0.
 - The second point, known as the upper reference alternative (x_1, y_1), reflects the most favourable value and is assigned a score of 100.
- b. The third point on the curve (x_2, y_2) is determined by selecting an intermediate value within the defined range and assigning it a relative preference score. This point helps shape the curvature of the stakeholder's preference function.

Step 3. Assign Weights to the Decision Variables

After capturing stakeholder preferences, stakeholders assign weights to each decision variable to express its relative importance in the evaluation. These weights reflect strategic priorities and determine each variable's influence on the final outcome. When multiple stakeholders are involved, this step can reveal differences in power between stakeholders (Arkesteijn et al., 2015, p.105). To ensure a fair process, a neutral facilitator (subject owner) can oversee the weighting. The final result is a set of agreed weights that sum to 100%, allowing alternatives to be compared based on both preference scores and variable importance.

Step 4. Define Design Constraint(s)

In the fourth step of the PAS method, stakeholders define constraints to determine the feasibility of a portfolio alternative. These constraints establish upper and/or lower limits for one or more identified decision variables. They may arise from organisational, legal, or technical requirements. For example, according to the accommodation policy of the police, a constraint may state that all offices have at least an energy label C by 2027 (Directie FM en sector Huisvesting, 2023a).

Step 5. Creating the Portfolio Alternatives

In the fifth step, portfolio alternatives are created based on the possible interventions and the number of buildings in the real estate portfolio as defined by the stakeholders (Arkesteijn, 2019). These alternatives are designed by varying the decision variables' design scores within the identified constraints. The parallel generation of design alternatives happens either in:

- a. Stakeholder groups collaboratively design alternatives and use the PAS model to test feasibility and calculate a preference score using the PFM algorithm.
- b. An engineer generates feasible design alternatives and applies the PFM algorithm to identify the design alternatives with the highest overall preference score.

Step 6. The Selection and Validation of the Design Alternative

In the final phase, the PFM algorithm evaluates each of the portfolio alternatives by using the scores of the decision variables. Alternatives are ranked by preference scores, with the highest-rated option considered the most suitable accommodation strategy. Comparing the preferred alternative's score to the current situation reveals its added value and indicates how effectively the new portfolio improves in meeting organisational needs (Arkesteijn, 2019).

3.3.4 SUB-CONCLUSION STUDY 1 'HOW'

The second part of the literature focuses on the 'how' by adopting the Preference-based Accommodation Strategy (PAS) design and decision-making method (Arkesteijn, 2019) as a foundation. As real estate increasingly responds to the changing demand of hybrid working, the PAS method is adapted in this research to integrate hybrid working preferences and portfolio optimisation. Therefore, the integrated research instruments will be designed to support the design and decision-making of the PAS.

3.4 INTEGRATION INTO THE PAS METHOD

In this section, the integrated instruments are elaborated to translate hybrid working demands, capturing preferences and stimulating portfolio optimisation.

3.4.1 REFERENCE MODEL

For the identification of the hybrid working preferences, the use of so-called reference models could be considered. According to MacKenzie et al. (2006), “a reference model is an abstract framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment”. In other words, it distils a complex reality into a simplified model comprising a small number of unifying concepts. This abstract yet structured nature of reference models provides a common language and semantic framework that can be used across different implementations (MacKenzie et al., 2006).

Reference models serve either a normative or a descriptive function (Winter & Schelp, 2006). A normative reference model prescribes an ideal set of elements and their relationships (often based on theory or “best practice”), essentially acting as a benchmark or goal state that organisations should strive for. A descriptive reference model, on the other hand, is derived from observing real-world practices and serves to describe common patterns without necessarily judging them. Winter and Schelp (2006) note that in the design science context, all reference models are generic templates that should be extended and configured for any specific application situation. This means that while the reference model provides a starting structure, it will be tailored to fit the particular context, goals, and constraints of the organisation using it. In this graduation research, a normative reference model will be utilised that is expected to be adapted by the stakeholders or omit certain elements when applying it to their own situation.

De Leeuw (2002) describes a model as a system used as a tool to study another system, by making the original system simpler, more accessible or manageable while remaining sufficiently similar to reality. A reference model is a particular kind of model, typically high-level and idealised, that captures the essence of a domain’s knowledge in a way that is sufficiently similar to reality to be useful, yet simpler than the messy real world. By focusing only on the aspects that are relevant for a given purpose (and ignoring extraneous detail), a reference model allows stakeholders to manage complexity without getting overwhelmed by it. This makes it particularly useful to apply reference models to the PAS method as it supports decision-making to make it less generic.

The PAS design and decision approach (Arkesteijn, 2019) is structured around a series of steps that stakeholders follow to develop a preference-based accommodation strategy. In the first step of PAS, stakeholders define their objectives and the decision variables that will be important in evaluating portfolio alternatives. This initial step is essentially about structuring the problem, where stakeholders articulate what they want to achieve (objectives) and decide how to measure progress toward those goals (criteria or performance indicators). Here is where a reference model can be extremely valuable. According to De Leeuw (2002, p. 301), stakeholders can use reference models (or performance measurement systems) to help define their problem situation in a systematic manner. In practical terms, a reference model provides a menu of potential objectives, criteria, and variables that stakeholders might consider, drawn from broader industry knowledge and theory.

3.4.2 THE DEMAND MODEL

In Real Estate Management, one of the biggest challenges is bridging the gap between the dynamic demand for real estate and the relatively static supply, caused by the fast pace of business compared to the slow response of real estate. This current mismatch becomes particularly evident in the context of hybrid working, where demand for office space fluctuates frequently (Gupta et al., 2022). As a result, it became harder to optimise organisations' real estate portfolios with the rapidly changing needs of their employees.

To address this issue, Cheng (2022) developed a quantitative demand model to forecast corporate office space needs in the post-pandemic era. This model was selected because it is the most recent approach that directly links employees' hybrid working preferences to space requirements. According to Cheng (2022), existing models in the literature were either too aggregated or not suited to the corporate level. While previous studies on office demand forecasting applied a similar disaggregated modelling but on a wider scale, these models are not directly applicable at the organisational level due to their scale and data requirements (Cheng, 2022). In response, Cheng (2022) adapted the model for corporate real estate by embedding it in a scenario planning framework, enabling flexible and quantifiable forecasting for diverse post-pandemic workplace strategies.

Office space formula

The formula in Figure 3.13 is structured around the disaggregated demand model, which calculates “the total office space equals the sum of space needed per user” (Cheng, 2022, p. 100). Following this logic, the model calculates total demand by distinguishing different types of users and multiplying three key factors per user group: the number of users, space per user, and the proportion of office space.

$$D = \sum \Delta D = \sum \Delta \gamma \times \Delta \beta \times \Delta \theta$$

Where:

- D = Total demand of office space
- γ = ABW implementation plan
- β = 1/share-ratio
- θ = The employment headcount classified by different employee groups

Figure 3.13 Mathematical formula of office space demand forecasting for corporate real estate in the post-pandemic (Cheng, 2022, p.100)

The employment headcount represents the number of workers, categorised into groups based on their activities and personal needs within the employment structure. The classification is structured in task groups and persona groups, defined by Cheng (2022, p.10) as: “Task groups categorise employees by their tasks, in other words, their ways of working. Each task group has a unique way of working, and this is reflected by the characteristics of their working settings.” Additionally, “Persona groups categorise employees by their individual needs in terms of time spent on individual work settings. To each persona group, a share ratio of ‘employee/seat’ is assigned. The ‘seats’ include the seats of individual desks, such as the desks in open work-settings, focus rooms and touch-down work-settings” (Cheng, 2022, p.10). This reflects the understanding that an IT specialist and a project manager might use office space differently. By segmenting the total headcount into these groups, it can assign different share ratios and an ABW implementation plan.

The share ratio determines the relationship between the total number of employees and the number of seats provided, visualised in Figure 3.14. A lower share ratio means more sharing per desk, while a

higher share ratio means each employee requires a larger share of a dedicated seat. The share ratio depends on two variables: the average number of days employees work in the office in a week and desk occupancy rate (Cheng, 2022, p.101), which together reflect how intensively a desk is used. In the modified share ratio formula, where five represents the number of working days in a standard week, the model indicates that if employees work fewer days on average, the share ratio increases proportionally. However, if actual desk occupancy is low, the effective share ratio decreases accordingly.

The modified share-ratio is $\frac{5\delta * \eta}{\alpha}$.

Where:

δ = share-ratio (sheerly based on ABW, differs per persona group)

α = number of days employees working in the office in a week,

η = desk occupancy rate

($0 < \alpha \leq 5$, $0 < \eta \leq 100\%$)

Figure 3.14 The modified share ratio proposed by Cheng (2022)

The ABW implementation represents the average space use per employee who uses the offices by considering four critical components: “the number of seats the office needs, the kinds of seats (work-settings) implemented, the proportion of each type of seat, and the area each type of seat needs” (Cheng, 2022, p.100). The ABW implementation plan is expressed as a profile of workplace settings (e.g. desks, collaboration areas, focus rooms) as a percentage of the total seating capacity. From this, and knowing how many employees will use those seats, one can derive the actual seat count and space per employee for each group.

3.4.3 SUB-CONCLUSION STUDY 1 ‘WHAT’

The final part of the literature focuses on the ‘what’ by detailing what the translation of the hybrid working preferences and demand into reference models and a demand model is, and how they are integrated into the design and decision-making of the PAS method (Arkesteijn, 2019). While the PAS method provides a structured approach to preference-based decision-making, it lacks specific instruments to translate the emerging demand for hybrid working. In this context, the approach refers to the degree of iteration between the PAS method and the additional models. By integrating the reference models and a demand model, this research ensures that the conceptual design reflects a fit-for-purpose approach to aligning real estate with both hybrid working preferences and portfolio optimisation.

3.5 CONCLUSION OF THE CLIENT STATEMENT

Building on the insights from the three literature studies, the client statement can now be formulated. According to the design science process of Dym and Little (2004), this involves clarifying the objectives, establishing user requirements, identifying constraints, and establishing functions.

CLIENT STATEMENT STEP 1: OBJECTIVES

The first step addresses clarifying the objectives, which are the features or behaviours the design is intended to achieve (Dym & Little, 2014, p. 47). The graduation research objective, previously outlined in Section 1.3, is further clarified by explicitly defining the key terms from the problem statement: integration, fit-for-purpose, and adaptation in Table 3.1.

Table 3.1 The three main objectives in this research

Objective	Specification
Integration	The first term refers to the integration of the research instruments from the Hybrid Office Portfolio Optimisation (HOPO) models into the application of the PAS method. The HOPO models consist of two instruments: (1) reference models for identifying hybrid working preferences, capturing the evolving and at times conflicting needs of users, organisations, and broader trends; (2) a demand model, further developed from Cheng (2022), to estimate office portfolio demand. Some of the preferences from the reference models are translated into the demand model to identify usage patterns, enabling support for optimisation. The reference models and demand model are applied to the PAS method to determine how they could potentially add value.
Fit-for-purpose	The second term relates to whether the reference models and demand model are suitable to achieve their intended role when integrated into the PAS design and decision-making method. The role of the reference models is to provide an overview of potential variables, rather than starting from scratch, and the demand model is designed to stimulate portfolio optimisation. Heywood and Arkesteijn (2016) note that “CRE alignment is pluralistic and complex,” meaning that the way alignment involves multiple forms and directions, with no single model fully capturing all aspects. For example, including all of the information of the reference models as decision variables is neither feasible nor necessarily more effective. Consequently, to test the fit-for-purpose, this study evaluates the relationship between the specification established in Step 5 (Section 4.1) and the resulting outcomes, thereby assessing the effectiveness of the integration. Step 5 outlines the extent and quality of the alignment, while the application tests the iterative interactions to determine how well the instruments support decision-making.
Adaptation	The last term concerns how the PAS method is changed to better suit the use and different conditions of hybrid working and portfolio optimisation. This involves evaluating the fit-for-purpose results of the reference models and demand model to identify where the PAS method can be adapted. The aim is not to replace the method, but to add value by incorporating elements that align with the current challenges of hybrid working and portfolio optimisation. The steps and activities of the method remain the same; only the way it is applied is refined to better address the evolving demands.

CLIENT STATEMENT STEP 2: USER REQUIREMENTS

The second step focuses on the clarified needs of the client that clearly describe what the design problem entails (Dym & Little, 2014, p. 39). First of all, stakeholders are flexible in using the integrated research instruments in their own way. The reference models will guide stakeholders in defining the decision variables. The demand model translates these preferences of demand into portfolio demand, providing a measurable indication of how much space is needed to optimise the office real estate portfolio. Ultimately, users should be empowered by the reference model and demand model to identify or make adjustments until an optimal solution is achieved within the PAS method.

CLIENT STATEMENT STEP 3: CONSTRAINTS

The third step involves identifying the constraints, which are strict limits or restrictions on the design's attributes or behaviours that should be satisfied and cannot be violated (Dym & Little, 2014, p. 67). The research instruments are tested in a pilot study within the client's organisational context, meaning their design, applicability, and outcomes are shaped by the client's specific policies, standards, regulations, and value system, which may differ across corporate or public organisations. Moreover, the portfolio will be delivered by the client, which defines the scope of the research in terms of the number of buildings included, with the availability of data.

CLIENT STATEMENT STEP 4: FUNCTIONS

The fourth step examines defining the functions, which are the specific actions or tasks the designed device or system is supposed to do (Dym & Little, 2014, p. 72). The Functions comprise two elements:

The reference models

Hybrid working has shown that organisations and employees often have differing, sometimes conflicting values. Together, the three reference models provide a comprehensive basis for defining decision variables in the PAS method and translating them into the demand model by capturing and structuring the hybrid working demands:

- Literature-based trends: this model provides insight into future hybrid working trends that are essential for general application and for anticipating long-term developments.
- Employee preferences: understanding the immediate needs of employees, referred to as knowledge workers within the context of hybrid working, the office environment can be adapted to actual user requirements, leading to greater satisfaction and effectiveness.
- Organisational preferences: this model ensures the strategic alignment of real estate decisions with the organisational objectives of policy set by the company.

Stakeholders can review this reference model and select which variables are relevant to their situation and objectives. By doing so, they benefit from existing knowledge (the model might remind them of factors they otherwise would have overlooked) and can brainstorm decision variables while remaining free to add, remove, or modify them. The reference model is a tool that offers options and insight, but the final selection of decision variables is made by the stakeholders.

The demand model

The demand model is a designed system that should perform the following functions:

1. Transform preferences of office demand into a portfolio demand: the demand model calculates a measurable outcome based on both user and organisational preferences regarding demand (e.g. hybrid working patterns, workplace needs). By linking the demand model to survey data, it becomes possible to capture real user needs directly from employees.
2. Integrate into the PAS workshops: the demand model is transformed from the building level to the portfolio level and should be incorporated into the PAS dashboard. This supports stakeholders in designing office portfolios in an iterative manner by stimulating portfolio optimisation during the workshop. The outcome of the demand model indicates the actual portfolio space required for the stakeholders.
3. Enable adjustment of the variable values: the stakeholders are allowed to adjust the input of the variable values within the formula during the workshop to generate alternative end values to explore multiple outcomes.

04

Conceptual design:

Step 5: Establish Specifications

Step 6: Generate Alternatives

Design Science Research

4. DESIGN SCIENCE RESEARCH: CONCEPTUAL DESIGN

This chapter presents the conceptual design, which is divided into two parts: ‘Hybrid Working Preferences’ and ‘Portfolio Optimisation’. These parts are the first modelling part of the research that is referred to as the Hybrid Office Portfolio Optimisation (HOPO) model.

4.1 DESIGN DEVELOPMENT

Building on the client statement (Chapter 3), the first part elaborates on the three reference models that are developed or adapted to identify hybrid working preferences based on literature, survey data (CfPB, 2024) for knowledge workers, and policy accommodation for the organisation derived from an existing framework (Swens, 2024). In the second part, the development of the demand model is elaborated, linking the identified hybrid working preferences to the elements of the model for portfolio optimisation.

PART I ‘Hybrid Working Preferences’

- Reference model - Hybrid Working Trends
- Reference model - Knowledge Workers
- Reference model - Policy Accommodation

PART II ‘Portfolio Optimisation’

- The demand model

The development of the conceptual design aligns with the identification of future demand. The conceptual design process, shown in Figure 4.1, involves defining measurable specifications from the client statement and using them to generate design alternatives that shape the initial conceptual design.

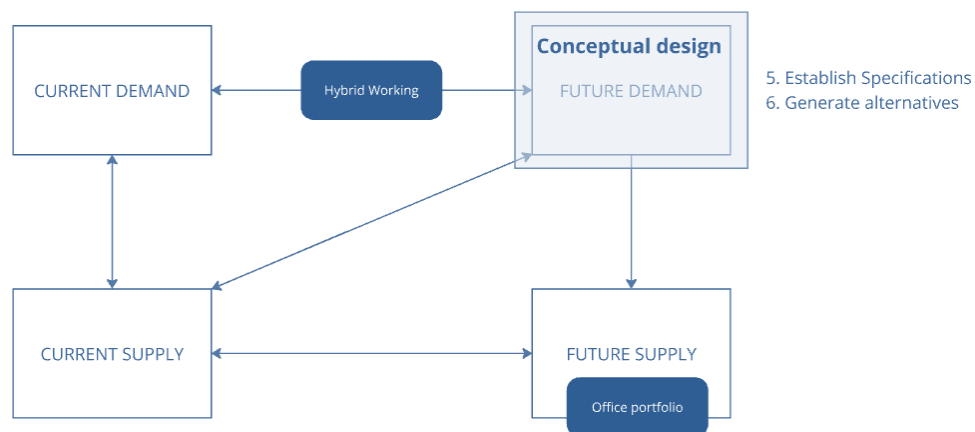


Figure 4.1 Conceptual design, positioned in the DAS frame (Own illustration, based on DAS frame, De Jonge et al. (2009))

STEP 5 – ESTABLISH SPECIFICATIONS

The specifications for the reference models and the demand model, which need to be considered in the development of the conceptual design, will differ accordingly due to their distinctive nature. These specifications define clear functional, performance, and constraint criteria, serving as measurable targets to assess the effectiveness of each model in practice (Dym & Little, 2014, p. 81).

Specifications for the use of the Reference models

Table 4.1 The specifications of the three key terms in the objectives for the reference models

Objective	Performance specification
Integration	The reference models help stakeholders identify relevant decision variables and score their preferences in the first two PAS method steps.
Fit-for-purpose	The reference model should be user-friendly, support stakeholders in defining decision variables, and enhance communication through shared terminology, thereby simplifying and clarifying discussions about decision variables.
Adaptation	Stakeholders may freely choose variables from the reference model that must be usable within a one-hour interview, remain applicable and relevant within the organisational context, or have it clearly specified for the organisation.

To evaluate whether these specifications are achieved, the following performance indicators are measurable:

- The extent to which stakeholders experience increased clarity through the model, e.g. making a vague goal of a stakeholder more specific by using the reference model (qualitative).
- The number of times stakeholders use variables from the reference models (quantitative).
- The degree to which stakeholders perceive the design of the reference model as helpful in defining decision variables (qualitative and quantitative).

This will be evaluated using a Likert scale to assess the level of implementation (Table 4.2) based on a comparative analysis of variables selected during stakeholder interviews. Although Barzilai (2001) highlights that commonly used evaluation scales may lack mathematical validity, the Likert scale is applied here as a pragmatic tool to enable comparative assessment.

Table 4.2 Performance Specifications levels of the Reference models

Level of implementation (Likert score)	Specifications criteria
1 – No implementation	No variables (0%) are taken from the reference model; stakeholders do not use it at all.
2 – Very limited implementation	Only a few variables (about 10-30 %) are taken as inspiration from the reference model.
3 – Moderate implementation	Several variables (around 50%) are selected from the reference model.
4 – High implementation	Most variables (more than 70%) are adopted directly from the reference model with only minor additional formulations.
5 – Full implementation	All or almost all variables (at least 90%) are taken directly from the reference model without modification or addition

Specifications for the use of the Demand model

Table 4.3 The specifications of the three key terms in the objectives for the demand model

Integration	The Demand model provides stakeholders with insight into the required office space demand for optimising their office portfolio during the workshop in the PAS method.
Fit-for-purpose	The Demand model calculates portfolio demand, lets stakeholders adjust inputs interactively, and integrates user-preference data to align outcomes with actual end-user requirements.
Adaptation	The model enables transparent, accurate and flexible calculations within a 60-minute workshop. Adjustments to the variables will be instantly reflected in recalculation with no obligation to strictly adhere to the recommended space outputs.
Integration	The Demand model provides stakeholders with insight into the required office space demand for optimising their office portfolio during the workshop in the PAS method.

To evaluate whether these specifications have been met, performance indicators will include:

- Integration quality of survey-derived user preferences, assessed by perceptions of relevance and usefulness in the workshop process (qualitative).
- Accuracy in matching the calculated portfolio demand closely to the actual workshop portfolio design (quantitative).
- The extent to which stakeholders effectively utilise and adjust variable values during the workshop session (qualitative).
- The clarity and transparency in tracing adjustments made by stakeholders to the demand model variables and corresponding recalculations (qualitative and quantitative).

These indicators will be assessed through evaluations using a Likert scale, measuring the implementation level based on a comparative analysis between the calculated demand model and the final portfolio designs. After completing the research, an evaluation process will be conducted to measure the model's effectiveness, impact, and overall alignment with stakeholders throughout the implementation period. This is outlined in Table 4.4.

Table 4.4 Performance Specifications levels of the Demand model

Level of implementation (Likert score)	Specifications criteria
1 – No implementation	Stakeholders do not apply the demand model outputs or variables of the formula at all.
2 – Very limited implementation	Stakeholders minimally use the demand model, with a large deviation margin ($\pm 30\%$)
3 – Moderate implementation	Stakeholders partially align their design with the demand model, with a sufficient deviation margin ($\pm 20\%$)
4 – High implementation	Stakeholders largely adopt demand model outputs, with a close deviation margin ($\pm 10\%$)
5 – Full implementation	Stakeholders fully align the design with the demand model output, with an exact deviation margin ($\pm 5\%$)

STEP 6 – GENERATE ALTERNATIVES

Step 6 focuses on generating or creating design alternatives, which is the process of developing multiple potential design solutions by exploring different concepts, combinations, and approaches before selecting the most promising ones” (Dym & Little, 2014, p. 92). However, in this research, only one alternative conceptual design is developed, starting with the presentation of three distinct reference models in Part One (Sections 4.1.1 - 4.1.3), followed by the demand model in Part Two (Section 4.1.4). By following an operational research approach, the development of the conceptual model is structured as an iterative process divided into three phases:

- Phase 1: Problem identification
- Phase 2: Model building
- Phase 3: Output.

PART I - ‘HYBRID WORKING PREFERENCES’

4.1.1 REFERENCE MODEL - HYBRID WORKING TRENDS

Problem identification

The first reference model focuses on establishing a general knowledge of hybrid working preferences. The concept of adding value can be viewed through the lens of performance indicators, which vary over time and context. Currently, no consensus exists regarding which parameters are essential or which terms are most appropriate for various value parameters. The shift towards hybrid working further increases this complexity, as preferences become more diverse and conflicting. Therefore, it is essential to identify and structure the relevant variables that reflect these evolving preferences.

These variables were derived from a systematic literature review, as described in the research method (Section 2.4.1), using a predefined search strategy and selection criteria. The final selection of papers provided the conceptual foundation for identifying and categorising hybrid working preferences. To structure these preferences, the variables are categorised according to Den Heijer’s (2011) four perspectives: Organisational, Financial, Functional, and Physical.

Model Building

Organisational

The organisational (strategic) perspective focuses on aligning the real estate with the core business strategy (Lindholm & Leväinen, 2006). A study addressing added value in this context includes Lindholm & Leväinen (2006), which provides a list of parameters such as **location**, **work environment**, **physical flexibility**, and **facilities and services**. Furthermore, an organisation considers how hybrid work is implemented and managed, as it is not a one-size-fits-all solution. Hybrid working **policies**, such as the specific number of mandated in-office days, are formed in the strategy (Sokolic, 2022). Even company **culture** and **brand image** will be effectively embodied by office design and layout to reinforce organisational identity (Haynes & Nunnington, 2010). Finally, **talent attraction and retention** are strategically significant, necessitating appealing amenities and flexible work environments (Sokolic, 2022).

Financial

The financial perspective focuses on cost efficiency, investments and the economic performance of the real estate. In a hybrid working context, financial variables are undergoing shifts as companies seek to **reduce costs** or **increase flexibility** (Lindholm & Leväinen, 2006). The total cost of occupancy, including **revenue, exploitation, asset** value and other operational expenses per square metre, remains a fundamental consideration (Gupta et al., 2022). Additionally, **lease flexibility** or **ownership** structure strongly affect portfolio management, as shorter leases or ownership increase juridical-financial flexibility and enable faster portfolio adjustments to changing space demands (Verhoeff, 2014).

Functional

From the functional perspective, the success of an office portfolio is determined by how well it supports users. Employees in hybrid work have more flexibility and autonomy in terms of time, location and space, which enables them to tailor their work arrangements to personal and professional needs (Echeverri, 2020). **Employee satisfaction**, influenced by workspace, work activities, personal factors, and well-being, is crucial as positive experiences enhance engagement and productivity, while negative ones discourage office attendance (Appel-Meulenbroek et al., 2022). To provide a suitable office, the functionality of the workspace aligns with user needs to determine the **right mix of spaces that support work activities** (Mateescu et al., 2025). However, specific **office attributes** such as plants, pleasant views, and ergonomic furniture do not appear to significantly influence employees' workplace choice (Voll et al., 2024). Instead, the highest-scoring environmental factors according to Voll et al. (2024) include a **healthy and safe working environment, good transport connections, modern technical equipment, comfortable** indoor conditions (light, air, noise, and temperature), **workplace privacy**, and **sufficient space** to perform various tasks. Lastly, **personalisation** is often overlooked in hybrid work, crucially shapes employees' sense of identity and distinctiveness in non-territorial workspaces (Elsbach, 2003).

Physical

The physical perspective addresses the supply side of real estate and its alignment with demand requirements. Hybrid working has reshaped traditional practices as organisations reassess space needs due to reduced office demand (Gupta et al., 2022). Key decision variables include how much space is required, measured through **occupancy rate** and **square meters per person** (CBRE, 2023; Cooke et al., 2022). Organisations increasingly use **data** to monitor how spaces are utilised over time (CBRE, 2023). Beyond quantity, **layout and configuration** determine the right spatial mix, supported by evolving **office models** such as shared offices, hub-and-spoke networks, or fully remote setups (Sailer et al., 2023). **Physical adaptability**, including reconfigurable workplaces and **access** to multiple locations, improves flexibility (Echeverri et al., 2021). Finally, **sustainability** is emphasised through reduced commuting and lower carbon footprints (Barath & Schmidt, 2022).

Output

The first reference model simplifies the complex reality of hybrid working into four perspectives. This helps stakeholders define decision variables and improve communication by conveying the otherwise endless list of potential added values. The identified variables (as presented in Table 4.5) offer simplified representations that can be linked to various sub-criteria that are further elaborated in Appendix G.

Table 4.5 Simplified version of the reference model - Hybrid Working with identified variables

Organisational	Financial	Functional	Physical
Location (Lindholm & Leväinen, 2006)	Reduce Costs (Lindholm & Leväinen, 2006)	Employee Satisfaction (Appel-Meulenbroek et al., 2022)	Occupancy rate (CBRE, 2023)
Work Environment (Lindholm & Leväinen, 2006)	Increase Flexibility (Lindholm & Leväinen, 2006)	Office Environment (Mateescu et al., 2025)	Space per worker (CBRE, 2023)
Physical Flexibility (Lindholm & Leväinen, 2006)	Revenue (Gupta et al., 2022)	Office Attributes (Voll et al., 2024)	Data (CBRE, 2023)
Facilities and Services (Lindholm & Leväinen, 2006)	Exploitation (Gupta et al., 2022)	Healthy and Safety environment (Voll et al., 2024)	Layout and configuration (CBRE, 2023)
Policy (Sokolic, 2022)	Asset value (Gupta et al., 2022)	Accessibility (Voll et al., 2024)	Office models (Sailer et al., 2023)
Culture (Haynes & Nunnington, 2010)	Ownership (Verhoef, 2014)	Technology (Voll et al., 2024)	Physical adaptability (Echeverri et al., 2021)
Branding (Haynes & Nunnington, 2010)	Lease Flexibility (Verhoef, 2014)	Comfort (Voll et al., 2024)	Accessibility (Echeverri et al., 2021)
Attracting and retaining staff (Harris, 2015)		Workplace Privacy (Voll et al., 2024)	Sustainability (Barath & Schmidt, 2022)
		Sufficient space (Voll et al., 2024)	
		Personalisation (Elsbach, 2003)	

4.1.2 REFERENCE MODEL - KNOWLEDGE WORKERS

Problem identification

The second reference model identifies the preferences of so-called knowledge workers. Surveys are a common method to capture such preferences, as they provide systematic insights into how end-users perceive and value their working environment. As an illustrative example, the comprehensive survey conducted by the Center for People and Buildings (CfPB, 2023a) among police employees is used. This survey has 177 questions divided in themes about employees and organisation, workplace (home and office), collaboration, leadership, and health. The survey was completed by over 13.000 employees of the police organisation, which has a total workforce of approximately 60.000 employees (CfPB, 2023a). The respondents belong to the group of employees who work in a hybrid way, with more than half falling within the target group 'Office', referring to the Police Services Centre² (PDC) and the Commissioner's Staff³.

Model Building

Each survey question (CfPB, 2023a) was analysed based on its own assumptions to reflect the preferences of knowledge workers for potential steering factors in the office portfolio management. The survey questions were extensive and included many personal questions about individual

² The Police Services Centre is referred to as 'PolitieDienstenCentrum (PDC)', is the internal service organisation of the Netherlands Police.

³ The Commissioner's Staff is referred to as 'Korpsstaf', is the management department of the Netherlands Police.

characteristics, work process experiences, agreements and engagement with the organisation, collaboration methods, and employee well-being. These aspects cannot be directly translated into interventions within the office real estate portfolio, as they are primarily related to organisational culture and individual perceptions. Moreover, questions were presented in the form of multiple-choice or satisfaction scale that could offer different insights. This could give rise to multiple criteria from a single question. Table 4.6 illustrates this process through two examples of variables derived from two different types of survey questions.

Table 4.6 Example of reference decision variable retrieved from survey questions CfPB (2023a)

Document	Page	Question	Criteria
Monitor Rapportage	34	What mode of transport do you use to travel to the office?	1.1 The percentage of police staff (PDC) commuting by car. 1.2 The percentage of police staff (PDC) commuting by public transport. 1.3 The percentage of police staff (PDC) commuting by Other(s) (walking, bike, electric bike, scooter).
Monitor Rapportage	42	At home, for working remotely, I have: <ul style="list-style-type: none"> o A dedicated workspace o Not a specially equipped workspace o I never work from home 	2.1 The percentage of police staff (PDC) working from home

(CfPB, 2023a)

(Own interpretation, 2025)

Based on a total of 81 survey questions (CfPB, 2023a), 19 variables were identified as listed in Table 4.7. Each original question is referenced, including the source document and corresponding page number.

Table 4.7 All identified decision variables from the documents of CfPB (2023ab)

Question page	Decision Variable	Criteria
10*	Increasing overall satisfaction	Overall satisfaction score with the workplace
33	Reducing travel time	The percentage of knowledge workers with travel time under [15/30/45/60/90/>] minutes
34	Encouraging sustainable transport	The percentage of knowledge workers commuting by [car/public transport/or any mode of transport or combination of modes]
35	Activity profile	The percentage of the type of work activity [general/focused/collaboration/ scheduled meetings/ unscheduled meetings/calling/other]
42	Stimulating remote work	The percentage of knowledge workers working from home
55	Improve office flexibility	The percentage of knowledge workers with a dedicated workplace
57	Improving workplace amenities	The percentage of offices with [plants/art/colour/none]
58	Enhancing office view	The percentage of offices with a view of [urban/sky/nature/none]
60	Office layout – psychosocial factors	Satisfaction score
61	Office layout – physical layout factors	Satisfaction score
62	Office layout – spatial layout factors	Satisfaction score
63	Office layout – architectural layout factors	Satisfaction score
64	Office layout – amenities factors	Satisfaction score
65	Ensuring optimal ICT availability	The percentage of available digital tools
67	Increasing satisfaction with hybrid working	Satisfaction score related to hybrid work [login facilities, accessibility, collaboration]
68	Location profile	The percentage of location type [office/on the road/home/other organisation/other client]

69	Increasing remote working hours	The percentage of knowledge workers working [<8/16/24/32/40] hours from home per week
70	Occupancy rate	The percentage of knowledge workers in the office per week [Monday, Tuesday, Wednesday, Thursday, Friday]
82	Meeting profile	The percentage of meeting type [2 people/ 3-4 people/ 5-8 people/ 9-16 people/ more than 16 people]

* only variable not related to a question but mentioned in the report (CfPB, 2023b)

The analysis of the survey questions revealed several insights into the translation of questions into reference decision variables. Firstly, the identified variables may align with existing accommodation policies of the police. For instance, the police real estate portfolio promotes sustainable mobility by prioritising locations that are easily accessible by public transport (Politie, 2023b). However, it cannot be ruled out that, for example, Question 34 from the survey (Table 4.7) is weighted according to only one criterion, or in this case, influenced by a single mode of transport. Therefore, this was done for this reason to define multiple potential criteria per question to allow for the inclusion of a broader variety of variables, which stakeholders can then select based on relevance. This approach can result in a wide range of criteria emerging from a single question.

In addition, some variables may serve as inspiration, helping stakeholders to further refine existing variables or to formulate new ones. Questions that use satisfaction scores appear particularly difficult to translate into concrete variables, as these scores represent subjective snapshots. Further research would be required to determine whether implementing a given variable actually results in increased satisfaction. Nevertheless, striking or deviant scores may still prompt stakeholders to define specific variables, allowing user needs to be translated into actionable decision variables.

Output

All identified preferences of the knowledge workers have been specified for the 'Office' target group by conducting a SPSS Statistics analysis from the survey data (CfPB, 2025). This enabled the variables to be more aligned in the context of hybrid working and portfolio optimisation, which is further detailed in Appendix F.

These variables are now categorised according to overarching objectives, in order to present them clearly during interviews. In total, three main objectives were formulated and outlined in Table 4.8:

- Accessibility: reflect different forms of mobility, ensuring efficient access to the office.
- Hybrid Working: captures the need for spatial and functional flexibility within the office, describing different work patterns and support tools.
- Office environment: reflects the physical qualities that create a healthy and comfortable environment.

Table 4.8 All analysed decision variables from the reports and survey (CfPB, 2023ab; Houtveen et al., 2024a; CfPB, 2025)

Question page	Objective	Decision Variable
33	Accessibility	Reducing travel time
34	Accessibility	Encouraging sustainable transport
35	Hybrid Working	Activity profile
42	Hybrid Working	Stimulating remote work

55	Hybrid Working	Improve office flexibility
65	Hybrid Working	Ensuring optimal ICT availability
67	Hybrid Working	Increasing satisfaction with hybrid working
68	Hybrid working	Location profile
69	Hybrid Working	Increasing remote working hours
70	Hybrid Working	Occupancy rate
82	Hybrid Working	Meeting profile
10*	Office Environment	Increasing overall satisfaction
57	Office Environment	Improving workplace amenities
58	Office Environment	Enhancing office view
60	Office Environment	Office layout – psychosocial factors
61	Office Environment	Office layout – physical layout factors
62	Office Environment	Office layout – spatial layout factors
63	Office Environment	Office layout – architectural layout factors
64	Office Environment	Office layout – amenities factors

The full list of variables that visualise the reference model, including their underlying data, is documented in a comprehensive Excel file. The input variables specifically used in the Demand model are visually highlighted in orange, whereas the reference decision variables are marked in dark blue.

The Excel file is outlined in Dutch, as it is intended for stakeholders working in a Dutch firm. The supporting data for each variable is shown in light grey cells and consists of the following columns:

- Column A: Source (document title)
- Column B: Page number
- Column C: Survey question
- Column D: Objective
- Column E: Decision variable
- Column H: Criterion
- Column L: Unit of measurement

Figure 4.2 presents an example of a section from this Excel framework, illustrating the structure and organisation of the data. The full list of variables cannot be shared publicly as it contains confidential information about the survey and data.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Document	Pagina	Vraag	Doel	Decision variable	Criterion	Unit							
Input documenten													
Werk in Transitie Monitor – Monitor Rapportage				MR			Werknemersvoorkeur variabel						
Werk in Transitie Monitor – Interne benchmark				IB			Ruimtebehoefte variabel						
Werk in Transitie Verdiepende analyse				VA									
1. Medewerker & Organisatie													
MR	33	Wat is gemiddeld je reistijd voor woon-werkverkeer (enkele reis) naar kantoor?	Bereikbaarheid	Het reduceren van de reistijd	Het percentage PDC medewerkers met een reistijd lager dan 30 min	%							
					Het percentage PDC medewerkers met een reistijd lager dan 60 min	%							
		Mogelijke Variabel:	Politie (totaal)		Reistijd kantoor enkele reis	Huidig							
		Het percentage PDC medewerkers met een reistijd lager dan 30 min		x%	0-15 minuten	x%							
		Het percentage PDC medewerkers met een reistijd lager dan 60 min		x%	16-30 minuten	x%							
		Gem. reistijd medewerkers:		x	31-45 minuten	x%							
					46-60 minuten	x%							
					61-90 minuten	x%							
					Meer dan 90 minuten	x%							
		Mogelijke Variabel:	Kantoor		Reistijd kantoor enkele reis	Huidig							
		Het percentage PDC medewerkers met een reistijd lager dan 30 min		x%	0-15 minuten	x%							
		Het percentage PDC medewerkers met een reistijd lager dan 60 min		x%	16-30 minuten	x%							
		Gem. reistijd medewerkers:		x	31-45 minuten	x%							
					46-60 minuten	x%							
					61-90 minuten	x%							
					Meer dan 90 minuten	x%							
MR					Activiteitenprofiel werknemers op kantoor	%							
35		Besteding van werktijd aan activiteiten (activiteitenprofiel)	Politie (totaal)		Activiteitenprofiel	Huidig							
					Algemeen en meer routinematig werk	x%							
					Geconcentreerd werk	x%							
					Samenwerking	x%							
					Geïsoleerd werken	x%							

Figure 4.2 Screenshot of a part of the Knowledge Workers' Preferences in the Reference model (Confidential details are left out)

4.1.3 REFERENCE MODEL - POLICY ACCOMMODATION

Problem identification

For the third reference model, it was not necessary to develop a new policy accommodation model for the Netherlands Police, as Swens (2024, pp. 93–100) had already developed the Office Accommodation Policy Framework. Compared with the other reference models, this framework is more important as it defines organisational objectives that stakeholders are expected to follow. As Hill and Hupe (2002) argue, established policies set the official course of an organisation, create accountability, and ensure that different actors in the implementation process are working towards the same goals. Therefore, the existing framework is further adapted to critically review to fit the specific context for this research.

The framework (Swens, 2024) consists of 93 decision variables that are based on the policy documents: the Accommodation Vision 2040, Framework & Rules, and the Target Portfolio & Real Estate Strategy. At the time of this research, no policy changes had occurred, confirming the continued relevance of Swens' original model. Although the model provides value as a supporting instrument, Swens (2024, p. 95) acknowledges that the framework is not yet fully operational in its current form. The policy documents lack internal consistency, resulting in significant overlaps in objectives across different documents. Furthermore, the policy objectives predominantly address the portfolio as a whole, with limited attention to specific goals for the office portfolio. Consequently, Swens (2024, pp. 99–100) concludes that the model should primarily be viewed as a guiding instrument that requires further refinement, simplification, and specification.

Model building

The Office Accommodation Policy Framework of Swens (2024) represents a valuable first step towards integrating the policy goals of the police organisation. However, for use in the interviews, further refinement and supplementation were necessary to make it more practical and to provide a deeper understanding of the goals for effective use. Therefore, this research includes an additional analysis aimed at formulating relevant decision variables specifically tailored to the office portfolio.

To avoid inconsistencies and overlap within the 93 identified decision variables, many of which are further subdivided into sub-decision variables, an assessment was carried out to identify overlapping objectives. The existing categorisation of policy objectives was maintained to better interpret and clarify variables that were either superficial or insufficiently detailed.

The analysis began with the document Framework & Rules (Directie FM en sector Huisvestiging, 2023b), which outlines specific criteria related to the office real estate case of the Police Services Centre² (PDC). The objectives formulated in this document were adopted and then further specified. An example of this process is shown in Figure 4.3.

Document	Goal	Total- / Office Portfolio	Decision variable	Criterion	Unit
Kaders & spelregels	More efficient accommodation	Total portfolio	The space budget is distributed per unit.	1.1a The percentage in reduction space budget PDC	23 - 27%
	Sustainability in line with government policy	Total portfolio	Minimum label C for offices on 31-12-2026.	1.1b The number of m2 divested for the PDC	m2 GFA
			The labelling of buildings is a major factor in prioritising projects and assessing the portfolio.	2.2 Minimum energy label C offices	%
Realistic and feasible pace of renewal	Total portfolio	As long as the power of realisation is not clear, a maximum investment volume of €250 million per year applies (price level 2021).	3.1 Maximum investment volume of €250 million per year		€

Reference model (Swens, 2024)

Application of the author (2025)

Figure 4.3 Example of formulated criterion based on the reference model of Swens (2024)

The analysis revealed that, based on the decision variable framework by Swens (2024), three different options emerged. A variable could either be defined specifically for the office segment, formulated more concretely through an extended description, or it may have already been mentioned and therefore corresponds to an existing variable, in which case it is not included separately. Ultimately, the document Framework & Rules (Directie FM en sector Huisvestiging, 2023b) was the most suitable one with small adjustments from the document Target Portfolio & Real Estate Strategy (Directie FM en sector Huisvestiging, 2023a).

Output

In total, 20 criteria have been derived from 41 decision variables found through a structured analysis in which the decision variables were interpreted, specified or matched. Although these criteria are specifically tailored to the Police Services Centre² (PDC), they are largely applicable to the broader portfolio due to shared characteristics and policy objectives. The simplified version is illustrated in Table 4.9.

Table 4.9 All analysed decision variables from the Office Accommodation Policy Framework (Swens, 2024) and confidential details (X) are left out.

Document	Goals	Decision Variable
Framework & Rules	More efficient accommodation	1.1a The percentage of the reduction of the space budget PDC 1.2b The number of m2 GFA divestment for the PDC 1.2 Divestment of X m2 GFA/year 1.3 Required workplaces and use of space
	Sustainability in line with the government police	2.1a CO ² -reduction of X% in 2030 & X% in 2050 2.1b. CO ² reduction of X tonnes of CO ² emissions 2.2 Minimum energy label C offices 2.3 Annual percentage reduction in fossil energy use X% 2.4 Annual percentage reduction in final energy use X% 2.5 Sustainable mobility in which percentage reduction of CO ² emission from environmentally harmful travel kilometres X% 2.6 Accessibility in which number of location meet location type A/B/C
	Realistic and feasible pace of renewal	3.1 Maximum investment volume of € X million per year 3.2 Conversion of rental properties to ownership (contract type) 3.3 Annual mutation rate of approximately X%
	Manageable operating costs	4.1a Exploitation of max € X million per year 4.1b Exploitation on average € X per square metre
	Appropriate quality	5.1a The percentage of buildings with quality level A 5.1b The percentage of buildings with quality level B 5.1C The percentage of buildings with quality level C 5.2 The percentage of buildings to be retained or disposed

To enhance usability, an additional column in blue has been added in the original model to specify the corresponding unit. Since there is limited time during the interviews to review the entire reference model and the other reference models, these reference decision variables are made more visible and accessible. The original structure and categorisation of the objectives have been retained.

In addition to the formal criteria, some decision variables of Swens (2024) also mention broader themes that can serve as guiding principles for the formulation, because these have not (yet) been translated into concrete objectives or criteria. It can serve as inspiration for stakeholders to consider these themes. The themes include feasibility, available capacity, realistic project planning, risk management, alignment with the annual planning cycle, and market availability. During interviews with stakeholders, these thematic principles can be further specified, as the PAS method allows each criterion or objective to be

made measurable (Arkesteijn, 2019). The complete reference model is an adapted version, as partially visualised in Figure 4.4.

Figure 4.4 Screenshot of part of the Reference model - Strategic Accommodation (Retrieved from Swens (2024))

PART II - 'PORTFOLIO OPTIMISATION'

4.1.4 DEMAND MODEL

Problem identification

In the second part, the demand model is developed to present how the hybrid working preferences are integrated into one of the parameters in the office space demand formula developed by Cheng (2022). This formula comprises three elements of employment headcount, share ratio, and the ABW (Activity-Based Working) implementation plan, as shown in Figure 4.5.

$$D = \sum \Delta D = \sum \Delta \gamma \times \Delta \beta \times \Delta \theta$$

Where:

- D = Total demand of office space
- γ = ABW implementation plan
- β = 1/share-ratio
- θ = The employment headcount classified by different employee groups

Figure 4.5 Mathematical formula of office space demand forecasting for corporate real estate in the post-pandemic (Cheng, 2022, p.100)

Model building



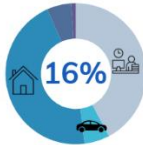

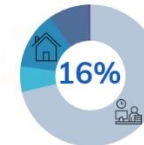

The Employment Headcount

The employment headcount is categorised by dividing employees into different task groups and persona groups. For persona groups, this research applies the six work location preference profiles developed by the Centre for People and Buildings (CfPB, 2024). These profiles provide insight into how knowledge workers divide their working week across different work locations, such as the office, home, or while travelling. The six profiles provide a realistic representation of employee distribution based on actual work patterns and link work location preferences to behavioural and work-related traits such as autonomy, collaboration, and task orientation (CfPB, 2024). By linking these profiles to the persona groups, a context-specific understanding of employees' working behaviours and needs is established.

In the thesis of Cheng (2022), the task group was divided into confidential, individual, location-dependent, and team. Based on the survey (CfPB, 2023a), this categorisation or an equivalent could not be applied to define the task group. Therefore, the task group was categorised as a single general group of office staff, which was then subdivided into the work location preference profiles.

To support this classification, in this research, the cluster analysis conducted by CfPB (2025) was used to link various survey questions to the work location preferences profiles. The analysis focused on the target group of 'Office', consisting of the Police Services Centre² (PDC) and the Commissioner's Staff³ within the police. Based on this analysis, five out of the six profiles could be applied reliably, as the reliability threshold for the scale was met. The five-cluster solution was considered reliable as it achieved 80% explained variance and a homogeneity score of 0.80, indicating a good balance between cluster cohesion and separation. Notably, the 'dedicated office worker' profile was not represented, which is consistent with the hybrid working nature of the group in question. The results of the employment headcount are presented in Table 4.10, along with the analysis in Appendix G.

Table 4.10 Distribution of Employment Headcount among Police 'Office' employees, with figure retrieved from CfPB (2024a)

Persona Task Group	Toegewijde thuiswerker	Merendeels thuiswerker	Rondreizend thuiswerker	Halfom medewerker	Merendeels kantoorwerker	Toegewijde kantoorwerker
N	68	139	96	70	73	-
Office	 15% Dedicated home worker	 31% Mostly home worker	 16% Travel worker	 22% Half-and-half worker	 16% Mostly office worker	 0% Dedicated office worker

N= Number of respondents in the survey (total 446) from the target group 'Office'

Share-ratio

The next step involves determining the share ratio (Figure 4.6), which is the ratio between the number of employees and the number of available work desks within an office environment. This ratio indicates how many employees, on average, share a single desk. The ratio is defined for the employment headgroup 'Office'.

The modified share-ratio is $\frac{5\delta * \eta}{\alpha}$.

Where:

- δ = share-ratio (sheerly based on ABW, differs per persona group)
- α = number of days employees working in the office in a week,
- η = desk occupancy rate
- ($0 < \alpha \leq 5$, $0 < \eta \leq 100\%$)

Figure 4.6 The modified share ratio proposed by Cheng (2022)

The average number of office days per week (α) was calculated based on a survey question on page 69 (CfPB, 2023a). While the question did not explicitly ask how many days per week employees come to the office, it did ask how many hours they typically work from home. Therefore, the design decision was made to link the number of hours to the average number of days working in the office a week. Table 4.11 presents the calculation, assuming a full-time workweek consists of five working days.

Table 4.11 Calculation of the number of days employees work in the office in a week (α) based on survey data (CfPB, 2025)

Response	N	%	Average number of days working in the office in a week	Average number of days working in the office in a week
< 8 hours	49	11%	4.5	$\frac{\sum(\text{number of respondents} \times \text{average number of days in office})}{(\text{Total number of respondents})}$ <p style="text-align: center;">2.58</p>
8 - 16 hours	105	24%	3.5	
16 - 24 hours	140	32%	2.5	
24 – 32 hours	110	25%	1.5	
> 32 hours	30	7%	0.5	
Total	434	100%		

(Own interpretation, 2025) (Own interpretation, 2025)

N= Number of respondents in the survey (CfPB, 2025)

Desk occupancy (η) is calculated based on a survey question in which employees indicate their preferred working hours during a typical workday in an average workweek. From this, the average occupancy for each workday can be determined, as employees score how long they are typically present at the office throughout the day. However, this led to a design decision in which the desk occupancy does not fully correspond to the average weekly occupancy. This is because employees may not use a work desk for the entire duration of their presence at the office. In fact, many employees in this group increasingly come to the office primarily for meetings, which means a lower desk occupancy. Moreover, desk occupancy depends on the number of work desks available in an office, but there is no data available on how these desks are used in practice. Therefore, the results of this question are used to calculate the average office occupancy throughout the daily preferred occupancy from the 'Office' target group (CfPB, 2023b). Table 4.12 presents the calculation of the average weekly occupancy, assuming a standard workweek from Monday to Friday.

Table 4.12 Average weekly occupancy of the Office target group (CfPB, 2023b)

Response	%	The occupancy rate office in a week
Monday	38%	$\frac{\sum(\text{sum up percentage of the days})}{5}$ <p style="text-align: center;">38.2 %</p> <p style="text-align: center;"><i>Office</i></p>
Tuesday	53%	
Wednesday	34%	
Thursday	48%	
Friday	18%	
Total	100%	

(CfPB, 2023b) (Own interpretation, 2025)

ABW Implementation Plan

The ABW implementation plan quantifies the required workspace area based on the proportion and type of work settings needed for employees to carry out their tasks within the office. To support this, survey questions were identified that reflect employees' preferences regarding work settings. Ultimately, two questions were selected about 'Allocation of working in time to activities (activity profile)' and 'Distribution of meetings by group size (meeting profile)' were included, as they may influence the spatial distribution of the work environment, as illustrated in Table 4.13.

Table 4.13 Survey questions (CfPB, 2023a) related to ABW Implementation plan

Activity profile	%
General and more routine work	25%
Concentrated work	24%
Collaboration	17%
Planned meeting	14%
Unscheduled meeting	6%
Telephoning	9%
Other	5%

Question on Page 35 (CfPB, 2023b)

Meeting profile	%
Meeting with 2 people	41%
Meeting with 3-4 people	24%
Meeting with 5-8 people	17%
Meeting with 9-16 people	14%
Meeting with more than 16 people	6%

Question on page 82 (CfPB, 2025)

Output

The parameters from the formula have been identified, resulting in the development of the Demand model. To apply the model, only one input from the organisation was initially required, namely the number of employees.

To improve the model's accuracy and applicability, contact was made with Cheng (personal communication, March 2025). During this meeting, several ambiguities were clarified. Although the formula had been applied correctly, Cheng provided further explanation regarding how the share ratio had been defined in the original research. He explained that the starting value for the share ratio does not result from the formula itself but should instead be defined by the organisation. A key insight from this conversation was that the Netherlands Police apply so-called 'flex space norms', which reflect an approach opposite to the share ratio of Cheng. Whereas Cheng's model assumes a ratio of employees per desk ('employees per seat'), the police apply a ratio based on the number of desks per employee ('seats per employee'). To determine the total share ratio, the profiles from the police are incorporated at the starting value.

Furthermore, since the demand model is applied at the portfolio level, it is not beneficial to calculate each type of workspace for the ABW implementation plan. Therefore, the organisation's standardised norm (x m² GFA per work desk) is used to calculate the total demand (Projectteam Anders Werken, 2022c). Following the meeting, Cheng shared his full report, including the previously restricted pilot study (Cheng, 2022) and the original Demand model. Based on these materials, the Excel-based demand model was revised to better fit the context of this research at the portfolio level in Appendix G.

4.2 CONCLUSION OF THE CONCEPTUAL DESIGN

This chapter has elaborated on the conceptual design of the Hybrid Office Portfolio Optimisation (HOPO) model, addressing the first sub-question:

What hybrid working demands can be developed, and how can they be integrated?

The findings demonstrate that hybrid working demands can be understood and operationalised through two complementary components: hybrid working preferences, structured into three reference models, and supporting portfolio optimisation, expressed in the demand model. Together, these components provide a foundation for integrating hybrid working demands into the PAS method and guiding the fit-for-purpose design and decision-making of this research with an office portfolio.

Hybrid working preferences

Three reference models were developed or adapted to capture a comprehensive set of decision variables from different perspectives.

- The first reference model translates hybrid working trends into organisational, financial, functional, and physical variables, creating a knowledge base for identifying goals.
- The second reference model focuses on knowledge workers' preferences, using survey data (CfPB, 2023ab) to distil specific variables that reflect user needs and behaviour.
- The third reference model incorporates the Netherlands Police policy, originally from Framework of Swens (2024), which translates strategic objectives and accommodation criteria.

These reference models serve as structured input for the first two steps of the PAS method: defining decision variables and scoring preferences. They offer stakeholders an overview of potential variables without prescribing choices to make use of the knowledge that already exists, and do not start from scratch in each step. To determine whether stakeholders need a reference model, the PAS steps are first explored with them before integrating the models, ensuring they do not forget relevant criteria. Moreover, multiple reference models are applied to ensure completeness, with policy models considered more important since stakeholders are expected to follow them.

Supporting Portfolio Optimisation

In addition to identifying preferences, the conceptual design integrates some of these insights into a demand model to support portfolio optimisation. Building on Cheng's (2022) office space demand formula, the demand model incorporates employment headcount, share ratio, and ABW implementation parameters, which are further refined with survey-derived work patterns to reflect the actual hybrid working demand of knowledge workers. In this case, the demand model can be applied across multiple cases that want to implement hybrid working and stimulate an optimisation based on user preferences. This also enables the designing of portfolio alternatives that are aligned with the output of the demand model. During the workshops of Step 5 from the PAS method, the model is applied to provide a transparent and adaptable calculation of portfolio demand. By exposing the variables and allowing stakeholders to adjust inputs, the model encourages active participation and ensures that portfolio alternatives remain both data-driven and responsive to the possible different preferences of stakeholders.

05

Preliminary design:

Step 7: Analysing the Client

Step 8: Test and Evaluate

Environment

5. ENVIRONMENT: PRELIMINARY DESIGN

This chapter presents the preliminary design and is structured in two parts: ‘Hybrid Working Preferences’ and ‘Portfolio Optimisation’. The conceptual design of the Hybrid Office Portfolio Optimisation (HOPO) model, as introduced in the previous chapter, is now tested within the design and decision-making of the PAS method to test the fit-for-purpose relationship.

5.1 DESIGN DEVELOPMENT

First, the reference models developed earlier are applied during the first interview of the PAS method by following the first four steps (Arkesteijn, 2019). The demand model is applied during the workshop of the fifth step from the PAS method (Arkesteijn, 2019), where stakeholders design a portfolio alternative.

PART I ‘Hybrid Working Preferences’

- Reference model - Hybrid Working Trends
- Reference model - Knowledge Workers
- Reference model - Policy Accommodation



Interview I
(Arkesteijn, 2019)

PART II ‘Portfolio Optimisation’

- The demand model



Workshop I
(Arkesteijn, 2019)

The development of the preliminary design (Figure 5.1) starts with identifying future demand through interview I, where stakeholders formulate their decision variables. This future demand is then integrated with the current supply of the office portfolio during workshop I. The aim of the workshop is to design a portfolio alternative based on this demand and to support the optimisation of the future portfolio. All results of the PAS application are included in Appendix E.

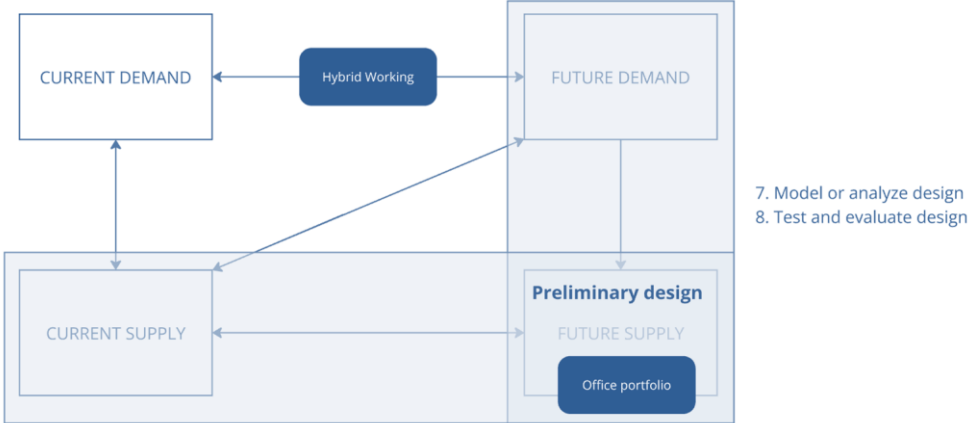


Figure 5.1 Preliminary design, positioned in the DAS frame (Own illustration, based on DAS frame, De Jonge et al. (2009))

STEP 7 – ANALYSING THE CLIENT FOR THE PILOT STUDY: THE NETHERLANDS POLICE

The seventh step focuses on analysing the design to predict their performance, feasibility and behaviour (Dym & Little, 2014). In order to test the conceptual design, a pilot study was conducted within the Netherlands Police. The Netherlands Police provides a relevant context, as it places both the impact of hybrid working and the optimisation of its real estate portfolio as goals. As the police may have additional needs in this regard, two stakeholders from national portfolio management were interviewed to map these out. The full analysis of the client and all the results of the PAS application are included in Appendix E.

The aim of police portfolio management is to transform the current portfolio into a desired target portfolio, with a key objective in the office segment being the reduction of total square metres. Within this transition, a decision model adds value by providing insight into different organisational perspectives, clarifying trade-offs, and structuring discussions on which interests carry more weight in a complex context. This also creates a shared understanding of what delivers the greatest added value for the police (van Haastert, personal communication, 2025).

The financial perspective serves as a boundary condition, representing non-negotiable financial constraints; therefore, not all four perspectives (Den Heijer, 2011) are integrated:

- User perspective
- Policy perspective
- Real Estate perspective

An important part of the process is evaluating plans, from the object to the portfolio level. Assessing at different levels enables well-considered trade-offs between variants. Various interventions can be applied to each office building to design portfolio alternatives, aligning with the Target Portfolio and Real Estate Strategy for 2040 (Directorate of FM and Housing Sector, 2023a, p. 32). These include:

- Complete disposal of a building
- Partial disposal
- Sustainability improvements
- Investment in 'Anders Werken'
- Renovation options

The pilot study is conducted within the office real estate of the Police Services Centre² (PDC) that consists of three main locations in the Netherlands: Rotterdam, Eindhoven, and Zwolle. In addition, at the initiative of the project leader of the PAS method, HUB50 has been integrated (Bovy, personal communication, 2025). This is the only location owned by the organisation, recently renovated, and designed for hybrid working. Not only PDC employees but also other teams have access to this working environment. In total, 3.187 full-time PDC employees have access to work at one of these buildings, although each has one designated location as their regular workplace. Besides these buildings, it is also possible to make use of other police office buildings. However, as these are assigned to other police teams, they are excluded from this portfolio (Bovy, personal communication, 2025). This reflects the dynamic nature of the PDC employee, who may work at various locations within the police real estate portfolio. The implemented office portfolio is visualised in Figure 5.2.



Office building	Building number	Type of office	Gross floor area	FTE	Police Ownership
PDC Rotterdam	1	Only PDC	18,816	1,544	No
PDC Eindhoven	2	Only PDC	3,654	250	No
PDC Zwolle	3	Only PDC	11,255	976	No
HUB50 Utrecht	4	Shared	20,902	417	Yes

Figure 5.2 Four office locations of the PDC employees from the police. Legend: dark blue circle: owned building and light blue circles: rented buildings

The office portfolio of the Netherlands Police has a considerable surplus of square metres, which is no longer financially viable in operation (Directie FM en sector Huisvesting, 2023a). There is already significant insight into the quality of these offices and the possibilities for managing them. As offices are to some extent generic and standardised, there is scope for improvement. Moreover, the demand for office space is decreasing due to hybrid working. According to the stakeholders, the PDC locations are typically not designed for hybrid working; however, this limitation does not apply to HUB50. The integrated portfolio consists of:



Figure 5.3 Building number 1, PDC Rotterdam



Figure 5.4 Building number 2, PDC Eindhoven



Figure 5.5 Building number 3, PDC Zwolle



Figure 5.6 Building number 4, HUB 50

Pictures are retrieved from Google Earth (2025)

STEP 8 – TEST AND EVALUATE THE CONCEPTUAL DESIGN

Step eight assesses the prototypes or models against the objectives, requirements, constraints, and functions to determine how well the design performs and to guide further improvements (Dym & Little, 2014). It outlines the testing and evaluation of the conceptual design in the design and decision-making of the PAS method, beginning with the integration of three reference models during interview I in Part One (Section 5.1.2), followed by the application of the demand model during Workshop I in Part Two (Section 5.1.3).

PART I - 'HYBRID WORKING PREFERENCES'

5.1.2 REFERENCE MODELS

In total, three interviews were conducted, guided by the interview protocol of Arkesteijn (2019, p. 170), which outlines the first four steps of the PAS method. The interviews began with an open exploration, during which the stakeholders were asked to reflect on objectives and challenges based on their own expertise and experience. This phase was intended to collect unbiased input without prior influence from the models.

In the second part of the conversation, the reference models were introduced, starting with suggestions to formulate new objectives based on the models in order to compile a complete list. Subsequently, the objectives formulated by the stakeholders were identified within the reference models. Some variables from the reference models can also be used to assign preference scores in the second step. The purpose of this step was to examine the extent to which the model could support the stakeholders in structuring or supplementing their thoughts, and whether new or alternative decision variables emerged compared to their earlier input. In the end, the stakeholders selected which decision variables were relevant from their perspective. The outcome of the first four steps is outlined in Table 5.1 and in the next section, each reference model is elaborated, indicating how many objectives and criteria from the model were included and in what manner.

Table 5.1 Outcome of the interviews from the first four steps of the PAS method (Arkesteijn, 2019)

#	Decision variables	Criterion unit	[x0. y0] 'Low'	[x1. y1] 'High'	[x2. y2] 'Mid'
1.1	Reduction of square meters	Occupancy rate of offices	[38.0]	[70.100]	[70.60]
1.2		Percentage of employees working from home	[80.0]	[96.100]	[87.0]
1.3		Percentage of employees without a dedicated workplace	[32.0]	[5.100]	[15.50]
2.1	Reduction of travel moments	max. commute time (min)	[60.0]	[30.100]	[45.50]
3.1	Office design matches wishes/need of employees	Satisfaction level (#)	[63.0]	[80.100]	[70.60]

#	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Preservation of office location	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)	[0.0]	[100.100]	[75.50]
2.1	Public transport accessibility	Number of min walk intercity station	[30.0]	[5.100]	[15.50]
3.1	Retain/acquire existing property in the market	Number of buildings 'existing property' in portfolio	[75.0]	[100.100]	[95.95]
4.1	Sustainability	Reduce CO ² emissions	[100.0]	[0.100]	[60.50]
4.2		Number of buildings with energy label A	[70.0]	[100.100]	[80.100]
5.1	Reducing space requirements	Flex space norms	[0,6.0]	[0,3.100]	[0,5.50]
6.1	Office space concept for hybrid working	Percentage of hybrid working office building	[50.0]	[100.100]	[75.50]

#	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Adaptability / accommodating growth and shrinkage of teams	Number of workplaces in the central Netherlands	[0.0]	[80.100]	[50.50]
2.1	Accessibility	Parking facilities	[1,5.0]	[3.100]	[2.50]
2.2		Number of min walk intercity station	[12.0]	[2.100]	[8.50]
3.1	Sustainability	Minimum Energy label A	[70.0]	[100.100]	[80.50]
4.1	A functional building that matches the work process of employees	Occupancy rate	[38.0]	[85.100]	[65.50]
4.2		Satisfaction level (#)	[63.0]	[80.100]	[75.50]
5.1	Maintenance	Low maintenance costs	[35.0]	[15.100]	[25.50]
6.1	Safety	Building must meet safety/security standards	[70.0]	[100.100]	[85.50]

Reference model Hybrid Working Trends

The stakeholders did not make use of the first reference model, as shown in Table 5.2. They were able to independently formulate objectives, and even when suggestions were provided, the variables mentioned from the reference model had either already been included or were considered irrelevant by the stakeholders. The decision variables that were already formulated as a goal: reduction of space, travel, sustainability, hybrid working concept, accessibility, maintenance and safety. Aspects considered less important included, for example, personal and demographic factors such as age, function, or background. According to the formulated specifications of the performance indicators, neither the qualitative nor the quantitative assessment was deemed helpful to the stakeholders.

Table 5.2 Outcome of the Performance Specifications of Reference Model Hybrid Working Trends

Level of implementation (Likert score)	Specifications criteria
1 – No implementation	No variables (0%) are taken from the reference model; stakeholders do not use it at all.

Reference model Knowledge Workers

The second reference model proved to be useful in both quantitative and qualitative assessments, as two variables were exactly integrated. Besides, four variables from the reference model helped set preference scores. However, most of the decision variables were formulated by the stakeholders and therefore, it has a very limited implementation as outlined in Table 5.3.

Table 5.3 Outcome of the Performance Specifications of Reference Model Knowledge Workers

Level of implementation (Likert score)	Specifications criteria
2 – Very limited implementation	Only a few variables (about 10-30 %) are taken as inspiration from the reference model.

The reference model was most useful for the user perspective, with Table 5.4 outlining all the integrations of the variables highlighted in bold. In addition, two perspectives independently formulated a satisfaction level and included the occupancy rate, with the reference model serving only as inspiration for assigning preference scores.

Table 5.4 The relationship between the Reference model, Knowledge Workers, and the PAS method (Arkesteijn, 2019)

#	Decision variables User	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Reduction of square meters	Occupancy rate of offices	[38.0]	[70.100]	[70.60]
1.2		Percentage of employees working from home	[80.0]	[96.100]	[87.0]
1.3		Percentage of employees without a dedicated workplace	[32.0]	[5.100]	[15.50]
3.1	Office design matches wishes/need of employees	Satisfaction level (#)	[63.0]	[80.100]	[70.60]

#	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]

#	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
4.1	A functional building that matches the work process of employees	Occupancy rate	[38.0]	[85.100]	[65.50]
4.2		Satisfaction level (#)	[63.0]	[80.100]	[75.50]

The two variables directly adopted from the reference model were considered valuable from the user perspective, as the criteria aligned with the goal of reducing office space, a trend also identified in the literature as a consequence of hybrid working (Gupta et al., 2022). The satisfaction levels supported the stakeholders in assigning preference scores, whereby the current score derived from the reference model (6,3) was regarded as the least ideal outcome, and therefore served as a baseline from which improvement towards higher employee satisfaction was pursued. The preference variable concerning occupancy rate (38,2%) was considered significantly low by the stakeholders. As a result, the score from the reference model had little influence, since a different preference score was assigned.

Reference model Policy Accommodation

None of the variables from the reference model were integrated as additional objectives by the stakeholders. Most of the formulated decision variables were already formulated, and the reference model didn't provide any further help for completing the list. Only three decision variables were further specified in the qualitative assessment for assigning preference scores, as the reference model provided data. Therefore, the reference model had very limited implementation as outlined in Table 5.5.

Table 5.5 Outcome of the Performance Specifications of the Reference Model Policy Accommodation

Level of implementation (Likert score)	Specifications criteria
2 – Very limited implementation	Only a few variables (about 10-30 %) are taken as inspiration from the reference model.

The information gathered from the reference model is marked bold in Table 5.6. The policy perspective articulated the goal of reducing CO₂ emissions during the interview. By using the reference model, the specific policy target for CO₂ reduction was adopted, with a 60% reduction scored as the least ideal (preference of 0) and a 100% reduction as the most ideal (preference of 100). For the flex space norms, the goals were used from the hybrid working policy document (Projectteam Anders Werken, 2022b). Additionally, the energy label objective received a higher score (original was C), indicating that the variable from the reference model was considered insufficient by the stakeholders.

Table 5.6 The relationship between the Reference model, Policy Accommodation, and PAS method (Arkesteijn, 2019)

#	Decision variables User	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
#	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
4.1	Sustainability	Reduce CO ₂ emissions	[100.0]	[0.100]	[60.50]
		Number of buildings with energy label A	[70.0]	[100.100]	[80.100]
5.1	Reducing space requirements	Flex space norms	[0,7.0]	[0,3.100]	[0,4.50]
#	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
3.1	Sustainability	Minimum Energy label A	[70.0]	[100.100]	[80.50]

Some variables of the reference model were included but interpreted differently; for example, accessibility was not scored based on the location type, but instead on the number of walking minutes from an intercity train station, as outlined in Table 5.7. Therefore, this interpretation provided a more concrete and better-aligned expectation for applying an accessibility objective.

Table 5.7 Accessibility decision variable that was interpreted differently

#	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
2.1	Public transport accessibility	Number of min walk intercity station	[30.0]	[5.100]	[15.50]

#	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
2.2	Accessibility	Number of min walk intercity station	[12.0]	[2.100]	[8.50]

PART II - 'PORTFOLIO OPTIMISATION'

5.1.3 DEMAND MODEL

For the application of the demand model during the workshops, the outcomes from the interviews in the previous section will be developed and presented. Within a few days, the stakeholders' decision variables were specified individually within the PAS Excel model for each intervention, as outlined in Appendix E. A visualisation of the dashboard, which serves as the main menu for the stakeholders, is shown in Figure 5.7. This allows for the design of portfolio alternatives, with each building offering the same interventions.

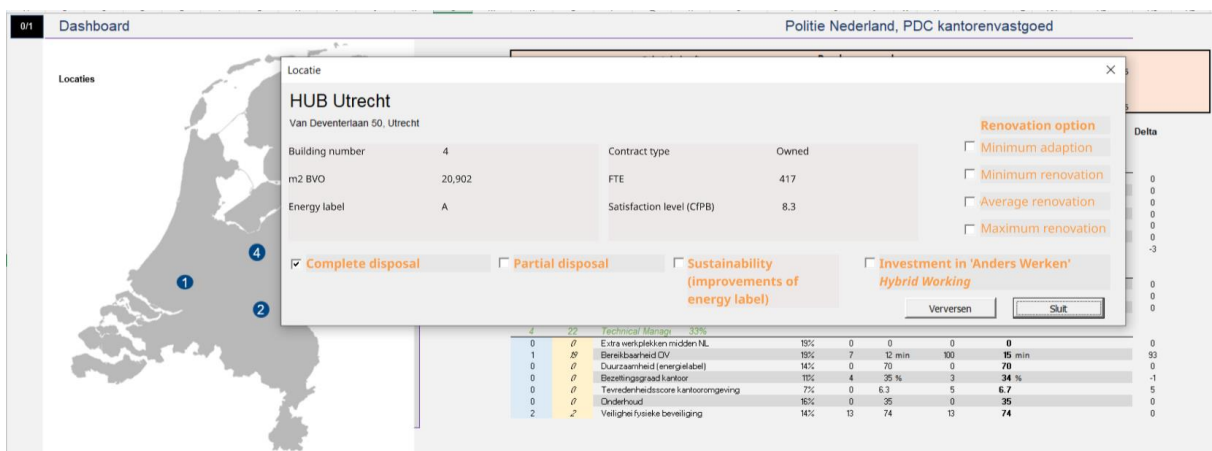


Figure 5.7 Screenshot of the Dashboard with possible translated Interventions

The Demand model is also integrated in the PAS Dashboard to visualise the current supply of the office portfolio, the future demand generated from the demand model and the future supply of the design portfolio alternative. At the top of the Dashboard (see Figure 5.8), the outcome of the demand model is shown as boundary conditions for the portfolio design.

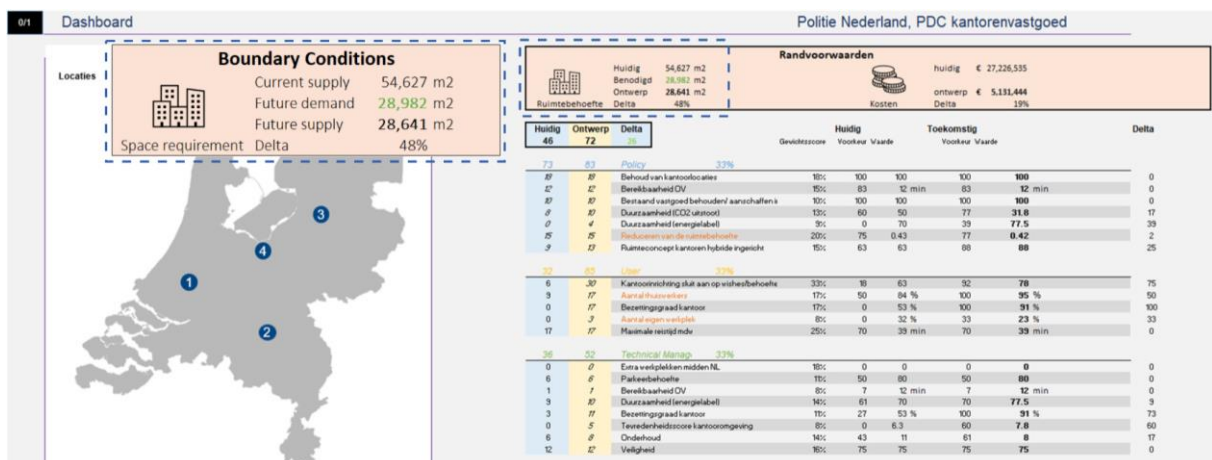


Figure 5.8 Screenshot of Dashboard from the PAS model with zoomed variables of integration of the Demand model

The stakeholders are able to influence the outcome of the Demand model by adjusting the three elements from the office space demand formula, as illustrated in Figure 5.9. This interactive approach allowed various policy choices and assumptions to be tested within a single, uniform model.

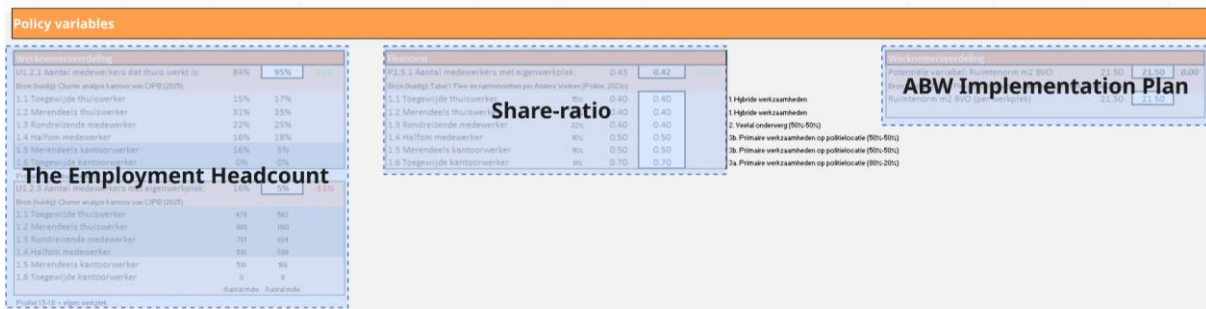


Figure 5.9 Policy variables that influence the outcome of Model 4 - Demand model in the workshop

Additionally, three variables influenced by policy decisions that relate to the demand model instead of the interventions. The three policy decision variables that can be improved by making adjustments to the employment headcount and share ratio during the workshop. In this process, the weighted average is calculated through to the decision variable to enhance the demand model. This progress is visualised in Figure 5.10.

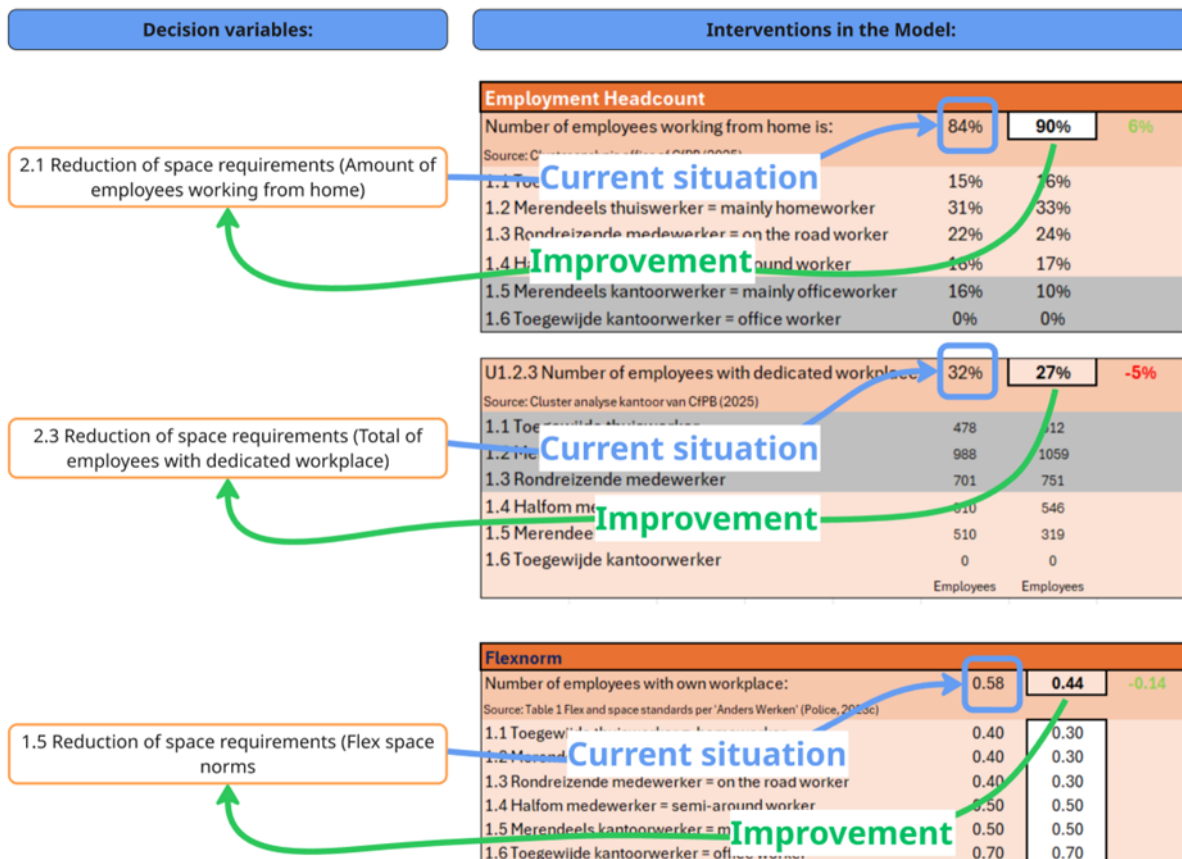


Figure 5.10 Policy variables that influence the outcome of the three decision variables from the stakeholders

In a meeting with an expert familiar with the PAS method (Valks, personal communication, 2025), the integrated model was discussed and proven effective in showing how interventions influence portfolio design. However, doubts arose about whether the modified share ratio had been correctly applied by

Cheng (2022). The expert advised ensuring the formula would be clear and yield a logical outcome during the workshop. Therefore, the full modified share ratio (Cheng, 2022) was not applied; instead, only the share ratio aligned with the police’s flex space norms (Police, 2022c) was used. Consequently, the parameters occupancy rate and average office days were excluded. This design assumes maximum occupancy on at least one office day and improves communication during the workshop, as participants are already familiar with these norms.

Application of the Demand Model in Workshop I

The workshop, attended by the same three interview participants, used the pilot study’s office portfolio to design a portfolio alternative. The first objective of the workshop is to familiarise the stakeholders with how the issue is represented in the PAS model. They need to understand the content before sharing their findings and insights. In addition, the PAS model is used to design portfolio alternatives, enabling stakeholders to better understand their own input as collected during the interviews (Arkesteijn, 2019). Finally, the Demand model has been integrated to stimulate an optimised portfolio alternative.

The workshop began with adjusting the Demand model by modifying the variables of the formula. The stakeholders only adjusted the variable employment headcount. According to them, the number of employees working from home should be higher, as this profiling of employment headcount of office employees also included the Commissioner’s Staff³, for whom it was expected that Police Services Centre² (PDC) staff would work from home more frequently. This adjustment led to a lower portfolio demand. As a result, an alternative portfolio was designed that closely matched the portfolio demand by selecting different interventions per office building, as shown in Figure 5.11.

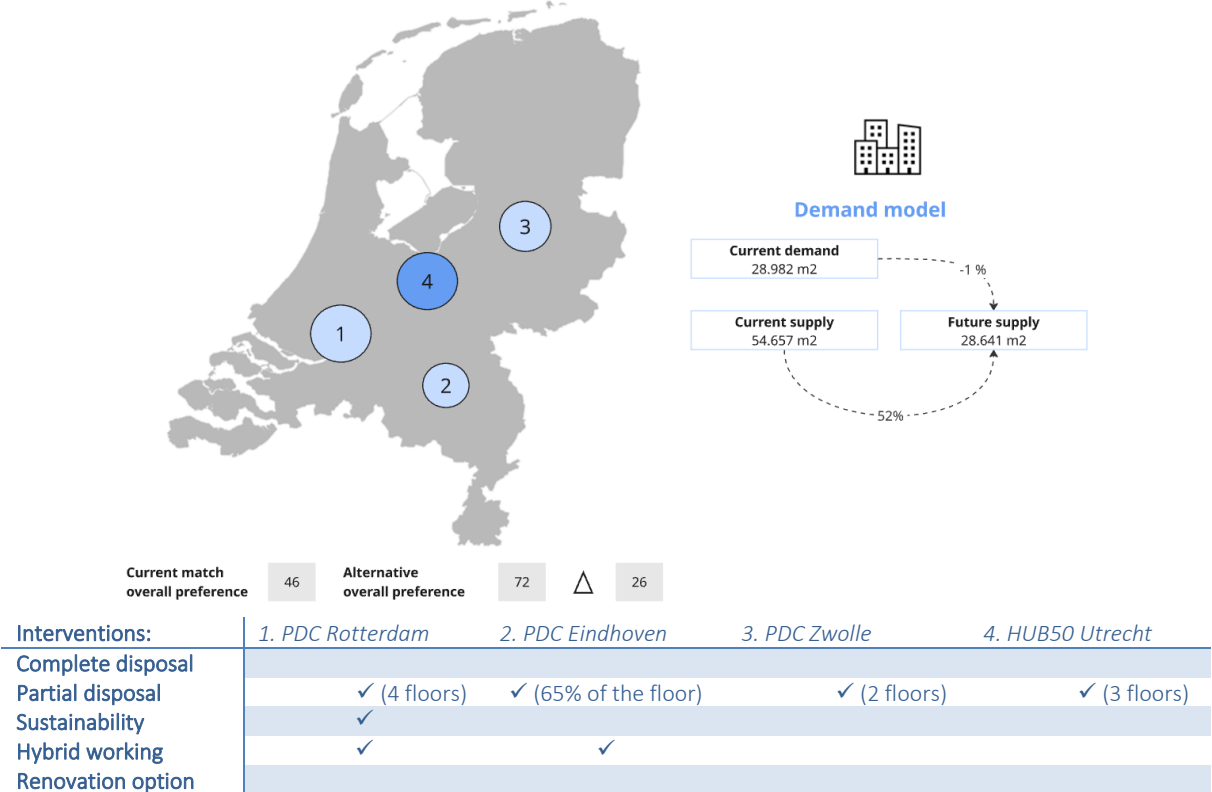


Figure 5.11 The portfolio alternative of the office portfolio from the police during workshop I (legend: Dark blue = owned building; light blue = rented building)

While stakeholders did not explore a wide range of portfolio alternatives, they used the demand model outputs to design a portfolio that closely matched the recalculated demand. This outcome indicates that the model provided a clear and traceable link to stimulate portfolio optimisation. Overall, the specifications were largely met with improvements to be made:

- Integration quality: the use of user-preference data was perceived as relevant and informed portfolio optimisation.
- Accuracy: the designed portfolio deviated less than 1% from the recalculated demand.
- Utilisation of variables: stakeholders interacted with the model by modifying the employment headcount.
- Clarity and transparency: visibility could be improved on the structure and outcomes of the demand model.

Based on the performance levels, the observed implementation can be categorised as Level 4 – High implementation (Table 5.8), as stakeholders largely adopted the demand model outputs with only minimal deviation, while still retaining flexibility to align with future strategic plans.

Table 5.8 Outcome of the Performance Specifications of the Demand model in Workshop I

Level of implementation (Likert score)	Specifications criteria
4 – High implementation	Stakeholders largely adopt demand model outputs, with a close deviation margin ($\pm 10\%$)

5.2 CONCLUSION OF THE PRELIMINARY DESIGN

This section summarises the conclusions drawn from the preliminary design phase, highlighting the integration of the hybrid working demands into the PAS method.

Reference models

In total, 20 decision variables were formulated by the stakeholders, with two of them directly integrated, eight further specified by assigning scores, and three applied differently. Also, seven decision variables were formulated independently by the stakeholders without the need to use the reference models (see Table 5.9). These variables were found in the third reference model policy accommodation, but lacked information to support assigning preference scores.

Table 5.9 The decision variables with a minimal fit-for-purpose relationship between the reference models and the PAS method

#	Decision variables User	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]	Reference model:
#	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]	
1.1	Preservation of office location	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)	[0.0]	[100.100]	[75.50]	Policy Accommodation
3.1	Retain/acquire existing property in the market	Number of buildings 'existing property' in portfolio	[75.0]	[100.100]	[95.95]	Policy Accommodation
6.1	Office space concept for hybrid working	Percentage of hybrid working office building	[50.0]	[100.100]	[75.50]	Policy Accommodation
#	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]	
1.1	Adaptability / accommodating growth and shrinkage of teams	Number of workplaces in the central Netherlands	[0.0]	[80.100]	[50.50]	-
2.1	Accessibility	Parking facilities	[1,5.0]	[3.100]	[2.50]	Policy Accommodation
5.1	Maintenance	Low maintenance costs	[35.0]	[15.100]	[25.50]	Policy Accommodation
6.1	Safety	Building must meet safety/security standards	[70.0]	[100.100]	[85.50]	Policy Accommodation

The reference models were applied during the PAS interviews, resulting in different outcomes, with initial impressions outlined in the next section.

Reference model Hybrid Working Trends

The variables in the first reference model were too broad and insufficiently specific, as stakeholders could independently formulate their own objectives. Although some variables aligned with these objectives, the timing of the model's presentation caused stakeholders to lose interest. One limitation of the model is the categorisation based on the four perspectives of Den Heijer (2011). A variable categorised under a specific perspective can also be used by stakeholders representing other perspectives. The categorisation helps to organise the endless list of adding value, but should be seen as one comprehensive framework. The reference model could still add value for stakeholders who are less experienced in their role or area of expertise. In such cases, it is important to carefully consider whether and how to involve these kinds of individuals in the process.

Reference model Knowledge Workers

Also, the second reference model proved to be of limited use in formulating new objectives, as it became clear that these stakeholders could formulate their own. The model provided greater added value in supporting the refinement and assignment of preference scores, rather than enabling scoring based solely on intuition or assumptions without relevant data. Only the variables lacked in depth to indicate prioritisation or future preferences of employees. In this context, the stakeholders particularly benefited when the variables were clearly defined and accompanied by quantified criteria.

Reference model Policy Accommodation

The third reference model showed similarly limited implementation, with only a few variables proving useful for assigning preference scores. After all, this model could have been the most valuable one for formulating decision variables, since stakeholders are expected to follow the policy. Only, its potential was diluted by the integration of three separate reference models, which caused overlap and reduced clarity for stakeholders. The reference models had differences in communication style and structure, making it more difficult to interpret and use them effectively. Moreover, the stakeholders seemed already satisfied with their goals when the reference models were presented. For assigning preference scores, stakeholders benefit only if these scores are clearly defined by the organisation's ambition or target. For example, a reduction percentage of the portfolio could be determined in the policy; otherwise, it is now implemented by stakeholders.

The Demand model

During the workshop, several improvement points were identified to be incorporated into the next session, aiming to enhance the usability and clarity of the demand model.

Refinements of the Demand Model

The stakeholders assessed the integration of the Demand model as a valuable tool for optimising a portfolio alternative. Since the stakeholders were able to understand the demand model and make adjustments, the full office space demand formula (Cheng, 2022) will be integrated into workshop II. This will allow for testing the hypothesis established prior to Workshop I, whether the modified share ratio was accurately developed by Cheng (2022). This results in the addition of a new share-ratio table, as illustrated in Figure 5.12.

Policy variables			
Future demand	44,500 m2	Total PDC employees (FTE)	3,585
Current demand	44,500 m2		

Employment Headcount			
Number of employees working from home is:	84%	84%	0%
<small>Source: Cluster analysis office of CPB (2025)</small>			
1.1 Toegewijde thuiswerker = homemaker	15%	15%	
1.2 Merendeels thuiswerker = mainly homemaker	31%	31%	
1.3 Rondreizende medewerker = on the road worker	22%	22%	
1.4 Halfom medewerker = semi-around worker	16%	16%	
1.5 Merendeels kantoorwerker = mainly officeworker	16%	16%	
1.6 Toegewijde kantoorwerker = office worker	0%	0%	
<small>Profiel 1.1-1.4 - thuiswerkers</small>			

Share-ratio (5 * Flexnorm * Occupancy) / Office days			
Share-ratio	0.58	0.58	0.00
<small>Source: Survey CPB (2025)</small>			
Occupation preference employees in office during the week	38%	38%	
Average number of days in office	2.58	2.58	

Flexnorm			
Number of employees with own workplace:	0.58	0.58	0.00
<small>Source: Table 1 Flex and space standards per 'Anders Werken' (Police, 2023c)</small>			
1.1 Toegewijde thuiswerker = homemaker	0.40	0.40	
1.2 Merendeels thuiswerker = mainly homemaker	0.40	0.40	
1.3 Rondreizende medewerker = on the road worker	0.40	0.40	
1.4 Halfom medewerker = semi-around worker	0.50	0.50	
1.5 Merendeels kantoorwerker = mainly officeworker	0.50	0.50	
1.6 Toegewijde kantoorwerker = office worker	0.70	0.70	

ABW-Implementation plan			
Space standard norm m2 GFA	21.50	21.50	0.00
<small>Source: Table 1 Flex and space standards per 'Anders Werken' (Police, 2023c)</small>			
Space standard norm m2 GFA (per workplace)	21.50	21.50	

Figure 5.12 Translated screenshot of the improvements of the integrated variables related to the Demand model

Moreover, inspired by the DAS-frame (De Jonge et al., 2009), the dashboard was updated during the workshop to improve readability by enabling visual comparison of current and future demand (Figure 5.13).

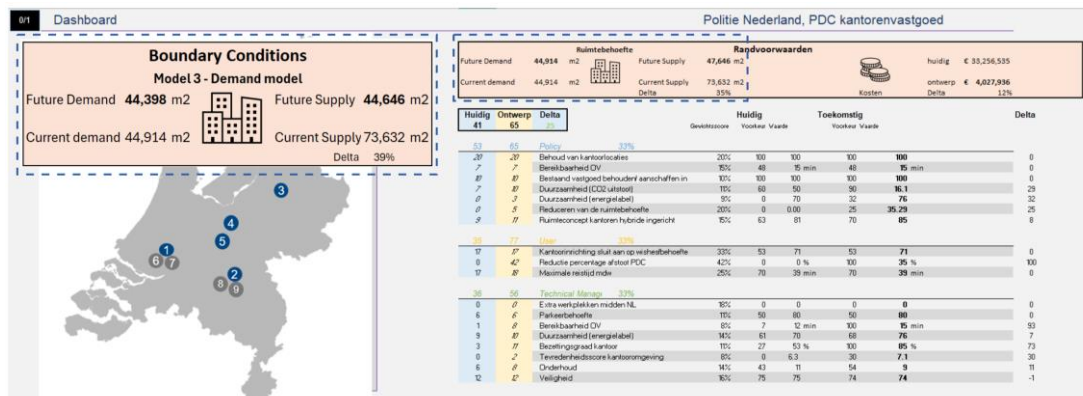


Figure 5.13 Screenshot of Dashboard of the PAS (Arkesteijn, 2019) with zoomed variables of the improved Demand model

Removal of Policy Decision Variables

The policy decision variables from the stakeholders were removed in the model (Figure 5.14). The variables had no impact on a single intervention in an office building; they were only influenced by adjustments within the demand model. The essence of the PAS method is to design a portfolio alternative based on the score of the decision variables related to interventions. Therefore, it was decided to exclude the decision variables.

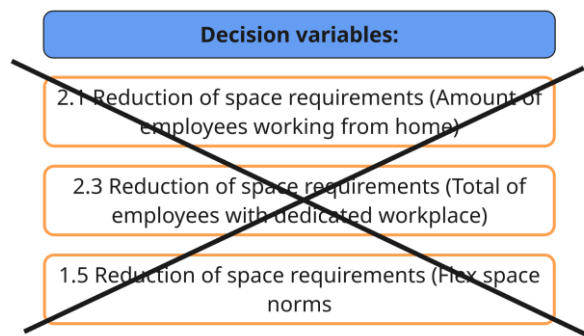


Figure 5.14 The Policy Decision Variables from the stakeholders

Refinements of Office Portfolio

Some confusion arose during the workshop regarding the office buildings included in the portfolio. According to the stakeholders, the office in Nieuwegein is missing (Figure 5.15). It became clear that this building had been deliberately excluded by the project leader of the PAS method, as a separate project for this building is already planned for the upcoming year (Bovy, personal communication, 2025).



Figure 5.15 Building number 5, PDC Nieuwegein (Picture retrieved from Google Earth, 2025)

Another point of attention was the lack of flexibility in the model concerning the cities of Rotterdam and Eindhoven. The stakeholders indicated that there should be an option to acquire or lease an additional building within these cities. As a result, additional selection options were added to the model, allowing for clear specification per city as to whether the current building is retained or an alternative building is to be used. This extended the original four buildings of the portfolio to five, with four additional selection options (Figure 5.16).

New buildings variables																									
<table border="1"> <thead> <tr> <th>Office building Rotterdam (New construction)</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>Number of square metres</td> <td><input type="text"/> m2</td> </tr> <tr> <td>Number of min from intercity station</td> <td><input type="text"/> min</td> </tr> <tr> <td>Parking spaces</td> <td><input type="text"/></td> </tr> <tr> <td>Meets safety/security</td> <td><input type="text"/></td> </tr> <tr> <td>Maintenance costs</td> <td><input type="text"/></td> </tr> </tbody> </table>	Office building Rotterdam (New construction)	6	Number of square metres	<input type="text"/> m2	Number of min from intercity station	<input type="text"/> min	Parking spaces	<input type="text"/>	Meets safety/security	<input type="text"/>	Maintenance costs	<input type="text"/>	<table border="1"> <thead> <tr> <th>Office building Rotterdam (Rent)</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>Number of square metres</td> <td><input type="text"/> m2</td> </tr> <tr> <td>Number of min from intercity station</td> <td><input type="text"/> min</td> </tr> <tr> <td>Parking spaces</td> <td><input type="text"/></td> </tr> <tr> <td>Meets safety/security</td> <td><input type="text"/></td> </tr> <tr> <td>Maintenance costs</td> <td><input type="text"/></td> </tr> </tbody> </table>	Office building Rotterdam (Rent)	7	Number of square metres	<input type="text"/> m2	Number of min from intercity station	<input type="text"/> min	Parking spaces	<input type="text"/>	Meets safety/security	<input type="text"/>	Maintenance costs	<input type="text"/>
Office building Rotterdam (New construction)	6																								
Number of square metres	<input type="text"/> m2																								
Number of min from intercity station	<input type="text"/> min																								
Parking spaces	<input type="text"/>																								
Meets safety/security	<input type="text"/>																								
Maintenance costs	<input type="text"/>																								
Office building Rotterdam (Rent)	7																								
Number of square metres	<input type="text"/> m2																								
Number of min from intercity station	<input type="text"/> min																								
Parking spaces	<input type="text"/>																								
Meets safety/security	<input type="text"/>																								
Maintenance costs	<input type="text"/>																								
<table border="1"> <thead> <tr> <th>Office building Eindhoven (New construction)</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>Number of square metres</td> <td><input type="text"/> m2</td> </tr> <tr> <td>Number of min from intercity station</td> <td><input type="text"/> min</td> </tr> <tr> <td>Parking spaces</td> <td><input type="text"/></td> </tr> <tr> <td>Meets safety/security</td> <td><input type="text"/></td> </tr> <tr> <td>Maintenance costs</td> <td><input type="text"/></td> </tr> </tbody> </table>	Office building Eindhoven (New construction)	8	Number of square metres	<input type="text"/> m2	Number of min from intercity station	<input type="text"/> min	Parking spaces	<input type="text"/>	Meets safety/security	<input type="text"/>	Maintenance costs	<input type="text"/>	<table border="1"> <thead> <tr> <th>Office building Eindhoven (Rent)</th> <th>9</th> </tr> </thead> <tbody> <tr> <td>Number of square metres</td> <td><input type="text"/> m2</td> </tr> <tr> <td>Number of min from intercity station</td> <td><input type="text"/> min</td> </tr> <tr> <td>Parking spaces</td> <td><input type="text"/></td> </tr> <tr> <td>Meets safety/security</td> <td><input type="text"/></td> </tr> <tr> <td>Maintenance costs</td> <td><input type="text"/></td> </tr> </tbody> </table>	Office building Eindhoven (Rent)	9	Number of square metres	<input type="text"/> m2	Number of min from intercity station	<input type="text"/> min	Parking spaces	<input type="text"/>	Meets safety/security	<input type="text"/>	Maintenance costs	<input type="text"/>
Office building Eindhoven (New construction)	8																								
Number of square metres	<input type="text"/> m2																								
Number of min from intercity station	<input type="text"/> min																								
Parking spaces	<input type="text"/>																								
Meets safety/security	<input type="text"/>																								
Maintenance costs	<input type="text"/>																								
Office building Eindhoven (Rent)	9																								
Number of square metres	<input type="text"/> m2																								
Number of min from intercity station	<input type="text"/> min																								
Parking spaces	<input type="text"/>																								
Meets safety/security	<input type="text"/>																								
Maintenance costs	<input type="text"/>																								

Figure 5.16 Four additional buildings with variables for Workshop II

06

Detailed design:

Step 9: Refine and Optimise

Environment

6. ENVIRONMENT: DETAILED DESIGN

This chapter presents the detailed design, which builds on the insights and improvement points identified earlier by applying the reference models and demand model.

6.1 DESIGN DEVELOPMENT

A second round of interviews and a second workshop are conducted to test the fit-for-purpose relationship.

PART I 'Hybrid Working Preferences'

- Reference model - Hybrid Working Trends
- Reference model - Knowledge Workers
- Reference model - Policy Accommodation



Interview II
(Arkesteijn, 2019)

PART II 'Portfolio Optimisation'

- The demand model



Workshop II
(Arkesteijn, 2019)

The development of the detailed design (Figure 6.1) starts with refining the future demand through interviews, where stakeholders can adjust or add their preferences from the decision variables. The demand model is once again integrated with the updated version of the current office portfolio supply during the workshop.

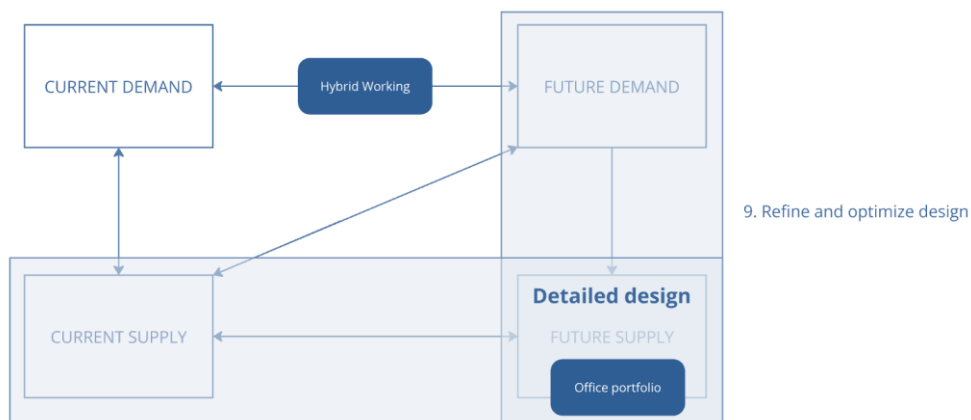


Figure 6.1 Detailed design, positioned in the DAS frame (Own illustration, based on DAS frame, De Jonge et al. (2009))

STEP 9 – REFINE AND OPTIMIZE DESIGN

The last step of this research design process involves improving chosen solutions by making adjustments, trade-offs, and enhancements to best satisfy objectives, requirements, constraints and functions (Dym & Little, 2014). The integration of reference models is used during Interview II in Part One (Section 6.1.1), after which the demand model is applied in Workshop II in Part Two (Section 6.1.2).

PART I - 'HYBRID WORKING PREFERENCES'

6.1.1 REFERENCE MODEL - HYBRID WORKING TRENDS

The reference models were primarily useful during the first interview, as the stakeholders were more flexible and open in formulating objectives. In interview II, no new decision variables were formulated; instead, a few existing variables were adjusted to better align with the stakeholders' future goals, supported by criteria that clarified this alignment. Table 6.1 presents the adjustments to the decision variables, along with the reference models used to support them.

Table 6.1 Adjustments of the decision variables after Interview II

#	Decision variables User	Criterion unit	[x0, y0]	[x1, y1]	[x2, y2]	Reference model:
1.1	Reduction of square meters	Reduction percentage portfolio	[27.0]	[23.100]	[25.50]	Policy Accommodation
1.2		Occupancy rate of offices	{60.0}	{70,100}	{70,60}	Deleted
1.3		Percentage of employees working from home	{80.0}	{96.100}	{87.0}	Deleted
1.4		Percentage of employees without a dedicated workplace	{32.0}	{5.100}	{15.50}	Deleted
#	Decision variables Policy	Criterion unit	[x0, y0]	[x1, y1]	[x2, y2]	
5.1	Reducing space requirements	Reduction percentage portfolio	[27.0]	[23.100]	[25.50]	Policy Accommodation
		Flex space norms	{0,6.0}	{0,3.100}	{0,5.50}	Deleted
#	Decision variables Real Estate	Criterion unit	[x0, y0]	[x1, y1]	[x2, y2]	
2.1	Accessibility	Parking facilities	{1,5.0}	{3.100}	{2.50}	Deleted
6.1	Safety	Building must meet safety /security standards	[70.0]	[100.100]	[85.50]	

Only the objective regarding the reduction of square meters was adjusted. The Policy Accommodation reference model provided an optimisation goal of at least 23% and an optimal of 27% reduction. This aligns more with the overall goal of reducing square meters and stimulating portfolio optimisation. For the other variables, it became clear during the first workshop that these variables were not relevant in the decision-making model and had no direct impact on one of the interventions that could be made for a building. After all, the reference models added limited value, and no further integration was made.

PART II - 'PORTFOLIO OPTIMISATION'

6.1.2 DEMAND MODEL

In the second workshop, the three stakeholders continue collaboratively with the design of a portfolio alternative. In this workshop, the focus shifts from understanding the model and adjusting inputs to emphasising the collaborative design of alternatives and the acceptance of outcomes from the model. For the research, the integration of the Demand model was also essential, particularly through the application of the complete modified share-ratio (Cheng, 2022).

The workshop was held online due to the absence of some stakeholders, but this did not further impact the overall results. The workshop began with an explanation of the improvements made to the dashboard. Then, the variables of occupancy rate and average number of office days from the share ratio were reviewed. Initially, stakeholders responded with some hesitation, unsure of how to interpret or act on these variables. However, after further clarification, it became clear that adjusting these parameters would influence the future demand that aligns with the integrated portfolio. Although the user perspective initially questioned why any changes were necessary, it was ultimately agreed in an internal discussion to increase the occupancy rate and reduce the average number of office days. These adjustments were considered more in line with the police's long-term vision of how employees are coming to the office and on what level, as visualised in Figure 6.2.

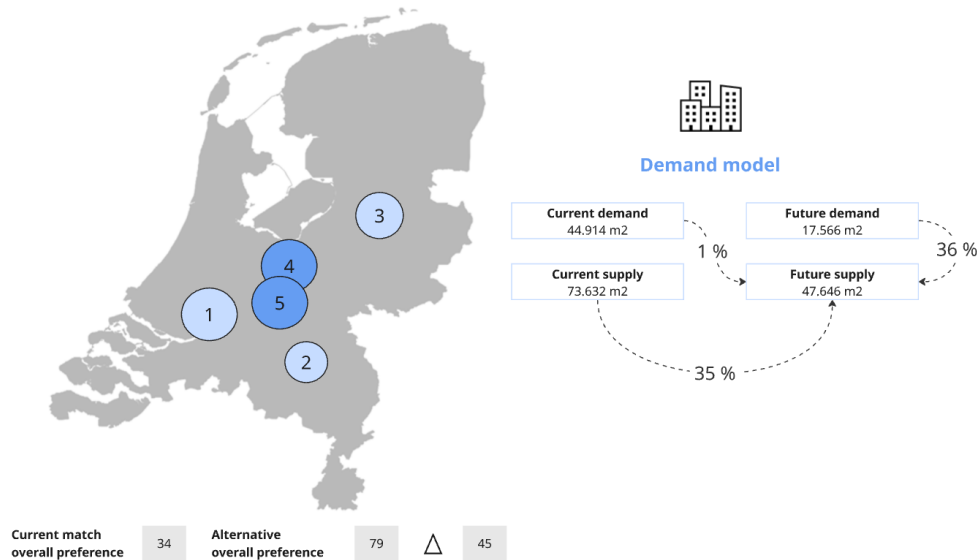
Policy variables			
Future demand	17,566 m ²	Total PDC employees (FTE)	3,585
Current demand	44,914 m ²		

Share-ratio (5 * Flex space norm * Occupancy rate) / Office days			
Share-ratio (Cheng, 2021)	Flex space norms	0.58	0.23
Source: Survey CfPB (2025)			
Occupancy rate preference employees in the office	38%	75%	
Average number of days at the office	2.58	2.00	

Figure 6.2 Adjustment of parameters from model 4 - Demand model during workshop II

The real estate perspective noted that the difference in space demand had become significantly larger, with a different outcome of almost 30.000 m². In the next phase, the stakeholders are designing a portfolio alternative. The previous portfolio alternative was not implemented, so the stakeholders are more likely to seek new solutions or alternative portfolios instead of staying with the previously designed one that aligned with the future plans. Moreover, it had to be tested prior to the workshop to ensure proper functionality. Since it only saves the final results, the decision was made to start without any pre-filled changes.

Despite this, the stakeholders appeared neither enthusiastic nor engaged in implementing other interventions. Initially, an open question was posed about which adjustments they would like to see in the current portfolio, but it received no response. Consequently, each of the three stakeholder was asked individually about their preferred portfolio alternative. Since this approach proved difficult, the interventions were then discussed on a building-by-building basis, including their impact on the decision variables. Nevertheless, compared to earlier workshops, the stakeholders showed limited interest in making changes. The future portfolio already demonstrated a higher preference score, which likely contributed to their reluctance. Even when further prompted about the possibility of reducing the total floor area to better match the projected space demand, no additional suggestions were offered. This ultimately resulted in a total score of 79 in the PAS model, as visualised in Figure 6.3.



Interventions:	1. PDC Rotterdam	2. PDC Eindhoven	3. PDC Zwolle	4. HUB50 Utrecht	5. Ringwade
Complete disposal					
Partial disposal	✓ (4 floors)	✓ (65% of the floor)	✓ (2 floors)	✓ (3 floors)	
Sustainability	✓				
Hybrid working	✓	✓			✓
Renovation option					✓

Figure 6.3 The portfolio alternative of the office portfolio from the police during workshop I (legend: Dark blue = owned building; light blue = rented building)

Despite a clear understanding of the dashboard updates and input variables, the actual implementation of interventions remained limited. This outcome suggests that while the revised model functioned properly, the motivation to further optimise the portfolio had decreased. The existing portfolio was already perceived as adequate, reducing the urgency to explore alternatives. Overall, the specifications were partially met, with notable differences compared to Workshop I:

- Integration quality: The integration of updated variables (occupancy rate and average office days) was acknowledged, but generates notably different outcomes.
- Accuracy: the designed portfolio deviated less than 1% from the recalculated demand
- Utilisation of variables: stakeholders changed the updated variables, but it did not stimulate designing another portfolio alternative.
- Clarity and transparency: the improved structure was perceived as valuable.

Based on the observed engagement and model use, the implementation level can be categorised as Level 3 – Moderate implementation (Table 6.2). Stakeholders showed understanding of the model but made limited use of its outputs.

Table 6.2 Outcome of the Performance Specifications of the Demand model in Workshop II

Level of implementation (Likert score)	Specifications criteria
3 – Moderate implementation	Stakeholders partially align their design with the demand model, with a sufficient deviation margin ($\pm 20\%$)

During the session, several findings and insights were gathered regarding using the Demand Model in the PAS. This section evaluates the final outcome of the application of these integrated models.

Complications with the outcome

In the second workshop, it was noted that the difference in space demand had become significantly larger. Looking into the formula, the demand significantly changes when the occupancy rate or the number of days is altered. A lower occupancy rate should result in a lower demand, as desks are used less frequently and can therefore be shared by more people. Moreover, the difference in future demand between Workshop I and Workshop II suggests that the portfolio demand should have decreased in Workshop II, as both the average number of office days and the occupancy rate were reduced. This is also not the case, as outlined in Figure 6.4.

	Flex space norms	Share-ratio (δ)	Desk Occupancy (η)	Office days/ week (a)	Output Share-ratio	Output flex space norms	Future demand
Workshop I	Dedicated home worker 0.4	2.5	100%	5	2.5	0.4	33,304 m2
<p>The modified share-ratio is $\frac{5\delta * \eta}{\alpha}$. <small>(Cheng, 2021)</small></p> <p>δ = share-ratio (sheerly based on ABW, differs per persona group) α = number of days employees working in the office in a week, η = desk occupancy rate <small>(0< α ≤5, 0< η ≤100%)</small></p>							
Workshop II	0.4	2.5	38%	2.58	1.8	0.5	44,914 m2
Workshop II	0.4	2.5	75%	2	4.7	0.2	17,566 m2
Lower occupancy	0.4	2.5	50%	5	1.3	0.8	65,833 m2
Even lower occupancy	0.4	2.5	25%	5	0.6	1.6	131,688 m2
Lower office days	0.4	2.5	100%	2.5	5.0	0.2	16,469 m2
Even lower office days	0.4	2.5	100%	1.5	8.3	0.1	9,869 m2
Both low	0.4	2.5	50%	2.5	2.5	0.4	32,917 m2
Both high	0.4	2.5	100%	5	2.5	0.4	33,304 m2

Figure 6.4 Outcome of the modified share ratio in the Demand model during the workshops

It can also be argued that the link from preferences of demand from the knowledge workers isn't sufficient because different work location preference profiles could have different outcomes for desk occupancy and the number of office days in a week. For example, a dedicated home worker comes to the office fewer days than a dedicated office worker. However, when these parameters are specified for those profiles, so that the share ratio aligns more with the type of user, the formula also reveals an unrealistic outcome. To illustrate this, the occupancy rate was derived from a graph, and the number of office days per profile was formulated in the report by Houtveen et al. (2024).

In this report, an average score per profile, based on input from multiple organisations, is discussed. Based on this, it can be assumed that the police's work location profile does not significantly deviate from these average values. Although the survey data allows for calculating exact values (CfPB, personal communication, 2025), the analysis requires linking multiple questions to the work profiles using a method developed and validated by CfPB. While the full dataset was provided, replicating this process doesn't seem to benefit the research and brings complexity and reliance on CfPB's proprietary method to do this analysis. In Figure 6.5, the derived occupancy rate is visualised.

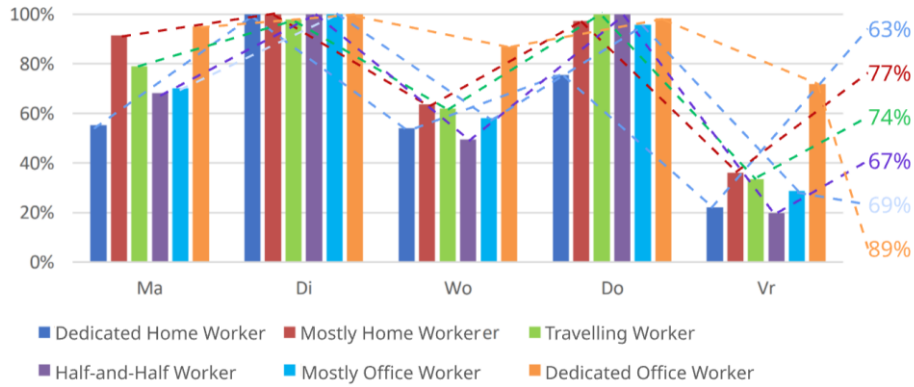


Figure 6.5 Occupancy rate of each profile, relative to the busiest day per profile (Retrieved from Houtveen et al., 2024, pp.8)

In Figure 6.6, specifying these data for each profile results in a lower office space demand. Compared to the top of the figure, with a full desk occupancy rate and five working days at the office, it seems to be logical to have a lower demand. As this outcome aligns with the expectation that the indicated work profiles currently spend fewer days at the office, it justifies the lower demand. However, where it is reasonable to assume that the first three profiles on average spend one to two days per week at the office, if the target occupancy rate increases on average to 75% (as discussed in Workshop II), the calculated office space demand decreases when the supply stays the same, as shown at the bottom of the figure. This outcome is counterintuitive because if the average occupancy rate increases, implying more frequent office attendance, the expected demand should increase, not decrease.

	Flex space norms	Share-ratio (δ)	Desk Occupancy (η)	Office days/ week (α)	Output Share-ratio	Output flex space norms	Future demand
Workshop I	0.4	2.5	100%	5	2.5	0.4	33,304 m2
Workshop II	0.4	2.5	38%	2.58	1.84	0.5	44,914 m2
<p>The modified share-ratio is $\frac{5\delta * \eta}{\alpha}$.</p> <p>(Cheng, 2021)</p> <p>δ = share-ratio (sheerly based on ABW, differs per persona group) α = number of days employees working in the office in a week, η = desk occupancy rate (0 < α ≤ 5, 0 < η ≤ 100%)</p>							
Dedicated home worker (15%)	0.4	2.5	63%	1	7.83	0.1	
Mostly home worker (31%)	0.4	2.5	77%	1.3	7.44	0.1	
Travelling worker (22%)	0.4	2.5	74%	1.7	5.46	0.2	
Half-and-Half Worker (16%)	0.5	2.0	67%	2.5	2.66	0.4	
Mostly office worker (16%)	0.5	2.0	69%	3.8	1.82	0.5	
Dedicated office worker (0%)	0.7	1.4	89%	5	1.27	0.8	
			(Houtveen et al, 2024)	(Houtveen et al, 2024)			19,243 m2
Dedicated home worker (15%)	0.4	2.5	75%	1	9.38	0.1	
Mostly home worker (31%)	0.4	2.5	75%	1.3	7.21	0.1	
Travelling worker (22%)	0.4	2.5	75%	1.7	5.51	0.2	
Half-and-Half Worker (16%)	0.5	2.0	75%	2.5	3.00	0.3	
Mostly office worker (16%)	0.5	2.0	75%	3.8	1.97	0.5	
Dedicated office worker (0%)	0.7	1.4	75%	5	1.07	0.9	
			(Houtveen et al, 2024)	(Houtveen et al, 2024)			18,017 m2

Figure 6.6 Outcome of the modified share ratio from the Demand model based on input of the work location preference profiles (Houtveen et al., 2024)

Therefore, the hypothesis that the modified share ratio was developed incorrectly seems to be true. Figure 6.7 shows that the relationship between occupancy rate and office days does not appear to be logically consistent. The graph below is based on a share ratio derived from the work location preference profile 'Dedicated home worker' with a share ratio of 2,5. Adjusting these values in the formula does not always give a realistic outcome. For example, if fewer desks are provided in the future, the desk occupancy might change, not because demand has changed, but because supply has decreased. Since an employee's response to this situation can vary, some may choose to work more from home when fewer desks are available, while others may prefer to come to the office. Similarly, if there are now fewer desks, some employees come to the office for fewer days; however, this does not necessarily mean that workplace demand has decreased. As a result, it is hard to use both variables as direct

indicators of demand, since they influence each other and other factors, and therefore do not fully represent actual space needs.

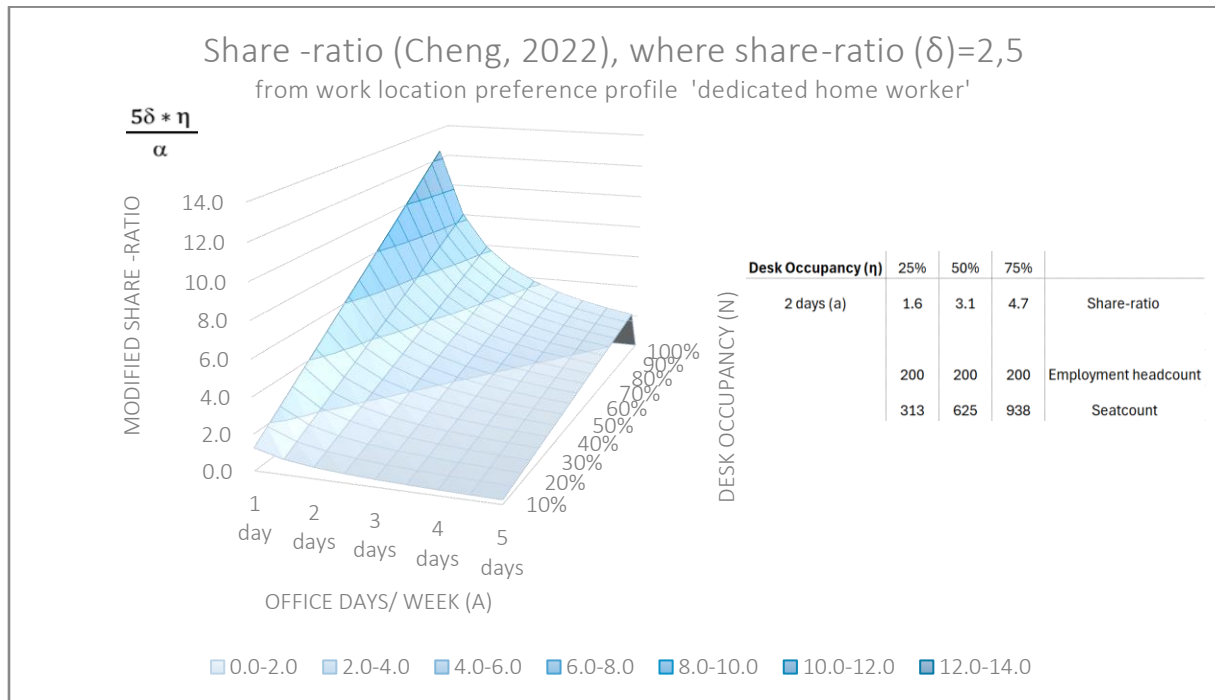


Figure 6.7 Outcome of share-ratio based on work location preference profile 'Dedicated home worker'

This analysis shows that changing the occupancy rate in the calculation does not give realistic results, because occupancy is the outcome of both supply and demand factors. For example, the growth of the organisation's employees increases it, reducing the number of workplaces can lower it, or improving workplace quality can attract more users and increase it. Therefore, occupancy should be treated as a resulting variable, not as a fixed input for calculations, and there are two ways to address this issue:

1. Adjust the formula. Leave out the occupancy rate variable in the formula. As in the first workshop, the variable of desk occupancy rate was excluded, and the stakeholders were still able to design a portfolio based on demand.
2. Don't change the input. Since the occupancy rate can be influenced by reducing the number of desks, attracting more employees to come to the office without changing the number of desks, or by combining both approaches, the variables can, in some combinations, be determined.

An additional insight on using the demand model is to use scenarios with interventions in the decision-making model. The value of scenarios lies in showing how changes in one factor affect the overall outcome. For example, if the organisation implements interventions to encourage employees to visit the office more often, it should be assumed that the outcome will change, which in turn increases demand for space. This does not guarantee the intervention will succeed, but it does demonstrate the intended direction of change and its potential impact.

During the workshop, there was a noticeable lack of effort to design new portfolio alternatives that could achieve a higher overall score, as this proved difficult due to conflicting stakeholder decision variables and trade-offs between costs and other highly rated objectives (full analysis in Appendix E).

6.2 CONCLUSION OF THE DETAILED DESIGN

This section elaborates on the preliminary and detailed design where the research instruments of the Hybrid Office Portfolio Optimisation (HOPO) are integrated in the PAS method to test the fit-for-purpose relationship between the HOPO-PAS, addressing the second sub-question:

What is the relationship between the integrated hybrid working demands and the application of the PAS design and decision-making method?

The hybrid working demands are developed in three different reference models and tested during interview I and II of the PAS to formulate decision variables. The other hybrid working demand has been developed into a demand model that is integrated into workshop I and II of the PAS to stimulate portfolio optimisation.

Hybrid Working Preferences

The stakeholders were responsible for determining the decision variables. While in theory, all identified variables could be included, in practice, only a selective group of variables proved to be useful. This selection was influenced by their expertise, way of communicating and quality and completeness of the reference models.

The stakeholders were able to independently formulate objectives, with the reference models offering little added value for integrating new objectives. The PAS method also showed that stakeholders can formulate unique objectives that are not (yet) included in a reference model. The stakeholders' expertise ensured that the objectives they formulated were directly relevant to their context, while the models mainly served as a verification tool or as inspiration for assigning preference scores. Since the policy and user perspectives indicate that the use of the preference score was helpful, as scoring became less reliant on assumptions and intuition and aligned more closely with the available data. It eliminated the need to search for data and enabled a more substantiated assessment rather than relying solely on intuition, according to the policy perspective. However, the variables from the reference models do not have a scoring for all three aspects, including the least, medium, and optimal scores. Therefore, stakeholders are still required to assign other scores if necessary.

The reference models were purposively introduced after the first open exploration phase in the PAS method. In the first part of the interviews, stakeholders were encouraged to provide input, which prevented the reference models from steering or limiting their thinking. Once initial objectives were established, the reference models were presented as a supplementary resource. At this point, stakeholders could use them to reflect on their earlier input, verify whether all relevant objectives had been considered, and, in some cases, refine existing variables by assigning preference scores. This timing limited the models to add value in structuring and scoring decision variables, rather than prematurely dictating or narrowing the range of objectives. As a result, stakeholders experienced the models as supportive rather than prescriptive.

The degree to which the reference models could contribute depended strongly on their quality and completeness. In particular, the hybrid working trends model was perceived as too generic, offering limited guidance for formulating concrete decision variables. Furthermore, using three different reference models (each with a distinct layout, structure, and level of detail) created an additional

cognitive load for the stakeholders, as they had to process different types of information in different formats. Among the models, the policy accommodation model showed the highest potential for generating decision variables due to its more detailed and policy-aligned content. However, by the time this model was introduced, most stakeholders had already formulated a sufficient number of objectives on their own. This illustrates that while the reference models contained relevant information, they were not comprehensive enough to fully support.

Portfolio Optimisation

The Demand Model was applied during the workshops, with a simplified share ratio used in the first workshop and the full modified share ratio in the second workshop. For the relationship between the identification of the knowledge workers' preferences in the second reference model and the demand model, the reference model demonstrates that it is only applicable for categorising the employees with the use of work location preference profiles from Center for People and Buildings to identify the first parameter of employment headcount. This reference model lacks in identifying the workspace office plan as one of the parameters (the ABW implementation plan). Therefore, the spatial norms were used from the organisation to calculate the total required office space demand of the portfolio. Although the second reference model is capable of identifying parameters from the share ratio, the modified share ratio proves to be difficult to apply, as the desk occupancy and the number of days employees work in the office per week are not suitable parameters. However, the outcome of the formula stimulates portfolio optimisation during the workshop. The research has shown that the demand model can be used to design an optimisation alternative for the portfolio. Based on an indication of the current demand and supply, stakeholders can develop a future supply (portfolio alternative) that better matches this office space demand for the portfolio.

Furthermore, the development of the preliminary design and detailed design also addressed the third sub-question, which is as follows:

How can the PAS model be adapted, and what needs to be changed to support a fit-for-purpose design and decision-making?

The research shows that integrating reference models into the PAS method to formulate decision variables is not strictly necessary. While they indicated that they had included all relevant variables by cross-checking with the reference models, it cannot be confirmed with certainty that no variables were overlooked. This limitation partly relates to the way the reference models were presented, and their layout and quality may have influenced interpretation. Some stakeholders experienced cognitive overload due to the complexity and inconsistent presentation of multiple reference models. Nevertheless, reference models could still add value in other PAS applications, particularly when stakeholders find it difficult to formulate variables on their own. Future applications could benefit from a more standardised and clearly structured approach. Consistency in format, layout, and level of detail would make reference models easier to interpret and strengthen their role in supporting decision-making. An alternative approach could be to develop one comprehensive reference model, which would integrate the elements of multiple models and thereby reduce complexity for stakeholders. Furthermore, although stakeholders successfully formulated their objectives without extensive reliance on reference models, it was observed that explicitly defined policy goals from the third reference model

could further streamline their integration. Setting clear, specific objectives at the onset would ensure alignment, making the implementation more coherent and data-driven.

Regarding the Demand Model integration, the research indicated that it supports portfolio optimisation by providing clear quantitative input into design and decision-making workshops. The demand model effectively informed stakeholders about portfolio demand, enabling them to design a portfolio alternative. However, the practical usability of the Demand Model was constrained by its limited ability to translate actual user preferences into meaningful spatial requirements within the modified share ratio formula. The variables of desk occupancy rate and number of office days are difficult to use together when they are adjusted during the workshop. To make the formula more fit-for-purpose, it can either be adjusted, applied with strict rules about changing which variables can be adjusted, or combined with scenarios that include interventions in the decision-making model. Overall, the demand model provided added value to be adapted in the Dashboard of the PAS method, where outcomes can be determined either before or during the workshop.

07

Discussion

7. DISCUSSION

This chapter interprets the research findings and reflects on the challenges, limitations, and future research identified during the integration of the reference models and the demand model into the PAS method, informed by the third round of interviews.

7.1 INTERPRETATION OF THE RESULTS

The Reference models

This research found that reference models were not strictly necessary for establishing decision variables in the PAS method. Particularly, the reference model on hybrid working trends (based on literature) and knowledge workers (based on survey data) appeared less effective than expected. Due to differences in contextual focus and visual representation, the models were difficult for stakeholders to interpret. In contrast, the accommodation policy (based on policy documents) reference model proved more applicable, as it directly reflected strategic information. Furthermore, presenting models only after formulating goals appeared to reduce stakeholder engagement. However, literature suggests that reference models can support decision-making by systematically structuring complex problem situations (De Leeuw, 2002, p. 301). Therefore, reference models still hold potential added value within the PAS method.

The added value can be found with studies highlighting the persistent gap between strategy and implementation (Noble, 1999; Okumus, 2003; Olson et al., 2005). Strategic plans, while intended to provide clarity and direction, often become disconnected from the realities of implementation (Okumus, 2003). This can have several causes (Tawse & Tabesh, 2021), but the reference model can help mitigate this by identifying goals, policies and actions that are later implemented by the stakeholders in the PAS method. As supported by Meskendahl (2010), the value of strategy lies not only in its formulation but in its implementation by translating strategic objectives into project portfolios; organisations create alignment between strategic intent and operational execution. Moreover, strategy is managed within different levels within the organisation, and this top-down hierarchical approach can lead to misalignment between strategic intent and implementation (Floyd, 2000). Implementing the strategy through a structured reference model adds value by making this translation explicit and traceable, thereby strengthening strategic alignment and enhancing the efficiency of business processes between upper and lower management and vice versa (Henderson & Venkatraman, 1989). Another point that adds value relates to a finding from Swens (2024), where interviewees indicated that constructing curves within the PAS method was perceived as difficult at the beginning of the process. This research showed that the reference model can help stakeholders in scoring the preference curves.

The findings suggest that reference models should be designed to be more comprehensive, either by expanding into multiple models or by consolidating into a single model. While different reference models provide a specific context that can increase accuracy, they may lead to fragmentation, may be difficult to apply because they require more data, and reduce comparability. Conversely, a single model ensures consistency, scalability, and a clearer visual presentation, but may risk oversimplifying contextual nuances or less focus on important information. The findings indicate that the policy-based model had the most potential, suggesting that future studies should further investigate how these variables can be strengthened or combined with others to create a more robust framework. It should be noted that these findings are based on stakeholders with prior experience in portfolio management.

For this group, formulating decision variables was relatively easy; however, this study did not observe whether the formulated strategies in the reference model were subsequently implemented as intended. Future research should therefore examine the degree of alignment between reference models and actual strategic outcomes in practice. Implementation remains a complex phenomenon that involves more than just the operationalisation of a strategic plan; it also emphasises interpersonal and behavioural elements, political processes, and the shaping and adoption process at multiple levels in the organisation (Noble, 1999). Moreover, it could also explore whether integrating reference models earlier in the PAS process leads to more consistent and transparent portfolio decisions.

Demand model

Another finding of this research concerns the limited added value of the demand model in its current form. Although the model can translate user preferences into a single outcome to stimulate an optimisation, its practical application revealed several constraints. Changing variables during workshops introduced complexity and uncertainty regarding the reliability of results. While this flexibility encouraged stakeholders to take responsibility for generating future demand, it remains unclear whether this process should be guided or predefined through model outputs. Portfolio management involves the continuous process of identifying, selecting, and managing a collection of real estate assets. Effective decision-making in this process requires screening and selection of a range of possible portfolios (Salo et al., 2024). The current application of the demand model provides only one calculated output, which limits its strategic usefulness for long-term portfolio optimisation. Therefore, integrating scenario thinking into the demand model could enhance its ability to simulate different organisational futures and support more resilient decision-making. However, it remains important to carefully consider the calculation of the share ratio, either by adjusting the formula or by identifying fixed values to ensure consistency and comparability of results.

In addition, the decision-making model could be extended to integrate a demand per building in order to present potential overcapacity for each building. This would be particularly valuable, since stakeholders do not always possess detailed knowledge of individual office buildings, which makes it difficult to reduce space in a targeted manner. By applying current and future demand to the current supply for each building, it becomes possible to design a future supply for that specific building. However, this may reduce the level of flexibility in generating alternative designs at the portfolio level, especially in portfolios where buildings that can potentially be relocated, repurposed or replaced are more flexible because their location is not tightly linked to the function they serve.

The role of the facilitator

During the workshops, the facilitator leads and facilitates the process (Arkesteijn, 2019) rather than influencing the content or outcomes. By guiding the use of the PAS method and supporting participants in understanding the instruments, the facilitator enabled stakeholders to take ownership of decision-making. Observations were made on how these instruments were applied, while stakeholders remained responsible for shaping the ideal portfolio through the interventions. The facilitator merely presented the input and demonstrated how it could influence the portfolio. To this end, the demand model was introduced, after which stakeholders could adjust its parameters to align with their goals. This approach allowed stakeholders to understand how the demand model was constructed and how their decisions could directly influence the design of a portfolio alternative. A workshop could also be held, with only the outcome being generated as identification. This allows stakeholders to focus only on designing the

portfolio. In the current format, the process was split into two separate components during the workshops.

7.2 LIMITATIONS OF RESEARCH

This section discusses the limitations that were identified during the research and that may have influenced the results and conclusions. By recognising and outlining these limitations, it becomes clearer which aspects may require further exploration or elaboration.

Reference models

A complexity of the first reference model is that it was developed through a narrative literature review based on a selection of search terms. While this approach allowed for a broad exploration of the topic, it also meant that certain relevant sources (e.g., De Vries, 2008, on performance indicators and KPIs or real estate norms) were not retrieved. The absence of such studies limited the model's foundation, making it less structured and comprehensive. Consequently, the robustness and completeness of the first reference model were affected.

The survey variables from the second reference model proved difficult to apply directly within the PAS method. They primarily reflected current satisfaction rather than future needs or improvements in the real estate portfolio, limiting their usability when assigning preference scores. Moreover, particularly complex or highly specific variables, such as the personalisation of workspaces or detailed technical aspects of office environments, were found to be less relevant during the interviews. This is because stakeholders focus on broader strategic objectives in the early stages of portfolio management, as these objectives apply to the entire portfolio. Integrating very specific variables from the reference models is not suitable at this stage, since such detailed requirements typically emerge in the tactical and operational phases rather than in strategic portfolio decisions (Den Heijer, 2011). The practical contribution of these variables was therefore constrained by either overly general formulations or by a level of detail that made them difficult for stakeholders to apply.

The use of the framework from Swens (2024) for the third reference model Policy Accommodation proved to be challenging and was considered too extensive, making it difficult to use effectively during the interviews. However, in this analysis, it became evident that the policy can be interpreted in multiple ways, and not all of the identified variables were included. Adapting a policy reference model is inherently difficult, as its value lies in providing a consistent strategy that enables comparison and alignment (Okumus, 2003). Adjusting the model risks undermining this consistency, which is why such adaptation should not be left to the facilitator of the process. Instead, the responsibility lies with the stakeholders to apply and interpret the model in light of their strategic objectives (Noble, 1999). Moreover, the PAS method proves that these abstract variables can be made more concrete by the stakeholders. In this sense, the facilitator's role is primarily to present the reference model in a clear and structured manner, ensuring stakeholders can engage with it effectively.

Portfolio Application Challenges

The selection of the portfolio for this pilot study was primarily based on practical accessibility, personal interest in hybrid working, and alignment with the research problem. Given the size and diversity of the police's overall real estate portfolio, it was not feasible to conduct a broader or complete portfolio analysis within the timeframe of this research. In hindsight, this resulted in the selection of a portfolio

that already had predefined plans in place, limiting the ability to explore alternative portfolio designs. A more critical formulation of case selection criteria, such as the degree of strategic openness, timing within organisational decision-making processes, and the diversity of real estate types, could have helped prevent these limitations.

Within the context of the Netherlands Police, which manages various types of real estate and user groups, it is more challenging to define a clear and bounded framework for determining which buildings are or are not considered part of the portfolio. As a result, alternative solutions, such as including buildings outside the specific office real estate of the Police Services Centre² (PDC), for example, district stations⁴ or even other types of offices, were not taken into account. Subsequently, the model could potentially be expanded to include so-called third locations, which represent alternative workplaces outside the home and the office, a suggestion that emerged from the user perspective during the interview.

Moreover, the stakeholder representative of the user perspective explained that the organisation first needs to establish a more concrete business plan and make fundamental decisions to address internal challenges. As a result, the situation presented in the research does not fully align with the actual organisational context, making it difficult to investigate portfolio alternatives. Although the developed model is seen as relevant and potentially helpful, the current lack of stability and prioritisation within the organisation limits the willingness to engage. This highlights the internal tension in the complexity of the organisation, which has only been a national organisation since 2013. Thus, selecting a broader or more strategically flexible portfolio could have provided greater opportunities to apply the PAS method with clear objectives, allowing for a more explorative and impactful use of decision-making models.

Scope application

Expanding the scope of the study by including a larger and more diverse group of stakeholders could potentially lead to different research outcomes. In this study, the limited number of interviewed stakeholders and their close collaboration may have resulted in relatively homogeneous preferences, limiting the PAS method's ability to uncover diverging priorities or conflicts. By contrast, a larger and more varied stakeholder group might reveal a wider spectrum of perspectives, resulting in richer discussions and possibly more complex trade-offs between organisational goals and user needs. A limitation in this regard concerns the representation of end users: although the selected strategic accommodation advisor provided valuable input from the user perspective, this role did not reflect employees' actual preferences. Research shows that employees often prioritise flexibility, comfort, and accessibility (Voll et al., 2024), which may conflict with strategic aims such as reducing space. Consequently, these preferences may have been underrepresented in this study, underscoring the importance of involving end users more directly to enhance representativeness and validity. While these contextual differences might not significantly affect the methodological contribution of this study, namely, testing the integration of hybrid working demands into the PAS method, they only have a small influence, such as the context of a reference model and the decision variables used in PAS.

⁴ District stations are referred to as 'politie bureau's' in Dutch, which serve as local police offices.

Online Workshop Implementation

Due to unforeseen circumstances, Workshop II was conducted online, which deviated from the original recommendations of the PAS method (Arkesteijn, 2019). Although all stakeholders and the project leader participated fully and the session ran effectively with the support of clearly visible dashboards, the online setting may have limited the interaction and dynamics between participants. However, the relatively small group size proved well-suited for an online format, making it a feasible alternative in unexpected situations. Nevertheless, the recommendation remains to organise workshops in person whenever possible to ensure optimal interaction and engagement.

7.3 SUGGESTION FOR FURTHER RESEARCH

This section provides recommendations for future research, based on the experiences and insights gained from this study.

Application in Different Public or Corporate Real Estate Contexts

This study focused exclusively on a single public real estate organisation. Future research could test the application of the integrated decision-making model in other public or private organisations to further explore the model's scalability and flexibility. Applying the model in a different context or within a larger real estate portfolio may help to determine whether it is also suitable for situations involving different strategic objectives, property types, and organisational structures.

The decision variables

The study revealed that stakeholders sometimes find it difficult to assign clear scores to preference variables. This is especially the case for criteria where no supporting data is available. In such situations, the formulation or clarification of objectives by the police could help to simplify the process. It is also beneficial to let stakeholders start by scoring straightforward objectives, in order to become familiar with the method before addressing more complex goals.

Future research could also explore soft value decision variables, such as user satisfaction, and investigate how these could be assessed under different interventions. It could also be the case that some decision variables currently lack a clear scoring method within the organisation. The PAS method supports the organisation in reflecting on these values and can further help by identifying such gaps before the first workshop. Furthermore, decision variables can be assessed based on different criteria related to the same objective. For example, the concept of accessibility may vary depending on whether the preference concerns proximity to an intercity train station or to a local bus stop. Although each criterion can be scored individually, it would be valuable to explore how they might be integrated. This would allow for different levels of scoring within a single, overarching objective, contributing to a more efficient decision-making process.

Generating Portfolio Alternatives

Another suggestion for future research is to generate different portfolio designs before the workshops. At present, stakeholders develop their own design alternatives, which supports an interactive approach. However, it is also possible to prepare several variants in advance that differ in scenarios, such as levels of centralisation, flexibility, sustainability, or space utilisation. This could encourage stakeholders to move beyond their usual patterns of thinking. In addition, saving the portfolio would make it easier to

document multiple portfolio variants during the workshop. In the current setting, only a single portfolio variant can be assessed in the Dashboard.

To support this, integrating advanced optimisation techniques, such as machine learning or artificial intelligence (AI), could enable the generation of multiple design alternatives in an automated and well-informed manner. These techniques may assist in predicting outcomes and identifying patterns and trends of the variants. However, caution is advised when using AI, as an excessive reliance on algorithms in decision-making may come at the expense of transparency and accountability (Larsson & Heintz, 2020). For this reason, AI should always serve as a supporting element within a broader, participatory decision-making structure, where human interpretation and dialogue remain central. Moreover, in settings where the police are not widely accepted to use AI tools due to privacy concerns.

Integration of real-time Data

A next step for future research is the integration of real-time data into the decision-making model. Real-time data enhances the flexibility and accuracy of decision-making, as it allows organisations to respond quickly to current changes. Within the organisation, data on occupancy rates is already being monitored, and additional data on energy consumption and maintenance conditions could also be incorporated. By continuously integrating this up-to-date information into the PAS model, strategic decision-making can be more closely aligned with actual use and changing needs. This would enable more accurate forecasts, more efficient use of space, and long-term optimisation of costs and sustainability.

7.4 IMPLICATIONS AND IMPACT

Practical Implications

This research contributes to existing knowledge by testing the applicability and usability of the Preference-based Accommodation Strategy (PAS), as developed by Arkesteijn (2019), within a public real estate context. It highlights the need to capture the wider and sometimes conflicting values in hybrid working. The study shows that clearly and concretely stated objectives support this integration with a reference model. Moreover, integrating a demand model into the PAS design and decision-making method supports well-informed decisions regarding portfolio optimisation. This integration provides new insights into how the design of a portfolio can be more aligned with the future demand for office space. Therefore, this research supports real estate organisations in preparing developments related to the office portfolio with the future implications of hybrid working and portfolio optimisation.

In conclusion, the integration of the reference models within the PAS method presents challenges due to variations in the level of detail and the applicability of variables. This highlights the importance of clearly formulated objectives and the active involvement of stakeholders to capture the future demand. The main contribution of this study lies in demonstrating how a demand model can be used to effectively optimise office real estate portfolios within a decision-making model.

08

Conclusion

8. CONCLUSION

The aim of this research was to integrate research instruments to provide a fit-for-purpose design and decision-making in the adapted Preference-based Accommodation Strategy (PAS) method (Arkesteijn, 2019). The integrated research instruments are referred to as the Hybrid Office Portfolio Optimisation (HOPO) model to add value and assess hybrid working preferences and office space demand for portfolio optimisation within the PAS. The conclusion provides a systematic answer to the main research question, which is derived from the analysis of the sub-questions. The research question addressed in this study is as follows:

How can the PAS design and decision-making method be adapted into a fit-for-purpose design and decision-making model that integrates hybrid working demands for optimising office real estate portfolios?

8.1 PART A 'INPUT'

The first step in answering the main research question is elaborating on the development of the HOPO model that is later applied in the PAS method.

Research sub-question 1:

What hybrid working demands can be developed, and how can they be integrated?

The hybrid working demands can be effectively captured and integrated through two research instruments: hybrid working preferences and portfolio optimisation. To address the diversity and complexity of hybrid working preferences arising from varying interpretations of adding value in either corporate or public real estate management, three reference models were developed. The first reference model about hybrid working trends is derived from literature and categorised according to the four perspectives of Den Heijer (2011). The second reference model captures the preferences of knowledge workers that were identified using survey data (CfPB, 2023a). The third reference model was further adapted from a framework (Swens, 2024) to effectively communicate the organisation's accommodation policy. These models provided structured inputs for defining decision variables and assigning preference scores within the PAS method.

Subsequently, a demand model adapted from Cheng (2022) translates user preferences into office space demand. The model consists of an employment headcount that is identified through linking survey questions to the work location preferences profiles. These profiles categorise the number of employees based on their preferred balance of office and remote work. This link is also made for the share ratio, reflecting usage patterns based on occupancy rates and preferred office days, to calculate the required number of shared workplaces. Only the preferences of users cannot be translated into an office plan, and for that reason, the spatial norms of the organisation are used to integrate as one of the parameters, which is the activity-based working (ABW) implementation plan. Together, these components generate the outcome of the demand model that is integrated in the PAS method to support the design of a portfolio optimisation.

8.2 PART B 'PROCESS'

In the second phase, the hybrid working demands were integrated into the PAS method through a pilot study with the Netherlands Police, testing the fit-for-purpose relations of the Hybrid Office Portfolio Optimisation (HOPO) instruments, including three reference models and a demand model, with the PAS design and decision making.

Research sub-question 2:

What is the relationship between the integrated hybrid working demands and the application of the PAS design and decision-making method?

Regarding hybrid working preferences, the three reference models were applied during the interviews of the PAS method to define and score the decision variables. The integration revealed that their added value was limited during the formulation of objectives. Stakeholders largely relied on their own expertise to independently formulate relevant objectives tailored to their specific context. The timing of introducing the reference models significantly influenced their effectiveness by first allowing stakeholders an open exploration phase without relying on the reference models. Consequently, the reference models functioned primarily as verification tools or sources of inspiration when assigning preference scores rather than guiding the selection of entirely new objectives. The level of quality also constrained the potential of these reference models. In particular, the hybrid working trends model was perceived as overly generic, limiting its capacity to provide concrete guidance in formulating specific variables. Among these, the policy accommodation reference model had the highest potential due to its closer alignment with defining objectives for the design and decision-making of the police office portfolio. This indicates that stakeholders can benefit from a reference model if it is clearly formulated to facilitate integration. However, having three distinct reference models, with differing formats, structures, and detail levels, increased the complexity of their fit-for-purpose contribution. Therefore, this research shows that the fit-for-purpose relationship was very limited, where stakeholders didn't rely on a reference model to define decision variables.

In the context of portfolio optimisation, the Demand model proved effective in designing a portfolio alternative that stimulates an optimisation during the PAS workshops. However, the integration of the modified share ratio presented complications, specifically in the difficulty of using both variables, namely the occupancy rate and the number of office days preferred. Consequently, only the flex space norms of the organisation are integrated to determine the share ratio. Despite these limitations, the structure of the Demand model, consisting of employment headcount, share ratio, and Activity-Based Working implementation parameters, can be used effectively to generate a future demand at the portfolio level. This facilitates a high implementation between the Demand model and the PAS method, enhancing the fit-for-purpose relationship.

8.3 PART C 'OUTPUT'

In the third part, the development of the instruments of the Hybrid Office Portfolio Optimisation (HOPO) into the PAS method will be reflected to deliver insights for answering the last sub-question.

Research sub-question 3:

How can the PAS model be adapted, and what needs to be changed to support a fit-for-purpose design and decision-making?

For the reference models, it is recommended to present them in a more standardised, consistent, and simplified format, enhancing their clarity and supportive role during decision-making. The effectiveness can be improved by setting the policy goals from the organisation as the main source. The PAS method demonstrated that vague goals can be made more concrete, supporting a strategy implementation decision-making process. Moreover, the variables of the demand model can be determined either before or during the workshop, with stricter rules about using the desk occupancy rate variable. Implementing different scenarios of demand could further enhance this.

8.4 MAIN CONCLUSION

Building on the three sub-questions, this section provides an answer to the main research question.

Main research question:

How can the PAS design and decision-making method be adapted into a fit-for-purpose design and decision-making model that integrates hybrid working demands for optimising office real estate portfolios?

In this research, the hybrid working demands of preferences were first captured through three reference models for defining and scoring decision variables. The reference models were intended to provide a comprehensive overview of variables as a starting point. However, in this application of the reference models, in combination with the PAS method, they added almost no value, mainly due to the expertise of stakeholders, inconsistencies in their quality, and the way they were presented. The research still shows the potential of using them as supportive instruments to structure discussions, give scores, and provide a systematic basis for decision-making in future applications

Secondly, the hybrid working demands are developed in the Demand model to stimulate portfolio optimisation. The most important design decision is not implementing the occupancy rate and the number of office days, but only the share ratio. The application of the demand model only indicates an outcome for the portfolio demand, supporting stakeholders in aligning future demand with current supply. This research demonstrates that integrating the Demand model provides limited added value in a fit-for-purpose contribution to the design and decision-making process for optimising office real estate portfolios. The research demonstrates its potential as an indicator of demand, which can further benefit applications that also integrate scenarios.

To conclude, the integration of the hybrid working demands was not so successful in the application of the PAS method. However, it cannot be concluded that it will never work. Several improvements are identified in the research, as the models still hold added value for adaptation in the PAS.

09

Recommendations

9. RECOMMENDATIONS

9.1 RECOMMENDATIONS FOR THE INTEGRATION OF MODELS INTO THE PAS METHOD

This research yielded several findings on the functioning of the reference models, the demand model, and the PAS method. To ensure successful implementation and integration, several aspects should be addressed. An additional expert interview was conducted with a representative from the National Portfolio Management⁵ (NPM), which holds similar responsibilities in facilitating the PAS design and decision-making process.

1. Stakeholder Involvement and Type of Portfolio

Stakeholders should be actively involved in the application of the PAS method. It is needed to clearly communicate the objectives, terminology, and outcomes associated with the method in order to build support and ensure clarity in the decision-making process. This helps to prevent misunderstandings, reduce potential frustration, and avoid repeated discussions about previous decisions. It is recommended to apply the PAS method initially to portfolios that are in the early stages of development or where clear optimisation opportunities still exist, and where stakeholders are open to innovative interventions.

2. A comprehensive reference model

It is recommended to develop a more comprehensive reference model that is closely aligned with the organisation's policy. Compared to the other reference models, the policy-based model proved to be more valuable in formulating objectives and guiding decision-making within the PAS method. By consolidating and simplifying this into a clear, policy-driven reference model, stakeholders can be better supported in translating strategic goals into concrete decision variables, as the PAS method enables policy goals to be made more concrete, thereby improving or testing their effectiveness.

3. Integrating models

The demand model has proven to be a valuable tool in designing portfolio alternatives, and it is recommended to incorporate it into the decision-making process. The current demand model produces only a single outcome, which oversimplifies the uncertainty of future office demand; therefore, incorporating scenario modelling is recommended to capture multiple possible futures and support more transparent and robust portfolio optimisation. In the case of the police, and potentially other organisations as well, scenarios had already been formulated that could be directly linked to the demand model. Additionally, it is worth exploring other models or instruments that could also add value to the decision-making. For example, a model that highlights the type of building contract could provide insights into optimal timing for actions such as selling or extending a property. This approach would allow for more dynamic and informed decisions based on contract terms and timing.

4. Dashboard

The dashboard is a beneficial tool for effectively communicating the portfolio design. It is suggested to integrate functionality within the PAS dashboard that allows multiple portfolio alternatives to be generated and stored. This enables stakeholders to explore and compare a variety of alternatives, supporting informed decision-making based on different organisational priorities. Additionally,

⁵ The National Portfolio Management department, referred to in Dutch as 'Landelijk Portfoliomanagement', is responsible for developing the desired portfolio.

incorporating available properties from the market for potential acquisition could be a valuable enhancement.

5. NPM: Implementing Scenarios

An important aspect of National Portfolio Management is the development of various scenarios for the (sub)portfolio, for which a dedicated tool is currently being set up. The PAS (Dashboard) can contribute to this by designing different portfolio alternatives depending on the defined scenario. This could be expanded either through multiple tabs or an organised menu structure. As a result, weighing different alternatives becomes more transparent, and the interests of various stakeholders can be visualised in a comparative analysis overview. It could also be considered whether Excel is the most user-friendly design tool for this purpose. Within the department, the measurement of decision variables within the PAS is regarded as an added value. Currently, the police's existing tool focuses mainly on financial aspects, whereas the PAS method extends this by measuring broader objectives and interests, with finances serving as a framework rather than the primary focus.

6. NPM: Evaluating the Decision Variables

The organisation defines a selective number of main policy objectives that can serve as target values. These objectives can be used to assess whether and to what extent a solution contributes to these goals, thereby helping to cluster and prioritise actions that make the greatest contribution. It is also important to extend this to the organisation's entire portfolio. Using these main objectives during interviews could help guide stakeholders in formulating decision variables while maintaining their given perspective. In this process, it can be determined which objectives are fixed and which could be further specified by stakeholders (for example, a user's perspective on travel distance or the need for a comfortable working environment for specific teams, which can then be translated into spatial requirements within a building). As a reflection, a comparison could be made between the established goals of different organisations to evaluate which objectives are or are not considered relevant. Thereby, it could give greater responsibility to the facilitator. This team oversees the overall portfolio and is ultimately accountable for steering projects and making strategic decisions. Stakeholder input regarding their objectives can still be collected and considered; however, the NPM team could determine the relative importance of these objectives to ensure consistency and alignment with organisational goals. The reference model could then be further developed to explore the relationship between this model and the way stakeholder input is implemented.

7. NPM: Setting a Target Value for Optimisation

Instead of merely calculating the occupancy rate, a specific target should be defined for the organisation or portfolio. This target value could then serve as a basis for optimisation. It could also be combined with the design of different scenarios in which varying space requirements and occupancy rates are identified, enabling stakeholders to design their portfolio alternatives accordingly.

At present, there appears to be a stronger need to update both qualitative and quantitative data. Therefore, it is not recommended to immediately initiate a new PAS application, especially since one is already ongoing. Instead, the focus should be on specifying and making measurable the missing data and variables. There also seems to be a need to strengthen the role of National Portfolio Management in the decision-making process, where stakeholders can be interviewed to define their objectives, while the actual weighing and reflection are conducted by National Portfolio Management as the responsible authority.

9.2 RECOMMENDATIONS FOR THE POLICE

Optimising office portfolios in response to hybrid working requires more than simply adjusting a decision-making model. A comprehensive strategy should take into account the interaction between the physical environment (Bricks), technological systems (Bytes), and behavioural changes (Behaviour) within the organisation (De Kok, 2016). Real estate is one of the organisation's most valuable assets, serving to facilitate core business processes (Gibler & Black, 2004). Just as hybrid working cannot be fully implemented within half a year of the research period, neither can the optimisation of real estate. Both require long-term commitment, coordination, and alignment with organisational goals.

1. Managing Behavioural Change

The transition to a hybrid work model requires significant behavioural adjustments from employees. Cultural norms, established habits, and individual preferences strongly influence both acceptance and effectiveness. Even the newly renovated HUB50 building, designed to support hybrid working, was not always used as originally intended. Some employees were unaware that the entire building is accessible and did not know where they were allowed to sit or how to make use of the facilities in a hybrid way. It is therefore essential to develop a clear and inclusive communication strategy that explains the rationale and benefits of hybrid working in the context of a new office environment. Employees should be actively involved in the decision-making process and receive appropriate support throughout the transition phase. In addition, the organisational culture should gradually evolve through consistent reinforcement of new working arrangements to prevent resistance caused by abrupt changes, as not everyone is used to adapting to a new environment.

2. Strategic Considerations for Office Space

The literature shows that employees are less likely to visit the office if they cannot use their preferred workspace, experience overcrowding, or are unable to collaborate comfortably (Brouwers et al., 2024). For this reason, flexible desk arrangements that support team collaboration while managing density should be considered. It is also important to evaluate the long-term sustainability of space reduction initiatives, as hybrid work patterns may evolve or reverse over time, potentially leading to higher costs in the event of future repurchasing or reconfiguration.

3. Supporting Remote Working

Effective hybrid working also requires appropriate support for employees' home working environments, which are increasingly valued (du Preez, 2024). Therefore, be clear in the policies about working from home if the organisation is leaning towards hybrid working and consider financial support to ensure that employees have access to a suitable home workspace, comparable to the functional facilities offered in the office. Recognising and accommodating different employee needs is essential in maintaining both productivity and satisfaction.

4. Flexible Workspaces and Accessibility

Improving the accessibility of workplaces has a significant impact on office occupancy. It may be worthwhile to explore alternative work locations that are closer to employees' homes in order to reduce commuting times. Currently, employees are often tied to a specific floor or even section of a building. This also presents opportunities to explore shared workspaces with external organisations to optimise space usage.

5. Portfolio Management Based on Employee Profiles

The current approach of assigning organisational units or target groups to fixed flex space norms does not accurately reflect actual employee behaviour and preferences. Within a single team, different interests can exist, and hybrid working often relates more to personal preferences than to team functions. Dividing employees based on work location preference profiles, as suggested by Houtveen et al. (2024a), adds value by simulating individual behaviour and needs in relation to space requirements, rather than applying general team-based space standards. This approach could be further refined by developing profiles that reflect different working styles, thereby capturing the characteristics of employees' work settings more accurately.

6. Strengthening Cooperation

A final recommendation concerns internal collaboration and alignment within the organisation, particularly between different management levels and operational teams within the Police Services Centre (PDC) Accommodation department. Based on its own observations in recent months, it is noticed that interdepartmental cooperation remains a bottleneck, with friction arising from top-level decision-making. Given the scale and complexity of the organisation, it is indeed challenging to ensure full alignment and meet everyone's expectations. Therefore, it is essential to communicate clearly to employees about which topics they can provide input on, how their feedback is processed, and what limitations may exist. Facilitating open dialogue is crucial, especially now that the stakes are high. Hybrid working may place additional pressure on collaboration, as spontaneous interactions are reduced. For that reason, it is important to actively involve employees in policy development and, for example, create more informal meeting spaces. When workplace accommodation is deliberately aligned with organisational culture and desired behaviours, hybrid working can actually strengthen collaboration and cohesion.

10

Reflection

10. REFLECTION

This chapter provides a reflection on the research, considering both the product and the process. The aim is to critically examine how the thesis was developed and the steps that shaped its completion.

10.1 THE PRODUCT

At the outset, I had high expectations and was ambitious about designing and optimising a portfolio. However, I quickly learned that creating an ideal portfolio is challenging and that there are more aspects to consider. This raised the first reflection question: 'How can decision-making models in real estate management be designed to better balance analytical rigour (standardisation) with the flexibility needed for real-world application?'

During the research, the integration of the instruments did not run smoothly. At the same time, I learned how to apply a decision-making model. As a facilitator of the model, one tends to treat the outcomes as absolute truths, whereas in fact it is necessary to take a step back and view them as a representation of the integrated ideas. An important but simple lesson was to use it as a supporting tool, while always remaining responsible for making well-considered decisions yourself. I realised that my role as a facilitator is not merely to present results, but to guide stakeholders in interpreting and contextualising these results with the use of the model.

The way in which the reference models were introduced and elaborated is something I would approach differently in the future. Having now completed the full PAS design and decision-making method, I have a better understanding of the challenges stakeholders face, and a comprehensive reference model aligned with the organisation's policy proves more helpful in this regard. Although objectives can initially be identified in broad terms, the PAS method helps to make them more specific and concrete. This allows strategies to be implemented in a way that reflects the organisational goals. While analytical models offer structure and transparency, real-world decision-making often involves ambiguous objectives, evolving strategies, and political dynamics that require flexible interpretation rather than strict adherence to model outcomes, but can help in gaining a better understanding.

The added value of the demand model lies in its ability to integrate user needs into the calculation. However, the occupancy rate variable is difficult to incorporate into the formula, and I believe this indicator should be viewed as a guiding indicator. The way the demand model was tested in this study could be further developed by presenting different scenarios that reflect the organisation's future. Comparing such scenarios could be a valuable addition to large-scale real estate design and decision-making.

The integrated portfolio turned out to be less suitable for designing an alternative using the PAS method. This raises the following reflection question: 'Is the decision-making model suitable for optimising all types of office portfolios?', Based on my experience with the police's office real estate portfolio, I learned that the model works best when applied to portfolios in their early development phase and when stakeholders with differing perspectives are actively involved, as this creates constructive friction and reveals alternative strategies. I also realised that the model should not be treated as the ultimate truth but as a tool to guide discussions and identify opportunities. My initial ambition to design the

'perfect' portfolio shifted towards understanding portfolio management as an iterative, strategic process that requires balancing evidence, judgement, and negotiation in the long-standing process

The graduation project aligns with the Management in the Built Environment (MBE) track, which dives into the concept of real estate management by focusing on strategic decision-making, stakeholder integration and value creation. The project also reflects the multidisciplinary approach of the MSc Architecture, Urbanism and Building Sciences (AUBS) by integrating design, management, and societal impact. It contributes to the field by bridging academic models and practical applications in sustainable portfolio management.

10.2 THE PROCESS:

The research process was anything but linear. The Design Science Research method aligned well with the objective of this study, but developing a model was a completely new experience for me. This method provided freedom and flexibility to approach the design process iteratively. Especially at the beginning, my focus was not sharp enough on what exactly I was investigating, and looking back, it did not seem that complicated. My supervisors encouraged me to remain critical and to consider the broader impact, although I apparently did not always fully understand or act on their feedback and focused more on the content rather than the design. The good point was that the independent development of the model went well, as a thorough and structured approach led to the final outcome. Particularly in processing decision variables, ensuring coherence with the formulas proved essential for generating meaningful impact in the portfolio design. I realised that the hardest part was not doing the work itself but structuring my thoughts clearly.

In hindsight, I could have been more proactive in discussing the challenges I faced and in planning how to use the instruments effectively. I tended to solve problems on my own, while I later realised that simply asking was often more helpful. Discussing the research results was also challenging, partly due to differences in knowledge regarding the PAS method. In future projects, I will be able to apply this experience by being more critical and improving my communication. These insights helped me to grow more confident in working with decision-making models in my future job. Ultimately, the main difficulty for me lay in the early phase of the project, understanding the problem statements and research framework logically and incorporating the research results more proactively.

Moreover, applying the PAS method during the research phase proved to be an intensive process, requiring the collection of input from multiple interviews and workshops. When the integration of the results turned out to be less effective than expected, it created additional pressure and stress. It was also challenging to maintain a balance between developing the models, writing the report, and preparing the interviews and workshops. One of the main planning challenges was scheduling the workshop with all relevant participants within a limited time frame. Because most of the focus in the early stages was on developing and applying the PAS method, the workload accumulated and became particularly heavy in the final weeks. Future researchers applying the PAS method should consider allocating sufficient time for iterative model refinement, validation, and stakeholder engagement to ensure robustness and generalizability. I also recommended that they explore other studies employing operations research, as this greatly enhanced my understanding of the research method.

Academically, the project contributes by integrating and testing existing methods within a decision-making model. Societally, it supports organisations in making strategic, sustainable, and user-centred portfolio decisions. Ethically, the project raises questions about how portfolio optimisation can impact accessibility, well-being, productivity, and equality among employees if not appropriately guided. The HOPO-PAS is transferable to other public or corporate organisations that face similar challenges in managing office portfolios under hybrid working conditions. While the organisational context may influence specific applications, the core principles of demand analysis, portfolio optimisation, and iterative decision-making remain relevant across both domains.

During the summer period, I had more time to reflect on my future. While graduating is my personal achievement, I realise that friends and family are a true gift. Revising and improving the report was certainly not always easy, but I am very grateful for the critical feedback from my supervisors. Over the past months, I have learned a great deal, and these experiences have been truly valuable to me.

REFERENCES

- Anderson, D. R., Sweeney, D. J., Williams, T. A., & Camm, J. D. (2014). An introduction to management science: quantitative approaches to decision making. Cengage Learning.
- Appel-Meulenbroek, R., Kemperman, A., van de Water, A., Weijs-Perrée, M., & Verhaegh, J. (2022). How to attract employees back to the office? A stated choice study on hybrid working preferences. *Journal of Environmental Psychology*, 81, 101784.
- Archdaily. (2024, August). The Edge / PLP architecture. ArchDaily. <https://www.archdaily.com/785967/the-edge-plp-architecture>
- Arkesteijn, M., & Binnekamp, R. (2012). Real estate portfolio decision making. CESUN 2012: 3rd International Engineering Systems Symposium, Delft University of Technology, The Netherlands.
- Arkesteijn, M. H. (2019). *Corporate Real Estate alignment: A preference-based design and decision approach* [Doctoral dissertation, Delft University of Technology]. TU Delft Repository. <https://doi.org/10.7480/abe.2019.12>
- Barath, M., & Schmidt, D. A. (2022). Offices after the COVID-19 pandemic and changes in perception of flexible office space. *Sustainability*, 14(18), 11158.
- Barendse, P., Binnekamp, R., De Graaf, R., Van Gunsteren, L., & Van Loon, P. (2012). Operations Research Methods: For managerial multi-actor design and decision analysis.
- Barzilai, J. (2010). Preference function modelling: the mathematical foundations of decision theory. *Trends in multiple criteria decision analysis*, 57-86
- Bryman, A. (2016). Social research methods. Oxford university press.
- Cambridge University Press. (n.d.). In Cambridge English dictionary. Retrieved August 13, 2025, from <https://dictionary.cambridge.org>
- CBRE. (2023, October). *Impact of hybrid working on office vacancy manageable thanks to flexibility of Dutch offices market*. Retrieved January 5, 2025, from <https://www.cbre.nl/en-gb/insights/reports/impact-of-hybrid-working-on-office-vacancy-manageable-thanks-to-flexibility-of-dutch-offices-market>
- CBRE (2023, December). Portfolio optimization in Large-Cap corporations. <https://www.cbre.com/insights/articles/portfolio-optimization-in-large-cap-corporations>
- Cheng, Z. (2022). Post-pandemic office real estate: A pilot study of using scenario planning to develop scenarios with quantitative office space demand for corporate real estate (Master's thesis). Delft University of Technology, Faculty of Architecture and the Built Environment. <https://resolver.tudelft.nl/uuid:2acd20ef-f3c1-4f6c-909b-583a409b2ab3>
- Cooke, H., Fiorentino, S., Harris, R., Livingstone, N., & McAllister, P. (2022). Corporate occupiers' attitude to flex space in the post-Covid environment. *Journal of Property Investment & Finance*, 40(5), 493-507.
- De Graaf, G., & Paanakker, H. (2014). Good Governance Performance Values and Procedural Values in Conflict. *The American review of public administration*, 45(6), 635-652.
- De Jonge, H., Arkesteijn, M. H., den Heijer, A. C., Vande Putte, H. J. M., de Vries, J. C., & van der Zwart, J. (2009). Corporate Real Estate Management. Designing an Accommodation Strategy (DAS Frame). Delft. Department Real Estate and Housing, Faculty of Architecture, TU Delft.
- De Kok, A. (2016). The new way of working: Bricks, bytes, and behavior. *The impact of ICT on work*, 9-40.
- De Leeuw, A.C.J. (2002). *Bedrijfskundig management* (second ed.): Koninklijke Van Gorcum.

- De Twee Snoeken Architectuur (n.d.) Politiebureau Burgwallen, Amsterdam. De Twee Snoeken Architectuur & Interieur. <https://www.tweesnoekenarchitectuur.nl/projecten/politiebureau-burgwallen-amsterdam/>
- De Vries, J. C., De Jonge, H., & Van Der Voordt, T. J. (2008). Impact of real estate interventions on organisational performance. *Journal of Corporate Real Estate*, 10(3), 208-223.
- Den Heijer, A. C. (2005). Managing university real estate portfolios, generating management information for performance-based portfolio strategies and real estate decisions. European Real Estate Society.
- Den Heijer, A. (2011). Managing the university campus - Information to support real estate decisions. Delft: Eburon Academic Publishers.
- Den Heijer, A. C. (2021). Campus of the future: Managing a matter of solid, liquid and gas. Delft University of Technology.
- Dewulf, G. P., Krumm, P. J. M. M., & De Jonge, H. (2000). Successful corporate real estate strategies. Arko Publishers
- Dym, C., & Little, P. (2004). Engineering Design: A Project-Based Introduction, Hoboken. In: NJ.: John Wiley & Sons Inc
- Dym, C. L., & Little, P. (2014). Engineering design: A project-based introduction (4e ed.). John Wiley & Sons.
- Economisch Instituut voor de Bouw (EIB) (2011) Kantorenmonitor.
- Echeverri Agudelo, N. (2020). The flexible workplace: An exploration into the value of co-working spaces as an accommodation strategy for corporations (Master's thesis). Delft University of Technology, Faculty of Architecture and the Built Environment <https://resolver.tudelft.nl/uuid:91457bef-652c-45e6-ae7b-41a29e19a75d>
- Echeverri, N., Jylhä, T., & Koppels, P. (2021). Searching for flexibility in corporate real estate portfolio: Six co-working strategies for user corporations. *Buildings*, 11(3), 115.
- Elsbach, K. D. (2003). Relating physical environment to self-categorizations: Identity threat and affirmation in a non-territorial office space. *Administrative science quarterly*, 48(4), 622-654.
- Evers, F., C., Van der Schaaf, P. and Dewulf, G. (2002) Public real Estate. Successful Management Strategies. Delft: DUP Science
- Floyd, S. W., & Lane, P. J. (2000). Strategizing throughout the organization: Managing role conflict in strategic renewal. *Academy of management review*, 25(1), 154-177.
- Gardner, N., Gujral, V., Kwok, A., Du, J., & Luby, R. (2025, May). *Flexible work's enduring appeal affects workers, employers, and real estate*. McKinsey & Company. <https://www.mckinsey.com/industries/real-estate/our-insights/flexible-works-enduring-appeal-affects-workers-employers-and-real-estate>
- Gibler, K., & Black, R. (2004). Agency risks in outsourcing corporate real estate functions. *Journal of Real Estate Research*, 26(2), 137-160.
- Gibson, V. (2003). Flexible working needs flexible space? Towards an alternative workplace strategy. *Journal of Property Investment & Finance*, 21(1), 12-22.
- Gupta, A., Mittal, V., & Van Nieuwerburgh, S. (2022). Work from home and the office real estate apocalypse
- Harris, R. (2015). The changing nature of the workplace and the future of office space. *Journal of Property Investment & Finance*, 33(5), 424-435.
- Haynes, B., & Nunnington, N. (2010). *Corporate real estate asset management: strategy and implementation*. Estates Gazette.

- Henderson, J. C., & Venkatraman, N. (1989). Strategic alignment: a framework for strategic information technology management.
- Hennink, M., Hutter, I., & Bailey, A. (2011). *Qualitative research methods*. SAGE Publications.
- Heywood, C., & Arkesteijn, M. (2017). Alignment and theory in corporate real estate alignment models. *International Journal of Strategic Property Management*, 21(2), 144-158.
- Hill, M., & Hupe, P. (2002). *Implementing public policy: Governance in theory and in practice*. Sage.
- Henderson, J. C., & Venkatraman, N. (1989). Strategic alignment: a framework for strategic information technology management.
- Höcker, M. C., Bachtal, Y., & Pfnür, A. (2022). Work from home: Bane or blessing? Implications for corporate real estate strategies. *Z Immobilienökonomie*, 8, 101-137.
- Jarzabkowski, P., Lê, J. K., & Van de Ven, A. H. (2013). Responding to competing strategic demands: How organizing, belonging, and performing paradoxes coevolve. *Strategic Organization*(11(3)), 245-280. <https://doi.org/10.1177/1476127013481016>
- Jylhä, T., Remøy, H., & Arkesteijn, M. (2019). Identification of changed paradigms in CRE research—a systematic literature review 2005-2015. *Journal of Corporate Real Estate*, 21(1), 2-18.
- IWG. (2024, April). How the Hybrid Model Can Slash Emissions. International Workplace Group (IWG). <https://work.iwgplc.com/MediaCentre/PressRelease/landmark-report-reveals-hybrid-working-can-reduce-carbon-emissions-by-up-to-70>
- JLL (2025, April). Global Real Estate Outlook 2025 <https://www.jll.com/en-us/insights/global-real-estate>
- JLL (2025, July). (@jll) Instagram-foto's en -video's. Instagram. <https://www.instagram.com/p/DLk2rC3JkQy/>
- Joroff, M. L., Lambert, S., & Louargand, M. (1993). Strategic Management of the Fifth Resource: Corporate Real Estate. Industrial Development Research Foundation
- Knoop, B. & van Rein, E. (2024a, august). *Wolters Kluwer verplicht werknemers naar kantoor te komen*. FD.nl. <https://fd.nl/bedrijfsleven/1527559/wolters-kluwer-verplicht-werknemers-naar-kantoor-te-komen>
- Knoop, B. & van Rein, E. (2024b, August). Grote werkgevers blijven vastgoed afstoten vanwege thuiswerken. FD.nl. <https://fd.nl/bedrijfsleven/1528394/grote-werkgevers-blijven-vastgoed-afstoten-vanwege-thuiswerken>
- Kuitert, L. (2021). The balancing act: How public construction clients safeguard public values in a changing construction industry. A+ BE | Architecture and the Built Environment(06), 1-234.
- Larsson, S., & Heintz, F. (2020). Transparency in artificial intelligence. *Internet policy review*, 9(2), 1-16.
- Leesman. (2025, January). Leesman. *The Hybrid Future* <https://www.leesmanindex.com/publications/the-hybrid-future/>
- Lindholm, A. L., & Leväinen, K. I. (2006). A framework for identifying and measuring value added by corporate real estate. *Journal of Corporate Real Estate*, 8(1), 38-46.
- MacKenzie, C. M., Laskey, K., McCabe, F., Brown, P. F., Metz, R., & Hamilton, B. A. (2006). Reference model for service oriented architecture 1.0. *OASIS standard*, 12(S18), 1-31.
- Mahoutchian, T., Paynter, N., Scoble-Williams, N., Forsythe, J., Poynton, S., Kamen, M., & Van Durme, Y. (2023, January). *Activating the future of workplace: The workplace evolves to be an input to the work itself*. Deloitte Insights. <https://www.deloitte.com/us/en/insights/topics/talent/human-capital-trends/2023/future-workplace-trends.html>

- Mateescu, M., Schulze, H., & Kauffeld, S. (2025). Choosing where to work: an empirical study of collaborative activities' impact on workspace choice behavior. *Journal of Corporate Real Estate*, 27(1), 47-68.
- McKinsey. (2025, March) Breaking the standstill: How social mobility can boost Europe's economy. <https://www.mckinsey.com/industries/social-sector/our-insights/breaking-the-standstill-how-social-mobility-can-boost-europes-economy#/>
- McKinsey (2025, May). *The enduring appeal of flexible work affects workers, employers, and real estate*. McKinsey & Company. <https://www.mckinsey.com/industries/real-estate/our-insights/flexible-works-enduring-appeal-affects-workers-employers-and-real-estate#/>
- Meskendahl, S. (2010). The influence of business strategy on project portfolio management and its success—A conceptual framework. *International journal of project management*, 28(8), 807-817.
- G. Miller, N. (2014). Workplace trends in office space: implications for future office demand. *Journal of Corporate Real Estate*, 16(3), 159-181.
- Miroslavov, M. (2024, January). What is hybrid work and why is it so popular? [2024 Guide]. OfficeRnD. <https://www.officernd.com/blog/what-is-hybrid-work/>
- Noble, C. H. (1999). The eclectic roots of strategy implementation research. *Journal of business research*, 45(2), 119-134.
- Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard business review*, 86(1), 78.
- Okumus, F. (2003). A framework to implement strategies in organizations. *Management decision*, 41(9), 871-882.
- Olson, E. M., Slater, S. F., & Hult, G. T. M. (2005). The importance of structure and process to strategy implementation. *Business horizons*, 48(1), 47-54.
- Regus. (2018, July). Flexible working, solid facts. http://vastgoedberichten.nl/wp-content/uploads/2018/10/181017-Regus_FlexibleWorkingSolidFacts_SummaryReport.pdf
- RICS. (2024, June). The future of the office space in the era of hybrid working: Navigating the new norm. <https://www.rics.org/news-insights/wbef/the-future-of-the-office-space-in-the-era-of-hybrid-working-navigating-the-new-norm>
- Salo, A., Doumpos, M., Liesiö, J., & Zopounidis, C. (2024). Fifty years of portfolio optimization. *European Journal of Operational Research*, 318(1), 1-18.
- Scheurs, T.N.J. (2019) A strategic approach to 'Office as a service' (Master's thesis). Delft University of Technology, Faculty of Architecture and the Built Environment. <https://resolver.tudelft.nl/uuid:5b44449a-a472-4567-8983-e1d68908a28d>
- Sokolic, D. (2022). Remote work and hybrid work organizations. *Economic and social development: Book of proceedings*, 202-213.
- Swens, E. E. (2024). Alignment in public real estate: A study on implementing a(n) (improved) case-specific PAS design and decision-making method to enhance the real estate management of the office portfolio of the Netherlands Police (Master's thesis). Delft University of Technology, Faculty of Architecture and the Built Environment. <https://resolver.tudelft.nl/uuid:1f73e566-b332-4b63-84cf-e3f3fc510681>
- Tawse, A., & Tabesh, P. (2021). Strategy implementation: A review and an introductory framework. *European management journal*, 39(1), 22-33.
- Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC medical research methodology*, 10, 1-10.

- Theloesen, W. (2025, May). Bezuinigen op vastgoed zonder concessies: een (on)mogelijke opgave? Twynstra Gudde. <https://www.twynstragudde.nl/inzichten/bezuinigen-op-vastgoed-zonder-concessies-een-onmogelijke-opgave>
- Tsipursky. (2025, July). Structured Hybrid's Rise and the Future of Office Space. Work Design Magazine. <https://www.workdesign.com/2025/07/structured-hybrids-rise-and-the-future-of-office-space/>
- Van Rein, E. (2024, July). Grote bedrijven verwachten nog meer kantoorruimte af te stoten. FD.nl. <https://fd.nl/bedrijfsleven/1523055/grote-bedrijven-verwachten-nog-meer-kantoorruimte-af-te-stoten>.
- Van Rijswijk, B. (2024b, September). Amazon verplicht werknemers vijf dagen naar kantoor te komen. FD.nl. <https://fd.nl/economie/1531280/amazon-stopt-in-2025-volledig-met-thuiswerken>
- Van Teijlingen, E., & Hundley, V. (2001). The importance of pilot studies. *Social research update*, (35), 1-4.
- Van der Schaaf, P. v. d. (2002). Public Real estate Management—Challenges for Governments. An International Comparison of Public Real Estate Strategies. DUP Science, Delft, The Netherlands.
- Van der Zwart, J., Arkesteijn, M. H., & Van der Voordt, D. J. M. (2009). Ways to study corporate real estate management in healthcare: an analytical framework.
- Van Vliet, L., van der Voordt, T. (editor), & den Heijer, A. (editor) (2004). Inleiding Vastgoedmanagement. Publicatiebureau Bouwkunde, TU Delft.
- Vlaming, H. (2024, November). Waarom Nederlandse bedrijven zweren bij hybride werken en die in het buitenland juist niet. *HR Praktijk*. <https://www.hrpraktijk.nl/hr-tech/hybride-werken/waarom-nederlandse-bedrijven-zweren-bij-hybride-werken-en-die-in-het-buitenland-juist-niet/#:~:text=87%20Procent%20heeft%20hybride%20werken,hogere%20productiviteit%20en%20beter%20personeelsbehoud.&text=Dit%20komt%20overeen%20met%20het,van%20alle%20Nederlanders%20regelmatig%20thuiswerkt>.
- Voll, K., Höcker, M. C., Bachtal, Y., Pfnür, A., & Schlereth, C. (2024). Identification of employee workplace choice determinants—A Best-Worst scaling study. *Transdisciplinary Workplace*, 446.
- Voordt, T. v. d., Hoendervanger, J. G., & Wijnja, J. (2022). Huisvestingsmanagement: van strategie tot exploitatie.
- Winter, R., & Schelp, J. (2006, April). Reference modeling and method construction: a design science perspective. In *Proceedings of the 2006 ACM symposium on Applied computing* (pp. 1561-1562).
- Yang, E., Bisson, C., & Sanborn, B. E. (2019). Coworking space as a third-fourth place: changing models of a hybrid space in corporate real estate. *Journal of Corporate Real Estate*, 21(4), 324-345.

References list from Center for People and Buildings

- a. Center for People and Buildings, Eindhoven University of Technology, & Delft University of Technology. (2023, October). *Werk in Transitie: Monitor rapportage – Politie* (General Monitoring Report).
- b. Center for People and Buildings, Eindhoven University of Technology, & Delft University of Technology. (2023, December). *Werk in Transitie: Interne benchmark – Politie* (Internal Benchmark Report).
- a. Houtveen, S., La Brijn, D., & Brouwers, G. (2024, November). *Locatiekeuzeprofielen: Waar werkt iedereen?* Center for People and Buildings

(CfPB). [https://www.cfpb.nl/media/uploads/file/Locatiekeuzeprofielen%20eindrapport%20\(2024\).pdf](https://www.cfpb.nl/media/uploads/file/Locatiekeuzeprofielen%20eindrapport%20(2024).pdf)

- b. Houtveen, S., Hoekstra, B., & La Brijn, D. (2024, December). *Werk in Transitie: Verdiepende analyse kantoorwerkcomgeving – Politie* (In-depth Analysis of the Office Work Environment).
- Brouwers, G., Niekel, M., Gosselink, A., Hoekjen, H.-J., & Schlangen, J. (2024). *Druk op kantoor? Een kwestie van perspectief! Waarom medewerkers drukte ervaren in de werkcomgeving*. Stichting Kenniscentrum Center for People and Buildings.
- Center for People and Buildings. (2025). *Survey results from Werk in Transitie: Monitor Rapportage – Politie (CfPB, 2023a)*. Unpublished dataset. Retrieved through personal communication (21-03-2025)
- Du Preez, M. (2024, 3 oktober). Thuiswerkplek hoger beoordeeld dan kantoorwerkplek. Center for People and Buildings. <https://www.cfpb.nl/actueel/thuiswerkplek-hoger-beoordeeld-dan-kantoorwerkplek>
- La Brijn, D., Du Preez, M. & Hoekstra, B. (2024). *Werk in Transitie Benchmark 2024*. Center for People and Buildings (CfPB). <https://kennisbank.cfpb.nl/artikelen/werk-in-transitie-benchmark-2024/>

References list from Netherlands Police

- Politie. (2023). Jaarverantwoording 2023 (pp. 2 164). <https://www.politie.nl/binaries/content/assets/politie/nieuws/2024/mei/jaarverantwoording-politie-2023.pdf>
- a. Projectteam Anders Werken (2022, July). *Anders Werken – een nieuwe balans*. Politie Nederland
- b. Projectteam Anders Werken (2022, September). *Handboek Anders Werken in projecten*. Politie Nederland
- c. Projectteam Anders Werken (2022, August). *Ruimtenormering*. Politie Nederland
- Directie Facility Management (2023, August). *Huisvestigingsvisie*. Politie Nederland
- a. Directie FM en sector Huisvestiging (2023, October). *Streefportefeuille & Vastgoedstrategie*. Politie Nederland
- b. Directie FM en sector Huisvestiging (2023, October). *Kaders & Spelregels*. Politie Nederland

- A: Interview and Workshop Protocol**
- B: Interview Questions**
- C: Workshop Outline**
- D: Informed Consent Form**
- E: Pilot study of the Preference-based Accommodation Strategy design and decision approach**
- F: Extra analysis for data in the decision-making model**
- G: The Hybrid Office Portfolio Optimisation – PAS model**
- H: Data Management Plan**
- I: HREC Approval**

Appendices

Appendix A: Interviews/ Workshop protocol

Informed Consent

Rotterdam, 26-03-2025

Dear Sir/Madam,

You are invited to participate in a research project entitled ‘*Strategic Optimisation of Office Portfolio for Hybrid Working*’. This study is conducted by Martijn Eversdijk, a student at TU Delft, as part of his graduation thesis for the Master’s in *Management in the Built Environment*. The research is carried out in collaboration with the Dutch National Police.

Background

The police organisation is facing a major challenge in reshaping its office portfolio towards 2040. With over 63,000 employees—of which approximately 11,000 are office workers—the police currently occupy 692,000 m² of office space, of which nearly one-third is to be divested. The ambition is to structure this portfolio in a future-proof, flexible, and sustainable manner, in line with societal developments, changing work processes, and tightened sustainability goals.

A key catalyst for change is the *Anders Werken* (Working Differently) programme, in which hybrid working takes centre stage. In this programme, hybrid working is not merely seen as a working method, but as a strategic instrument to enhance operational effectiveness, improve employee wellbeing, and simultaneously use real estate more efficiently. This shift towards activity-based and location-independent working requires a new way of thinking about accommodation: workspaces must be designed more flexibly, intelligently, and efficiently, while still supporting collaboration, visibility, and the social engagement of the police organisation.

The implementation of hybrid working directly affects the need for office space. Whereas dedicated desks per employee used to be standard, the new approach is based on flexible occupancy ratios, tailored to work profiles and space usage. For instance, under the *Future Accommodation* programme, the aim is to save 90,000 m² of office space through smarter and more flexible use of existing buildings.

These developments make it essential to base real estate portfolio decisions on both quantitative and qualitative insights. At the same time, the police face unpredictable and rapidly changing circumstances, such as technological innovations, budget shifts, and new sustainability requirements. This dynamic calls for robust and transparent decision-making.

To respond to this, the Preference-Based Accommodation Strategy (PAS) is being applied. This method was successfully piloted in 2022 by the police for the optimisation of OBT locations. The PAS provides a structured approach and tool to support the design and decision-making process of the real estate portfolio. The method incorporates stakeholder preferences into the design and selection of portfolio alternatives, followed by the evaluation of the added value of the newly designed portfolios by the stakeholders themselves. This research applies the PAS method to the office portfolio of the PDC, aligning it with the changing demand resulting from hybrid working.

By interviewing various organisational perspectives, insights are gathered into relevant preferences, needs, and boundary conditions regarding accommodation. This input forms the foundation for designing future-proof alternatives for the police’s office portfolio. In the subsequent phase of the research, various portfolio alternatives are developed during the first workshop. Based on the insights gained from Workshop 1, interviews are conducted with stakeholders to refine variables, update preferences and weights, and add new decision variables. In the final stage, Workshop 2 is held, during

which various alternatives are further developed and a final round of interviews is conducted to select a preferred alternative.

Objective

The objective of this research is to integrate various existing models into a transparent approach for optimising the office portfolio of the police in response to hybrid working: How can a transparent decision-making model optimise the office portfolio of the Dutch National Police in response to the increasing demand for hybrid working?

Interviews (PAS step 1-4)

The interview questions have been carefully designed to gain insights into preferences, needs, and boundary conditions that help guide the office portfolio of the PDC in relation to hybrid working. The questions aim to define, validate, and weigh preferences and to establish boundary conditions. The interview will take approximately 45 to 60 minutes, allowing enough time for an in-depth discussion without time pressure.

Workshops (PAS step 5-6)

During the workshop, the involved stakeholders will jointly design and assess alternatives for the future office portfolio of the police. This will be done using the PAS model (Preference-Based Accommodation Strategy), which incorporates previously collected preferences, needs, and boundary conditions from the participants. In small groups, alternatives are developed that better align with the organisation's strategic objectives and hybrid work models. These alternatives will then be discussed in plenary, compared, and (if possible) merged into one optimised proposal. The aim of the workshop is to reach broadly supported decisions based on transparent considerations, enabling the police's future accommodation to be arranged more effectively and sustainably.

Protocol

Your participation in this study is entirely voluntary. You may withdraw at any time without giving a reason. You are also free to decline to answer any specific question if you prefer.

Prior to the interview and workshops, the consent form will be reviewed with you and signed. If you agree, the interview and workshop will be recorded. This helps ensure accurate processing of the responses. All data from interviews and workshops will be fully anonymised; no names or other personal information will be shared in the final report.

Contact Information

If you have any further comments or questions about this study, please contact:

Martijn Eversdijk
mfaeversdijk@tudelft.nl

Or my academic supervisor

Monique Arkesteijn
m.h.arkesteijn@tudelft.nl

or company supervisor:

Casper Bovy
casper.bovy@politie.nl

If you are willing to participate in this research, could you please complete and sign the attached consent form?

Kind Regards, Martijn Eversdijk

Appendix B: Interview Questions

Interview I

The questions are designed to gain insight into the establishment of preferences, the assessment and weighting of those preferences, and the definition of constraints to guide the office portfolio in response to hybrid working. The semi-structured format allows room for both predefined questions and follow-up questions based on the participant's responses. The interviews were conducted in Dutch; the questions have been translated into English for this report.

A. Background and involvement in the police organisation and accommodation

1. Could you briefly introduce yourself and explain your role within the police?
2. How are you involved in decisions regarding police accommodation?

Transition to steps 1–4 of the PAS method (Arkesteijn, 2019): In this phase, the PAS method is briefly introduced, with a short explanation of the essence of each step. We will go through the interview questions following the protocol established by Arkesteijn (2019). In the first step, we also reflect on the performance variables derived from literature and reports.

B. Step 1 Specifying decision variables.

- 1.1 What are the current issues with the office portfolio for PDC staff as a result of hybrid working, from your perspective (Arkesteijn, 2019)?
- 1.2 What objectives are you aiming to achieve (Arkesteijn, 2019)?
- 1.3 Which decision variables reflect those objectives (Arkesteijn, 2019)?

C. Validatie van opgestelde variabelen uit literatuur en rapporten

- 1.4 To what extent do we recognise the following performance variables identified through literature and data?
- 1.5 Which of these performance variables out of the reference models do you consider most important from your role/perspective?
- 1.6 Are there any important factors you feel are missing and should be included?
- 1.7 Are there any differences between what is considered in the reference models and what you formulate as a decision variable?

D. Stap 2 Rating Preferences

- 2.1 Assign a preference score of 100 to your most desired outcome (Arkesteijn, 2019).
- 2.2 Assign a preference score of 0 to your least desired outcome (Arkesteijn, 2019).
- 2.3 Assign a preference score between 0 and 100 to an intermediate outcome (Arkesteijn, 2019).

E. Stap 3 Assigning weights

- 3.1 What are the relative weights between your decision variables (Arkesteijn, 2019)?

F. Stap 4 Determining design constraints

- 4.1 What design constraints must be met (Arkesteijn, 2019)?

Final question: If you could change one thing about the way the office portfolio is currently managed, what would it be?

Interview II

Cited from Arksteijn (2019, p.171):

Based on their experiences in workshop 1, in this round of interviews each stakeholder is allowed to adjust their variables, preferences, and weights and add new decision variables. The following interview questions are asked (see Table 4.10)

TABLE 4.10 Questions in interview 2

Steps		Interview questions/tasks	
1	Specifying decision variable(s)	1.1	Adjust and/or specify (additional) decision variable(s)
2	Rating preferences	2.1	Adjust and/or rate preferences (see 2.1 to 2.3 interview 1)
3	Assigning weights	3.1	Adjust and/or assign weights
4	Determining design constraints	4.1	Adjust and/or determine design constraints
Steps		Interview questions/tasks	
1	Specifying decision variable(s)	1.1	Adjust and/or specify (additional) decision variable(s)
2	Rating preferences	2.1	Adjust and/or rate preferences (see 2.1 to 2.3 interview 1)
3	Assigning weights	3.1	Adjust and/or assign weights
4	Determining design constraints	4.1	Adjust and/or determine design constraints

Figure 0. 1: Screenshot from PAS report (Arksteijn, 2019)

What is new:

- Was the integrated demand model understandable?
- What aspects of it could still be improved?
- What improvements should be implemented based on the previous workshop?

Interview III

Cited from Arksteijn (2019, p.172):

“In the third series of interviews, the decision makers are individually asked to confirm the selection of the best design alternative from the previous workshop. If all stakeholders individually accept this alternative the project is ended. However, if one or more stakeholders do not accept that alternative (with the highest overall preference score) as the best alternative this means that the empirical system has not been mapped correctly. If it would have been mapped correctly, all stakeholders would accept the outcome. Logically it follows that one of the stakeholders then needs to change the input in such a way that it better reflects their preferences. In that case, the exact same procedure is carried out as in the second series of interviews and the second workshop. If necessary, the cycle can be extended by repeating the interviews and workshop until a satisfactory result is reached, i.e. until all stakeholders confirm the alternative with the highest overall preference.”

1. Initial attitude towards the models

- What was your first impression of the PAS method and how it was intended to be used?

2. Experience

- How did you experience the process of formulating preference variables?
- Did you feel that the identified preference variables from the survey—such as satisfaction scores or employee needs—helped in formulating objectives? And in what way?
- Do you think this would also apply to preference variables identified from policy documents—did they help in formulating objectives or assigning preference scores?
- Did you find (or would you find) that a framework could assist in formulating objectives, even though you were able to do so based on your own expertise? Did you feel you might have overlooked something?
- How could the process of assigning preference scores be improved to avoid relying on gut feeling?
- What did you find helpful or rather confusing about integrating spatial requirements during the workshop? Were there other aspects of the dashboard that could be improved?

3. Attractiveness

- Which instrument appeals to you most for integration in the PAS method: the standardised list, employee preferences from a survey, policy preferences, or spatial requirements?

4. Perception of effectiveness

- Do you think that integrating spatial requirements helped in designing portfolio alternatives?
- Do you think the portfolio lent itself well to the PAS method? Why or why not?
- Were all possible interventions included in the process? Which were not?
- Do you feel you were able to design an optimal portfolio? Why or why not?

5. Evolving perceptions

- Why do you think there may have been a lack of interaction or engagement during the workshop? What could improve this?

Appendix C: Workshop Outline

Workshop I

Cited from Arksteijn (2019, p.171):

At the start of the first workshop, the facilitator repeats the specific purpose of the project, introduces the diary for the workshop and all stakeholders are introduced to each other. The facilitator shows the model to the stakeholders to give them a basic understanding of the model. The two main objectives of the first workshop are that the stakeholders

- (1) become familiar with the depiction of the problem in the computer model and
- (2) are able to use the computer model to design alternatives in order to gain insights in their own input as given in the first interview.

It should be noted that most stakeholders probably are not used to translating their objectives into concrete criteria on the one hand and never have been asked to define their own 'measuring scale' by rating their preferences according to step 2. In general, the stakeholders are divided in smaller subgroups and asked to perform a number of assignments.

What is new:

- The integration of the Demand model to investigate the portfolio optimisation based on this outcome

Workshop II

Cited from Arksteijn (2019, p.172):

In this workshop the decision makers continue designing alternatives to reach an optimal result together as a group (see Table 4.11). The decision makers have an adjusted mathematical model available based on the adjusted input in the second round of interviews with each of the stakeholders. The difference compared to the first workshop is that in this workshop, the stakeholders are already acquainted with the PAS model. In this workshop the stakeholders work together rather than individually. The focus shifts from understanding the model and adjusting the input towards designing alternatives and accepting the results as generated by the model.

Steps	Assignment		
5	Generating design alternatives	5.1	Design an alternative CRE portfolio with a higher overall preference score than the current portfolio taking into account the demands of all stakeholders
6	Selecting best design alternative	6.1	Select the alternative CRE portfolio with the highest overall preference score

Figure 1. 5: Screenshot from PAS report (Arksteijn, 2019)

What is new:

- The integration of the Demand model to investigate the portfolio optimisation based on this outcome

Appendix D: Informed Consent

Opening statement: Interviews/ Workshops

You are being invited to participate in a research study titled Strategic optimisation of office portfolio for hybrid working. This study is being done by Martijn Eversdijk from the TU Delft Faculty of Architecture and the Built Environment, in collaboration with the Netherlands Police (PDC).

The purpose of this research study is to explore how office real estate portfolios can be strategically managed and optimised in response to the increasing demand for hybrid working by incorporating research instruments into the decision-making model, and will take you approximately 5 minutes to complete. As part of this study, you are invited to take part in the application of the PAS design and decision-making approach (Arkesteijn, 2019). The data will be used for an academic thesis. We will be asking you to share insights on your experience with hybrid working variables, portfolio management strategies, and how your organisation addresses challenges related to underutilised office spaces.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by pseudonymising all collected data, storing it securely on encrypted servers, and limiting access to authorised researchers only.

The data will be anonymised for analysis and will not be shared in a way that identifies individual participants.

Your participation in this study is entirely voluntary, **and you can withdraw at any time**. You are free to omit any questions. If you wish to withdraw, please contact the researcher before the end of July 2025. After this date, anonymised data cannot be removed in the report.

If you have any questions or concerns regarding this research, please contact:

Martijn Eversdijk – Master’s Student, TU Delft Faculty of Architecture and the Built Environment.

mfaeversdijk@tudelft.nl

By agreeing to the PAS application, you confirm that you have read and understood the above information and consent to participate under these terms.

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated [28/04/2025], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	<input type="checkbox"/>	<input type="checkbox"/>
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	<input type="checkbox"/>	<input type="checkbox"/>
3. I understand that taking part in the study involves: The interviewer will record the conversation on audio and take written notes. The research will only use the anonymized transcription of the audio tape that has been transcribed	<input type="checkbox"/>	<input type="checkbox"/>
4. I understand that the study will end after the research has been published.		
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
5. I understand that taking part in the study involves the following risks potential discomfort or burden of sharing personal experiences. I understand that these will be mitigated by having the ability to withdraw from the study at any point.	<input type="checkbox"/>	<input type="checkbox"/>
6. I understand that taking part in the study also involves collecting specific personally identifiable information (PII) [job roles] and associated personally identifiable research data (PIRD) [-] with the potential risk of my identity being revealed [personal privacy]	<input type="checkbox"/>	<input type="checkbox"/>
7. I understand that the following steps will be taken to minimise the threat of a data breach, and protect my identity in the event of such a breach anonymisation of data; limited access to data; secure data storage.	<input type="checkbox"/>	<input type="checkbox"/>
8. I understand that personal information collected about me that can identify me, such as my name and gender, will not be shared beyond the study team.	<input type="checkbox"/>	<input type="checkbox"/>
9. I understand that the (identifiable) personal data I provide will be destroyed after 10 years.	<input type="checkbox"/>	<input type="checkbox"/>
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
10. I understand that after the research study the de-identified information I provide will be used for publications.	<input type="checkbox"/>	<input type="checkbox"/>
11. agree that my responses, views or other input can be quoted anonymously in research outputs	<input type="checkbox"/>	<input type="checkbox"/>
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		
12. I give permission for the de-identified transcripts that I provide to be archived in TU Delft repository so it can be used for future research and learning.	<input type="checkbox"/>	<input type="checkbox"/>
13. I understand that access to this repository is restricted and may only be used when credited under the same licence (CC BY-SA)]. The data in the repository will be deleted after 10 years.	<input type="checkbox"/>	<input type="checkbox"/>

Signatures

Name of participant [printed] Signature Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Martijn Eversdijk _____
Researcher name [printed] Signature Date

Study contact details for further information:

Martijn Eversdijk

mfaeversdijk@tudelft.nl

APPENDIX E

Pilot study of the preference-based Accommodation Strategy design
and decision approach



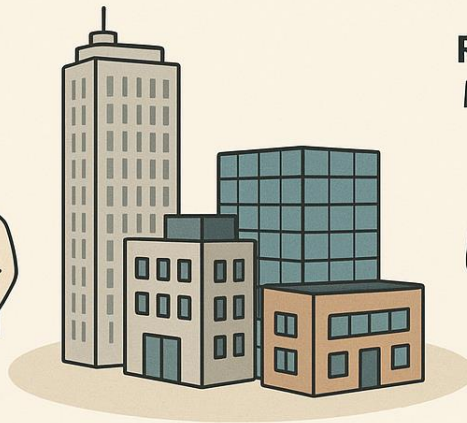
POLICY MAKERS



USERS



**REAL ESTATE
MANAGERS**



OFFICE PORTFOLIO



**FINANCIAL
STAKEHOLDERS**

Application: Preference-based Accommodation Strategy design and decision approach (Arkesteijn, 2019)

Portfolio: PDC Office Portfolio of the Netherlands Police

Facilitator: M.F.A (Martijn) Eversdijk

Period: February 2025 – May 2025

Contents

1. Introduction	127
2. The Client for the pilot study: The Netherlands Police	128
3. The Context of the Pilot Study	137
4. Interview I	139
4.1 Stakeholders specified decision variables (step 1)	139
4.2 Stakeholders determined preferences (step 2)	140
4.3 Stakeholders assigned weights (step 3).....	141
4.4 Stakeholders determined design constraints (step 4)	142
4.5 The process of the decision variables	143
5. Workshop I (step 5).....	145
5.1 Stakeholders design a portfolio alternative.....	145
6. Interview II (Step 1-4)	147
6.1 The final set of the decision variables.....	147
7. Workshop II (Step 5).....	150
7.1 Stakeholders designed and chosen the best alternative (step 5a and 6)	150
8. Conclusion	152
References	154

1. Introduction

This appendix presents the outcomes of the pilot study in which the PAS preference-based design and decision approach was applied. The Preference-based Accommodation Strategy (PAS) is described as "a preference-driven approach to the design and decision-making process for the development of an accommodation strategy" (Arkesteijn, 2019, p. 35). The method consists of a structured set of activities, involved stakeholders, a series of steps, and an underlying decision-making model (Arkesteijn, 2019), as illustrated in Figure 1.1.

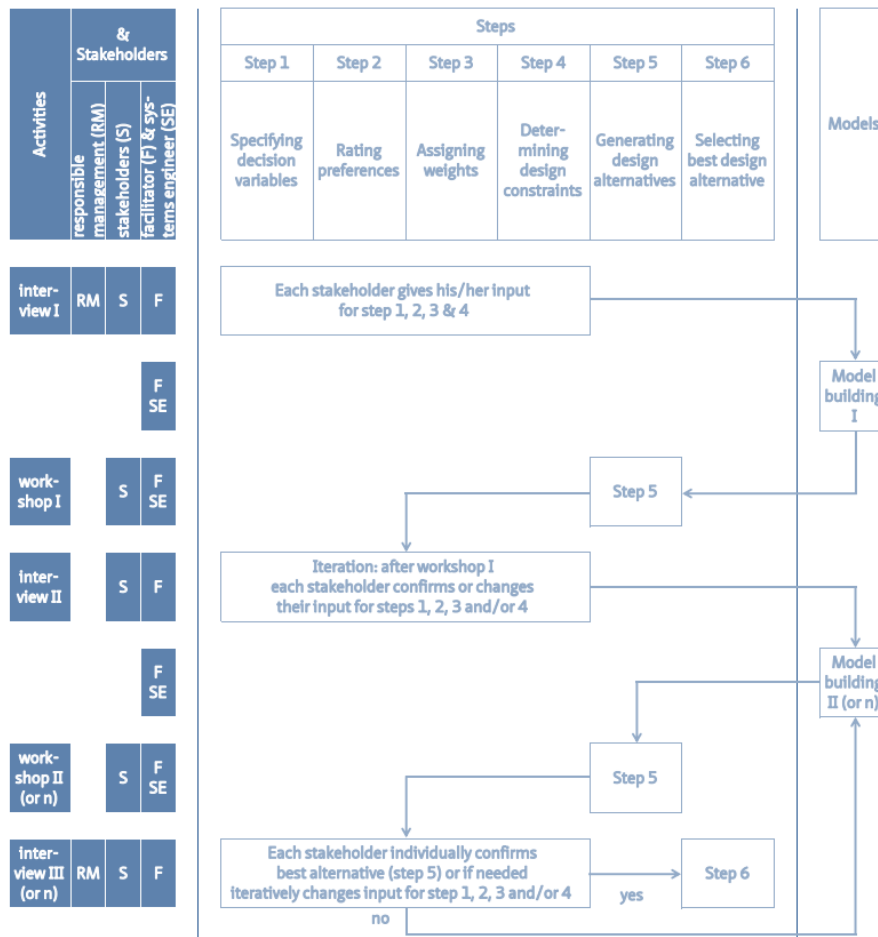


Figure 1.6 The flow chart of the PAS method (Arkesteijn, 2019, p. 237)

"The interviews were used to set the requirements which is done in steps 1 to 4 of PAS procedure and the workshops were used to design alternative CRE portfolios which is done in step 5 while the selection of the best alternative is done in step 6" (Arkesteijn, 2019, p. 169).

Interviews

- Step 1 Specifying decision variable(s);
- Step 2 Determining the decision maker's preference to each variable;
- Step 3 Assigning the decision maker's relative weight to each variable;
- Step 4 Determining the design constraints;

Workshops

- Step 5 Generating design alternatives;
- Step 6 Selecting the best alternative.

2. The Client for the pilot study: The Netherlands Police

The police is a public organisation that has grown into one of the largest public real estate owners in recent years. The organisation employs approximately 63.000 people, with almost 11.000 working in office-based settings, making it the largest public employer in the country (Politie, 2021). Given the complexity and diversity of the organisation, the following sections provide a more detailed description.

History

The organisation of the Netherlands Police has undergone two major reorganisations over the past few decades. The first reorganisation took place in 1994 following the introduction of the Police Act of 1993 (Inspectie der Rijksfinanciën, 2015). This restructuring combined the 148 municipal police forces and the National Police Force into 25 regional police units and established the National Police Services Corps (Korps Landelijke Politiediensten, KLPD). The second reorganisation within the Netherlands Police stemmed from persistent issues in cooperation among regional forces, characterised by fragmented structures and inconsistencies in task execution and management practices (Jacobs, 2014). To address these inefficiencies, the current Police Act of 2012 introduced the formation of a single National Police (Nationale Politie NP) in 2013 (Fijnaut, 2012). This transformation unified the 25 regional police forces into one national police organisation, led by a central corps leadership and divided into 10 regional units (Inspectie der Rijksfinanciën, 2015).

The Inspectie der Rijksfinanciën (2015) differentiates between internal and external steering. External steering involves the deliberate influence exerted on the police organisation by external entities, such as the Ministry of Security and Justice (Inspectie der Rijksfinanciën, 2015). The external steering falls outside the scope of this research. Internal steering deals with how the police manage their operations and resources within the organisation. It is organised across closely coordinated levels of national, regional, and local (Inspectie der Rijksfinanciën, 2015). The structure is visualised in Figure 5.2, with the Chief of Police leading at the national level, supported by the Chief of Staff. The Police Services Centre² (Politiedienstencentrum, abbreviated as PDC) manages national operations, including accommodation, which are further distributed across various districts.

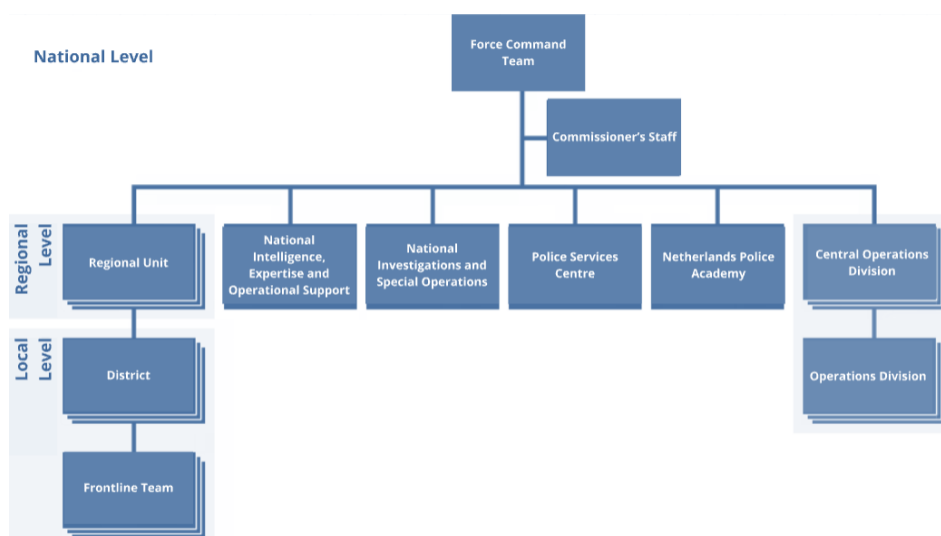


Figure 2.1 The organisation chart of the National Police (Translated by the author based on Politie (2025))

Hybrid Working for the Police

During the COVID-19 crisis, the Netherlands Police were compelled to adopt remote and digital forms of working. Evaluations have shown that this shift had a positive impact on both employee performance and well-being, which led to the structural implementation of *Anders Werken*¹ (translated as Different Working, abbreviated as DW) (Projectteam Anders Werken, 2022b). The police define DW as follows: “Different Working is the optimal balance between working at a police location and working remotely, which strengthens the development of the police organisation and is properly facilitated and supported” (Projectteam Anders Werken, 2022b). Aligned with this development, DW, referred to in academic literature as hybrid working, plays an integral role in accommodation projects where flexibility, sustainability, and functionality are key principles. As a result, the police have embraced hybrid working as a strategic instrument to improve operational effectiveness and employee well-being. It is not viewed as a goal in itself but as a tool to achieve the objectives of each police unit (Projectteam Anders Werken, 2022b).

Developments in DW are causing changes in how accommodation is used. As working conditions evolve, the accommodation strategy can be adjusted to support location- and time-independent working, with spaces differentiated based on the specific work processes of various user types. It is expected that employees will become more mobile, and that workspaces will be used more flexibly and efficiently. For the Police Services Centre² (PDC), the desired future balance is estimated to be approximately 61% of working time at a police location and 39% elsewhere (Projectteam Anders Werken, 2022a). However, this percentage is an average and varies significantly per target group, depending on work processes and operational needs. The PDC aims to scale up its facilities while maintaining space for meeting and connection. Different Working is approached as an open-ended transition, intended to contribute to the core objectives and values of DW, namely: well-being, sustainability, connection, flexibility, and capacity (Projectteam Anders Werken, 2022b). In total, three main documents (Table 5.1) have been developed by the strategic team (BIO) within the police organisation, providing a comprehensive foundation for the principles and implementation of Different Working.

Table 2.10 Overview of all police Anders Werken – hybrid working policy documents

Title	Author	Release date	Pages	Version	Status
Adviesnota Anders Werken – een nieuwe balans	Projectteam Anders Werken	July 2022 (a)	18	1.0	Final
Handboek Anders Werken in projecten	Projectteam Anders Werken	September 2022 (b)	48	1.2	Final
Ruimtenormering	Projectteam Anders Werken	August 2022 (c)	14	1.0	Final

The outcomes of DW, such as the adjusted flex space ratio, serve as guiding principles in accommodation projects to facilitate suitable work environments that align with employees’ ways of working, whether on-site or remotely. The strategy originally emerged through a bottom-up approach, based on extensive research into the needs and preferences of staff. However, current practice suggests that a top-down approach is becoming increasingly necessary to facilitate structured decision-making and provide clearer direction during implementation. To support this shift, clear policy frameworks are essential to explicitly define agreements and reinforce portfolio management (personal communication, Klaver, 17 February 2025).

From the start, several preconditions were established to enable the implementation of DW. These measures, referred to as 'no regrets' actions, include hybrid meetings, desk and room booking apps, building access systems, the use of laptops, remote work allowances, homeworking and mobility arrangements, improved digital connectivity, and HR-related policies and support services. At present, the DW programme is in the monitoring phase within accommodation projects. Practical experience is being gathered and evaluated, after which the implemented measures will be reviewed and adjusted where necessary. This continuous process of learning and adaptation is intended to ensure that the accommodation strategy is not only effective in the current context but also future-proof (Projectteam Anders Werken, 2022b).

The extent to which DW can be integrated into accommodation projects depends on the project phase and whether the project concerns new construction or a renovation. In renovation projects, particularly in buildings with cellular layouts, such as those with holding cells or compartmentalised rooms the implementation of DW is often more challenging due to spatial limitations imposed by the existing structure. In contrast, new-build projects offer the opportunity to design buildings from the ground up with DW as a guiding principle (Projectteam Anders Werken, 2022b). A clear example is HUB50 in Utrecht as visualised in Figure 5.3, where flexible and activity-based working was central to both the design and the interior layout (Zri, n.d).



Figure 2.2 HUB50 National Policehub in Utrecht (Zri, z.d.)

Moreover, as a project progresses, the ability to exert influence diminishes. For instance, during the development phase, only factors such as location and total area can typically be influenced, while other aspects, such as zoning, can still play a role in both the initiative and definition phases. Elements such as layout, facilities, and supportive infrastructure remain relevant until the design phase, whereas the flex space ratio can still exert influence throughout all phases, including the execution stage (Projectteam Anders Werken, 2022b).

The implementation of hybrid working is not solely dependent on physical accommodation; it also requires a broader cultural shift and policy adaptation within the organisation. Police units are responsible for promoting a form of leadership that fosters trust and autonomy while staff members are supported in adopting new ways of working. The Commissioner's Staff³ (korpstaf) is tasked with formulating relevant policies and operational frameworks by defining clear guidelines for workspace design, mobility, and homeworking arrangements. Without these mental and structural transitions, hybrid working will be difficult to integrate effectively (Projectteam Anders Werken, 2022a).

As part of the programme, employees are categorised into target groups according to the organisational structure shown in Figure 5.4. This classification defines four broad categories, which reflect where and how employees carry out their work. Each category provides a general picture of job characteristics and the extent to which work is performed at a police location or elsewhere. However, customised solutions per team remain essential to align with operational needs and work processes (Projectteam Anders Werken, 2022b).

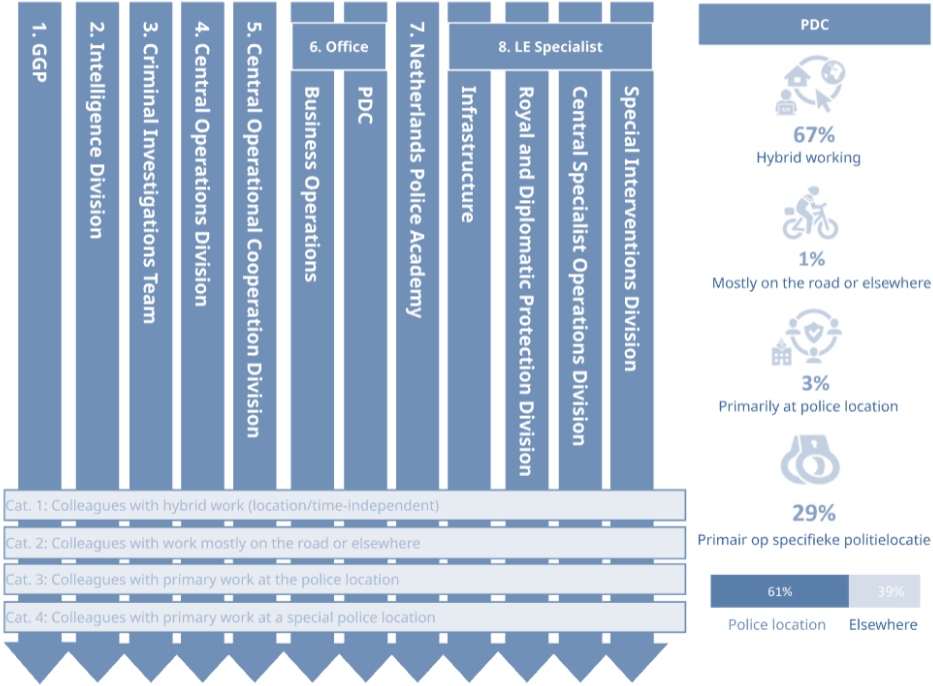


Figure 2.3 Target groups with categories and subdivision of the PDC sector (Integrated figures and translated by the author, Projectteam Anders Werken, 2022b)

This research focuses on the PDC target group, which includes employees working within the Police Services Centre² (PDC). Within this group, four categories are also distinguished that broadly indicate where and how employees carry out their work. Each target group consists of a composition of the four categories. Within the framework of DW, both the balance per target group and the balance per category have been assessed. The average flex space ratio for the PDC target group, including the management department, is 0.4. An overview of this balance for the different categories is presented in Table 5.2, which also includes the corresponding flex space ratio and space standard.

Table 2.11 Flex space ratio and Space standard per Different Working category

Categories	Flex space ratio (per fte)	Space standard m2 GFA (per workplace)
1. Hybrid work	0,4	21,5
2. On the road or elsewhere	0,4	21,5
3a. Primary work at the police location (80%-20%)	0,7	21,5
3b. Primary work at the police location (80%-20%)	0,5	21,5
4. Primary work at a special police location	N/A	N/A

The Accommodation Policy of the Police

An extensive analysis of this policy has already been conducted by Swens (2024, pp. 37–45). This section briefly outlines the main policy principles and complements them with insights relevant to the office real estate portfolio that accommodates the Police Services Centre² (PDC) employees of the police. The police’s accommodation strategy addresses several contemporary policy goals driven by stricter sustainability requirements aligned with the Paris Climate Agreement, organisational changes, and evolving accommodation needs. Increased attention is given to the flexibility, sustainability, affordability, and marketability of police buildings, reflecting the necessity of professionalising real estate management (Directie FM en sector Huisvestiging, 2023b). The police have determined the following accommodation needs: *"The police of tomorrow and the day after tomorrow need flexible, sustainable, affordable and manufacturable accommodation so that they can continue to do their work in the society of tomorrow and the day after tomorrow with dedication"* (Directie FM en sector Huisvestiging, 2023, p. 2).

By applying the Designing and Accommodation Strategy (DAS) framework, the police developed a structured approach to transition from their current to future accommodation needs and capacity. This framework supports the alignment between organisational objectives (demand) and available resources (supply) (De Jonge et al., 2009). A scenario analysis formed the basis for identifying future demand, as described in the Accommodation Vision 2040. The envisioned supply is detailed in the Target Portfolio, while the Real Estate Strategy outlines how the transformation from the current to the future portfolio will be realised. The Framework & Rules document defines the guiding principles and operational boundaries within which this transition is to be managed. Figure 5.5 visualises the coherence between these documents within the DAS structure, and Table 5.3 summarises their content.

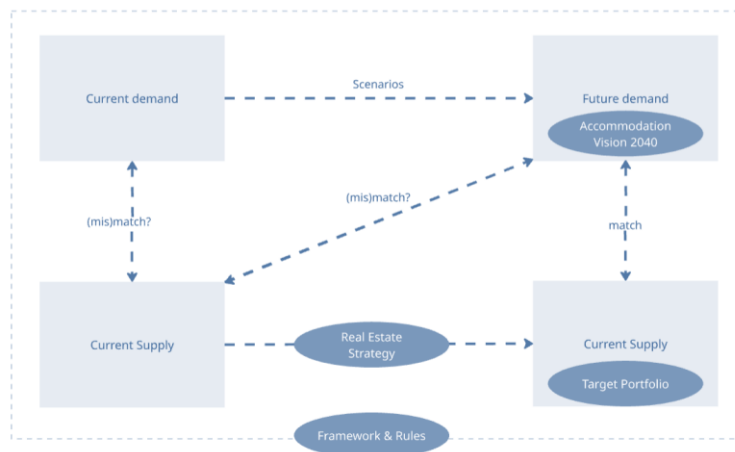


Figure 2.4 DAS Framework with policy documents police (translated by the author based on Politie, 2023b, p.4)

Table 2.12 Overview of all police policy documents

Title	Author	Release date	Pages	Version	Status
Huisvestingsvisie 2040	Directie Facility Management	August 2023	33	1.0	Final
Streefportefeuille & Vastgoedstrategie	Directie FM en sector Huisvestiging	October 2023 (a)	72	1.0	Final
Kaders & Spelregels	Directie FM en sector Huisvestiging	October 2023 (b)	20	1.1	Final

Accommodation Vision 2040 (huisvestingsvisie 2040)

In the Accommodation Vision 2040, the future demand was defined based on trend scenarios, which led to the formulation of six core pillars (Directie Facility Management, 2023). These pillars form the foundation of the accommodation strategy and serve as guiding principles for ensuring that future accommodation remains high-quality, affordable, and feasible. The vision elaborates on each pillar, outlining its impact on accommodation in both the medium term (up to 2030) and the long term (up to 2040). The pillars and their associated principles are presented in Figure 5.6 below.

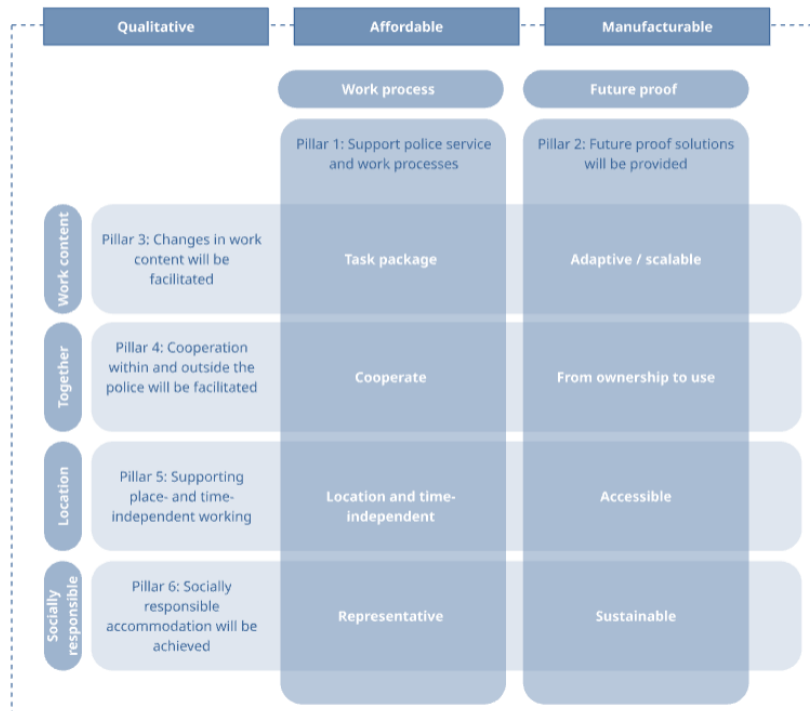


Figure 2.5 Six pillars (translated by the author based on Directie Facility Management, 2023, p.7)

Pillar 1: Supporting Police Services and Work Processes

In the medium term, changes in society continue to reshape the police's public safety tasks, prompting ongoing adjustments to services and work processes. Accommodation supports these developments through modern, scalable, and digitally integrated environments that enable flexible, location-independent work and collaboration. The shift from a few large police stations to smaller, locally accessible locations improves vitality, efficiency, and responsiveness while maintaining continuity and cost-effectiveness. In the long term, uncertainty remains regarding how much traditional police work will shift to digital and remote contexts.

Pillar 2: Future-proof Solutions Will Be Provided

Police accommodation responds to rapid societal and technological changes. The organisation increasingly shares facilities with internal departments and external partners in safety clusters and campuses, prioritising use over ownership. Flexibility and scalability are essential, enabling buildings to adapt to shifting needs while retaining value. Sustainability is integral, with goals to reduce CO₂ emissions, material use, and travel movements. Police facilities remain accessible, support shared mobility, and align with evolving transport solutions. In the long term, fixed workplaces may disappear, mobility options will influence location choices, and the ambition to be energy-neutral by 2050 drives long-term accommodation strategies.

Pillar 3: Changes in Work Content Will Be Facilitated

The police organisation is adapting to fundamental changes in its work, driven by automation, digitalisation, and advanced technologies. Standard tasks are increasingly supported by IT systems, big data, and AI, enhancing the police's ability to act proactively and effectively. Accommodation supports this digital transformation through scalable and flexible facilities such as mobile and pop-up locations. In the long term, technological innovations could take over the routine police tasks, requiring the police to adapt continuously and harness innovations like AI and big data to strengthen operational effectiveness.

Pillar 4: Cooperation Within and Outside the Police will be Facilitated

Collaboration with colleagues and external partners is becoming increasingly vital. The police operate in growing networks of public, private, and civic actors, sharing knowledge and facilities in regional and national safety centres. Police locations provide flexible spaces for both informal cooperation and confidential operations. Over time, collaboration will intensify, fixed work locations may disappear, and shared use of partner facilities will become more common, prioritising flexibility over ownership.

Pillar 5: Supporting Place- and Time- Independent Working

The police increasingly work in a place- and time-independent manner, operating from home, partner locations, central stations, or nearby hubs. Temporary facilities at crime scenes allow for remote investigation, followed by processing at a central site. Police locations are organised locally, regionally, or nationally based on the type of activity, accessibility, and required infrastructure. This approach reduces commuting, supports visibility and responsiveness, and promotes efficient, sustainable operations. In the long term, flexibility and shared use of locations will become essential.

Pillar 6: Socially Responsible Accommodation will be Achieved

The police integrate sustainability into both operations and accommodation strategy, ensuring compliance with environmental laws while aiming to exceed them where feasible. Accommodation reflects public trust and responsible governance, with a focus on reducing environmental impact, CO₂ emissions, and space usage. Scalable solutions like mobile or pop-up units support flexibility and sustainable public spending.

Target Portfolio & Real Estate Strategy

The policy document 'Target Portfolio & Real Estate Strategy' provides a clear and practical implementation of the 'Accommodation Vision 2040'. It defines the desired future state of the police's property portfolio (the 'what') and outlines the steps needed to achieve this goal (the 'how').

Current Office Portfolio

The current office real estate of the police comprises 692,000 m² gross floor area, divided into three categories: generic offices (well-connected by public transport), operational offices (quick accessibility for operational deployment), and specific offices (tailored to specialised user requirements). In the future portfolio, the police aim to more distinctly separate generic offices from operational and specific locations, enhancing the efficient and flexible use of buildings as visualised in Figure 5.7. This will result in better accessibility, improved sustainability, and greater adaptability to changing organisational needs. Generic offices specifically accommodate support staff such as PDC employees, unit

management, and other non-operational functions. They are clustered in key locations across the Netherlands, including The Hague, Utrecht, Amsterdam, Rotterdam, Zwolle, and Eindhoven.

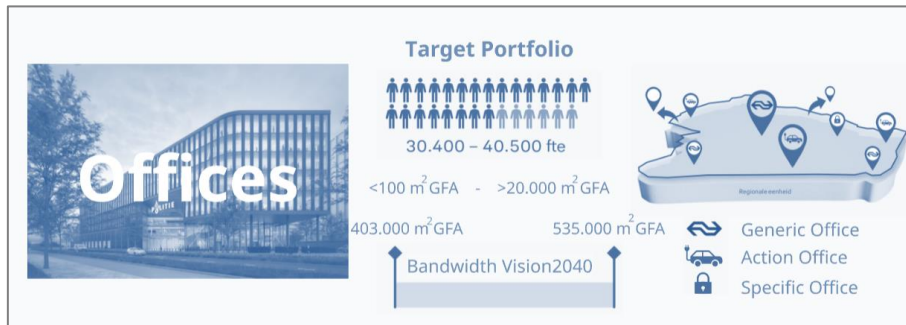


Figure 2.6 Future Office (Integrated and translated by the author based on Directie FM en sector Huisvestiging, 2023a)

The Office Real Estate Strategy

The strategy for the police office segment focuses on densifying and standardising the real estate portfolio (Directie FM en sector Huisvestiging, 2023a). Instead of basing accommodation on organisational structure, the work itself is now central, allowing multiple teams to be housed in standardised buildings. This increases flexibility, promotes cross-unit collaboration, and results in a reduction of office floor space and lower accommodation costs. There are five interventions planned towards 2040:

1. Reducing the number of square metres in use by concentrating user groups in the most suitable existing locations.
2. Creating a clear distinction between the strategic core portfolio, base stock, and flexible layer, with the core portfolio being prioritised.
3. Standardising and upgrading retained office buildings for multi-purpose use, including harmonised access and security systems.
4. Improving sustainability through renovation and new construction.
5. Defining a disposal strategy for buildings to be released, applying no-regret measures where functions remain and avoiding interventions where repurposing or demolition is expected.

Framework & Rules

In the policy document *Framework & Rules* (Kaders & Spelregels), five portfolio objectives have been defined to guide the police organisation’s accommodation strategy towards 2040, as visualised in Figure 5.8 (Directie FM en sector Huisvestiging, 2023b). These objectives set the boundaries within which the accommodation vision can be realised, ensuring that the transition towards a future-proof property portfolio remains feasible, affordable, and achievable while responding to societal trends and the evolving role of the police.



Figure 2.7 Portfolio goals of the police (translated based on Directie FM en sector Huisvestiging, 2023b, p. 3)

More Efficient Accommodation

The police aim to optimise accommodation by reducing space usage and aligning it more closely with operational processes. Through the *Different Working* programme, the focus shifts towards activity-based and location-independent working, addressing fragmented and inefficient use of space. The overall space budget will be reduced and allocated across units, with unused square meters being phased out swiftly. Theoretical space requirements are based on revised space standards, and reductions remain feasible and financially manageable. Units may compensate for each other if reduction targets cannot be met, and temporary programmes can be accommodated within existing space allocations.

Sustainability in Line with National Policy

Towards 2050, the Netherlands is transitioning to a sustainable, fossil-free society, and the police are committed to this goal. Their real estate strategy aligns with national climate policy, aiming for a 60% CO₂ reduction by 2030 and 100% by 2050, with targets allocated per organisational unit. Measures include meeting energy label requirements (minimum label C by 2026), reducing fossil energy use by 22%, and cutting final energy use by 14% between 2023 and 2027. The police also promote sustainable mobility and distinguish between A-locations (next to intercity train stations), B-locations (accessible by both public transport and car), and C-locations (primarily car-accessible).

Realistic and Feasible Pace of Renewal

Renewal of the police real estate portfolio is essential to improve alignment with operational needs, reduce energy and maintenance costs, and support long-term sustainability goals. However, due to limited capacity and market constraints, the pace of renewal needs to be realistic and manageable. An annual investment ceiling of €250 million (2021 prices) applies, with prioritisation based on feasibility, available capacity, and the organisation's ability to absorb change.

Manageable Operation Costs

The police aim to provide modern, efficient, and future-proof accommodation that supports operational needs while remaining within a structural budget of €380 million per year. This budget is based on 1,520,000 m² of efficient space use. All real estate costs fit within this framework, requiring clear financial planning, transparent cost allocation, and approval only for projects with secured funding or a clear financial proposal.

Fit-for-purpose

Police accommodation aims to provide a safe, flexible, and supportive working environment tailored to operational needs, while remaining future-proof. A tiered quality approach is applied, with different standards based on location, usage, and building lifespan. Three quality levels (A, B, C) are defined: from high-end new builds and major renovations (A) to basic compliance with legal requirements (C). Not all buildings need the highest standard; suitability depends on purpose, cost-efficiency, and urgency.

3. The Context of the Pilot Study

Project: The Office Portfolio
Organisation: The Netherlands Police
Start date: 11-02-2025

Stakeholders:



Figure 3.4 The four perspectives with the number of representatives in the pilot study (Den Heijer, 2011)

Process:

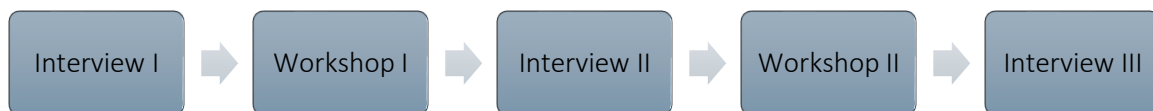


Figure 3.5 PAS Process in the pilot study

Portfolio:



Office building	Building number	Type of office	Gross floor area	FTE	Police Ownership
PDC Rotterdam	1	Only PDC	18,816	1,544	No
PDC Eindhoven	2	Only PDC	3,654	250	No
PDC Zwolle	3	Only PDC	11,255	976	No
HUB50 Utrecht	4	Shared	20,902	417	Yes

Figure 3.6 Four office locations of the PDC employees from the police. Legend: dark blue circle: owned building and light blue circles: rented buildings



Figure 3.4: Building number 1, PDC Rotterdam



Figure 3.5: Building number 2, PDC Eindhoven



Figure 3.6: Building number 3, PDC Zwolle



Figure 3.7: Building number 4, HUB 50

Pictures are retrieved from Google Earth (2025)

4. Interview I

4.1 Stakeholders specified decision variables (step 1)

Policy stakeholder

	Goal	Problems	Variables
1.1	Preservation of office location	Government policy	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)
2.1	Public transport accessibility	Police policy	Number of min walk intercity station
3.1	Retain/acquire existing property in the market	Police policy	Number of buildings 'existing property' in portfolio
4.1	Sustainability	Government policy	Reduce CO ² emissions
4.2		Police policy	Number of buildings with energy label A
5.1	Reducing space requirements	Police policy	Flex space norms
6.1	Office space concept for hybrid working	Police policy	Percentage of hybrid working office building

User stakeholder

	Goal	Problems	Variables
1.1	Reduction of square meters	Police policy	Occupancy rate of offices
1.2		Police policy	Percentage of employees working from home
1.3		Police policy	Percentage of employees without a dedicated workplace
2.1	Reduction of travel moments	Police policy	max. commute time (min)
3.1	Office design matches wishes/need of employees	Police policy	Satisfaction level (#)

Real estate stakeholder

	Goal	Problems	Variables
1.1	Adaptability / accommodating growth and shrinkage of teams	Police policy	Number of workplaces in the central Netherlands
2.1	Accessibility	Police policy	Parking facilities
2.2		Police policy	Number of min walk intercity station
3.1	Sustainability	Police policy	Minimum Energy label A
4.1	A functional building that matches the work process of employees	Police policy	Occupancy rate
4.2		Police policy	Satisfaction level (#)
5.1	Maintenance	Police policy	Low maintenance costs
6.1	Safety	Police policy	Building must meet safety/security standards

4.2 Stakeholders determined preferences (step 2)

Policy stakeholder

	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Preservation of office location	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)	[0.0]	[100.100]	[75.50]
2.1	Public transport accessibility	Number of min walk intercity station	[30.0]	[5.100]	[15.50]
3.1	Retain/acquire existing property in the market	Number of buildings 'existing property' in portfolio	[75.0]	[100.100]	[95.95]
4.1	Sustainability	Reduce CO ² emissions	[100.0]	[0.100]	[60.50]
4.2		Number of buildings with energy label A	[70.0]	[100.100]	[80.100]
5.1	Reducing space requirements	Flex space norms	[0,6.0]	[0,3.100]	[0,5.50]
6.1	Office space concept for hybrid working	Percentage of hybrid working office building	[50.0]	[100.100]	[75.50]

User stakeholder

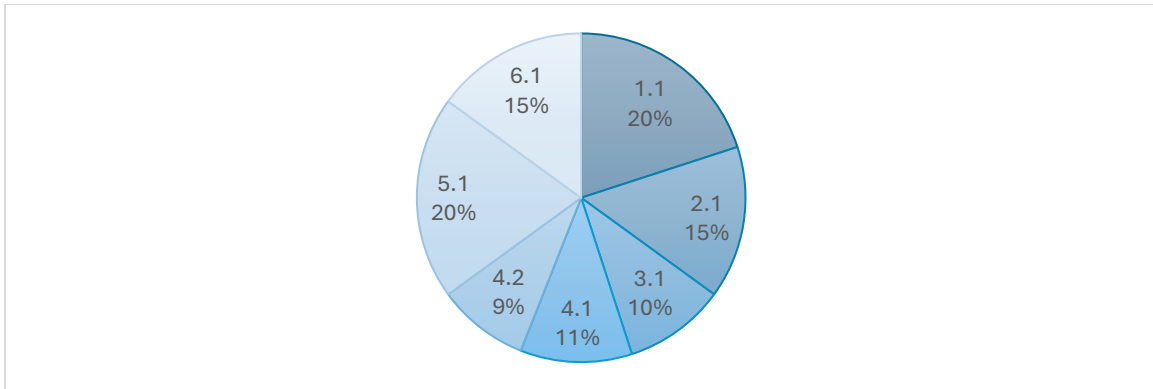
	Decision variables User	Criterion unit	[x0. y0] 'Low'	[x1. y1] 'High'	[x2. y2] 'Mid'
1.1	Reduction of square meters	Occupancy rate of offices	[38.0]	[70.100]	[70.60]
1.2		Percentage of employees working from home	[80.0]	[96.100]	[87.0]
1.3		Percentage of employees without a dedicated workplace	[32.0]	[5.100]	[15.50]
2.1	Reduction of travel moments	max. commute time (min)	[60.0]	[30.100]	[45.50]
3.1	Office design matches wishes/need of employees	Satisfaction level (#)	[63.0]	[80.100]	[70.60]

Real estate stakeholder

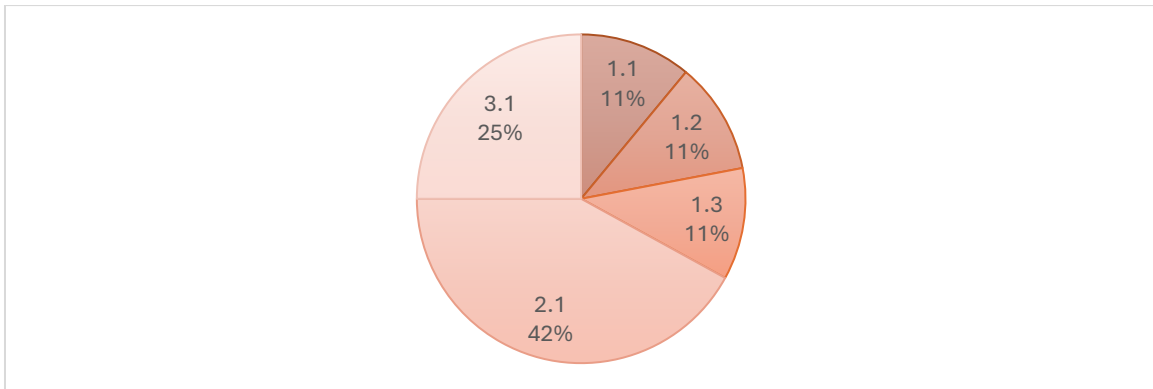
	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Adaptability / accommodating growth and shrinkage of teams	Number of workplaces in the central Netherlands	[0.0]	[80.100]	[50.50]
2.1	Accessibility	Parking facilities	[1,5.0]	[3.100]	[2.50]
2.2		Number of min walk intercity station	[12.0]	[2.100]	[8.50]
3.1	Sustainability	Minimum Energy label A	[70.0]	[100.100]	[80.50]
4.1	A functional building that matches the work process of employees	Occupancy rate	[38.0]	[85.100]	[65.50]
4.2		Satisfaction level (#)	[63.0]	[80.100]	[75.50]
5.1	Maintenance	Low maintenance costs	[35.0]	[15.100]	[25.50]
6.1	Safety	Building must meet safety/security standards	[70.0]	[100.100]	[85.50]

4.3 Stakeholders assigned weights (step 3)

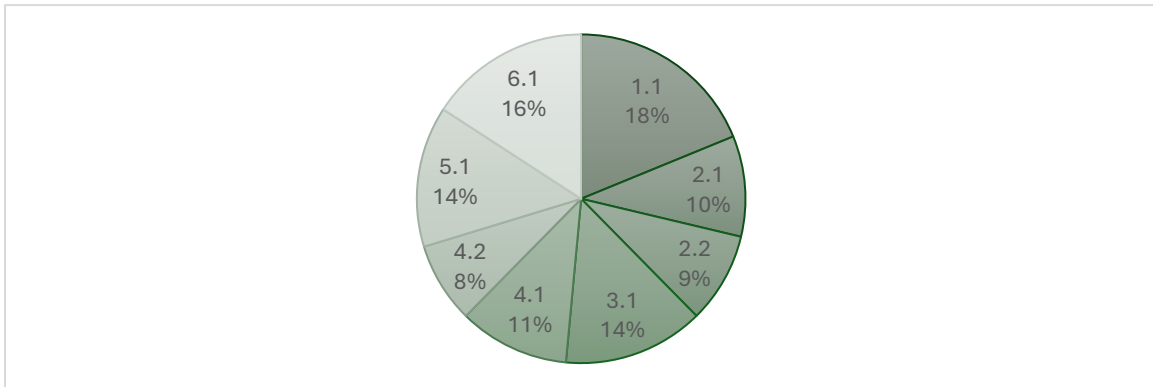
Policy stakeholder



User stakeholder



Real estate stakeholder



4.4 Stakeholders determined design constraints (step 4)

Policy stakeholder

Design constraint		
1.1	Must not cost more than current portfolio	100%
1.2	Sufficient power (energy transition/grid congestion)	100%

User stakeholder

Design constraint		

Real estate stakeholder

Design constraint		
1.1	Compliance with laws and regulations (building regulations / environmental permit)	100%

4.5 The process of the decision variables

The stakeholders' decision variables were specified individually within the PAS Excel model for each intervention, as shown in the dashboard in Figure 4.1. This allows designing the overall score on the portfolio alternative, with each building offering the same interventions. Furthermore, the financial boundaries were defined by the police, which display the current operational costs of the buildings, alongside the projected costs or savings of the designed portfolio alternative, as determined by the selected interventions.

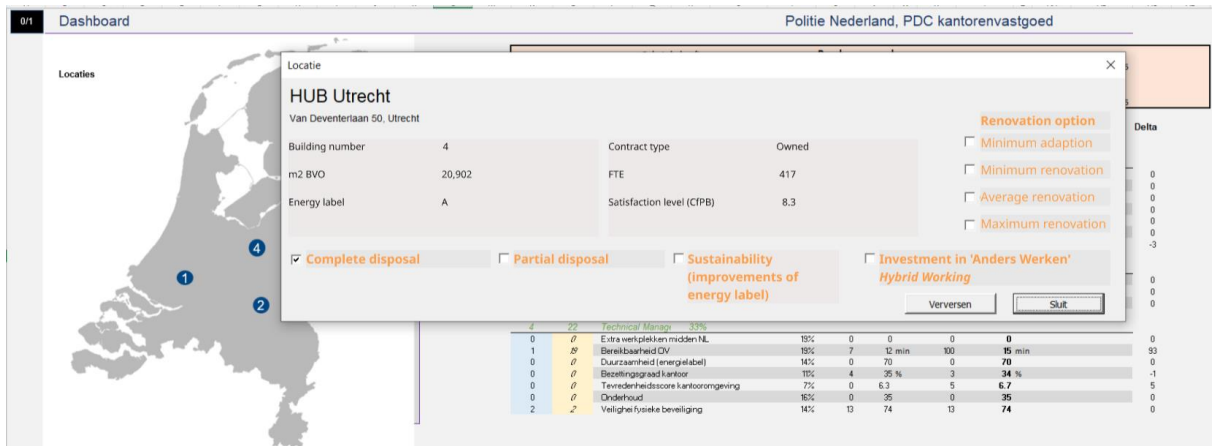


Figure 4.1 Screenshot of the Dashboard with possible translated Interventions

For the implementation decision variables, continuous consideration was required to assess how each variable influences the final outcome. This process is illustrated for an example variable in Figure 5.2. The satisfaction decision variable currently reflects a situation in which the PDC locations score 6.3 (CfPB, 2025), while the HUB50 scores 2 points because it is specifically designed for hybrid working. When an intervention is selected for a building, this variable increases by two points and by one point for the HUB50, as a value that would satisfy everyone is not considered realistic. This intervention has a positive effect on the overall design score of the portfolio alternative. These interpretations of the data are subsequently evaluated or adjusted during Interview II.



Figure 4.2 Example of interpretation of the decision variables in the PAS model

The interpretation of the decision variables was discussed during interview II, allowing stakeholders to indicate how these could be improved for each intervention. Overall, they could follow the line of reasoning, with some small improvements to be made, mainly because some variables can be directly linked to a specific building, such as the energy label. However, for variables like occupancy rate and flex space norms, the current situation per building could be reviewed, but not how these could be

improved through the application of an intervention. Another point of attention is after interview II was to ensure completeness, an option for both rental and purchase of an additional property in Zwolle was added (Real Estate Perspective, personal communication, 2025).

5. Workshop I (Step 5)

5.1 Stakeholders design a portfolio alternative

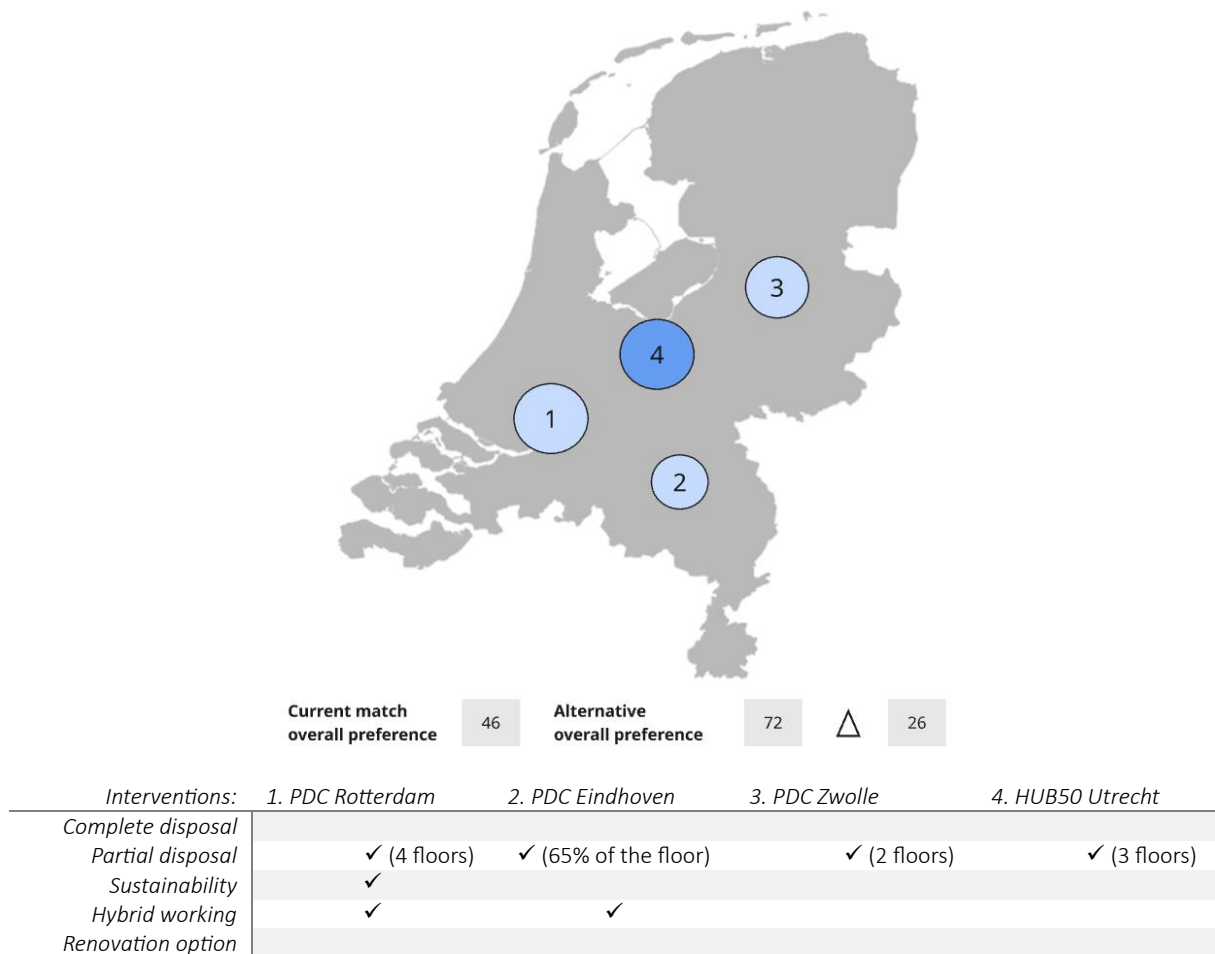


Figure 5.1 The portfolio alternative of the office portfolio from the police during workshop I (legend: Dark blue = owned building; light blue = rented building)

Decision Maker	Decision variables		D ₀	D ₁
Policy	1.1	Preservation of office location	18	18
	2.1	Public transport accessibility	12	12
	3.1	Retain/acquire existing property in the market	10	10
	4.1	Reduce CO ² emissions	8	12
	4.2	Energy label	2	5
	5.1	Reducing space requirements	0	10
	6.1	Office space concept for hybrid working	9	11
			60	79
User	1.1	Occupancy rate	0	17
	1.2	Home workers	9	17
	1.3	Workers with own workplace	6	1
	2.1	Reduction of travel moments	17	15
	3.1	Office design matches wishes/need of employees	6	15
			38	66
	1.1	Number of workplaces in the central Netherlands	0	18

Real estate	2.1	Parking facilities	8	8
	2.2	Number of min walk intercity station	1	1
	3.1	Minimum Energy label A	9	10
	4.1	Occupancy rate	3	11
	4.2	Satisfaction level (#)	0	4
	5.1	Low maintenance costs	6	6
	6.1	Building must meet safety/security standards	16	16
			42	73

6. Interview II (step 1 -4)

6.1 The final set of the decision variables

Policy stakeholder

	Goal	Problems	Variables
1.1	Preservation of office location	Government policy	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)
2.1	Public transport accessibility	Police policy	Number of min walk intercity station
3.1	Retain/acquire existing property in the market	Police policy	Number of buildings 'existing property' in portfolio
4.1	Sustainability	Government policy	Reduce CO ² emissions
4.2		Police policy	Number of buildings with energy label A
5.1	Reducing space requirements	Police policy	Reduction percentage portfolio
6.1	Office space concept for hybrid working	Police policy	Percentage of hybrid working office building

User stakeholder

	Goal	Problems	Variables
1.1	Reduction of square meters	Police policy	Reduction percentage portfolio
2.1	Reduction of travel moments	Police policy	max. commute time (min)
3.1	Office design matches wishes/need of employees	Police policy	Satisfaction level (#)

Real estate stakeholder

	Goal	Problems	Variables
1.1	Adaptability / accommodating growth and shrinkage of teams	Police policy	Number of workplaces in the central Netherlands
2.1	Accessibility	Police policy	Number of min walk intercity station
3.1	Sustainability	Police policy	Minimum Energy label A
4.1	A functional building that matches the work process of employees	Police policy	Occupancy rate
4.2		Police policy	Satisfaction level (#)
5.1	Maintenance	Police policy	Low maintenance costs
6.1	Safety	Police policy	Building must meet security standards

Policy stakeholder

	Decision variables Policy	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Preservation of office location	Number of offices located in designated locations (Rotterdam, Eindhoven, Zwolle)	[0.0]	[100.100]	[75.50]
2.1	Public transport accessibility	Number of min walk intercity station	[30.0]	[5.100]	[15.50]
3.1	Retain/acquire existing property in the market	Number of buildings 'existing property' in portfolio	[75.0]	[100.100]	[95.95]
4.1	Sustainability	Reduce CO ² emissions	[100.0]	[0.100]	[60.50]
4.2		Number of buildings with energy label A	[70.0]	[100.100]	[80.100]
5.1	Reducing space requirements	Reduction percentage portfolio	[27.0]	[23.100]	[25.50]
6.1	Office space concept for hybrid working	Percentage of hybrid working office building	[50.0]	[100.100]	[75.50]

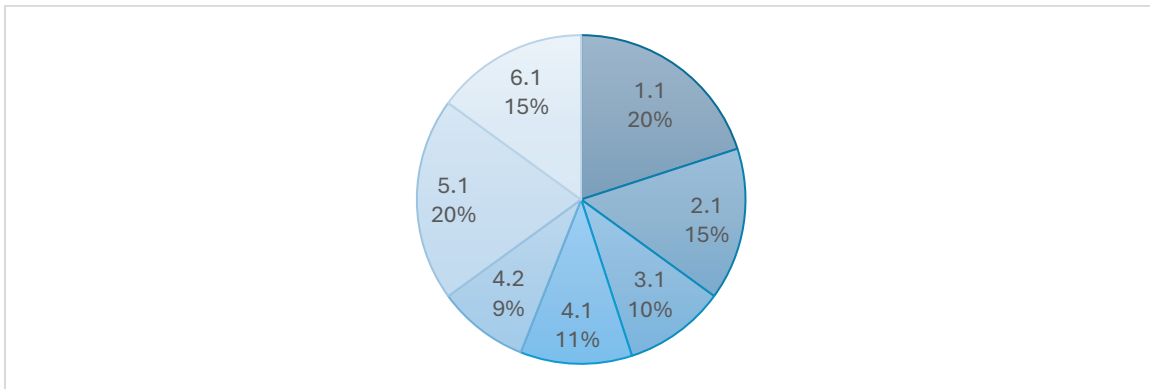
User stakeholder

	Decision variables User	Criterion unit	[x0. y0] 'Low'	[x1. y1] 'High'	[x2. y2] 'Mid'
1.1	Reduction of square meters	Reduction percentage portfolio	[27.0]	[23.100]	[25.50]
2.1	Reduction of travel moments	max. commute time (min)	[60.0]	[30.100]	[45.50]
3.1	Office design matches wishes/need of employees	Satisfaction level (#)	[63.0]	[80.100]	[70.60]

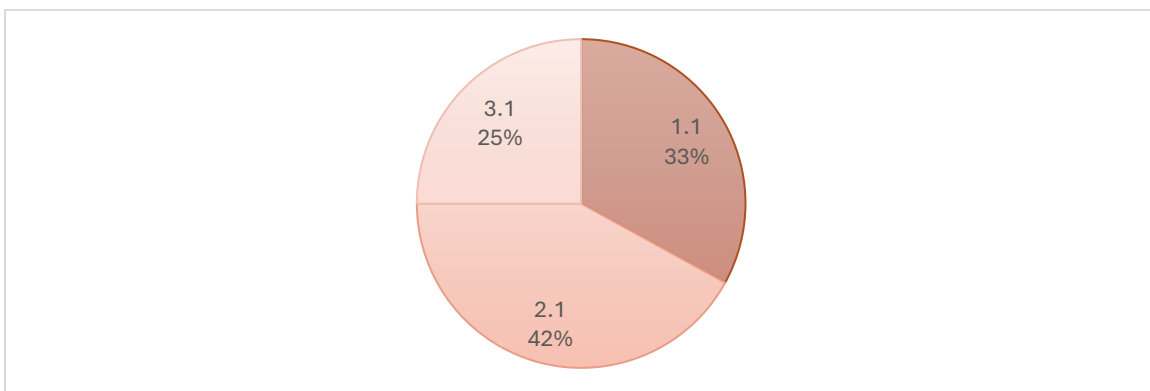
Real estate stakeholder

	Decision variables Real Estate	Criterion unit	[x0. y0]	[x1. y1]	[x2. y2]
1.1	Adaptability / accommodating growth and shrinkage of teams	Number of workplaces in the central Netherlands	[0.0]	[80.100]	[50.50]
2.1	Accessibility	Number of min walk intercity station	[12.0]	[2.100]	[8.50]
3.1	Sustainability	Minimum Energy label A	[70.0]	[100.100]	[80.50]
4.1	A functional building that matches the work process of employees	Occupancy rate	[38.0]	[85.100]	[65.50]
4.2		Satisfaction level (#)	[63.0]	[80.100]	[75.50]
5.1	Maintenance	Low maintenance costs	[35.0]	[15.100]	[25.50]
6.1	Safety	Building must meet safety standards	[70.0]	[100.100]	[85.50]

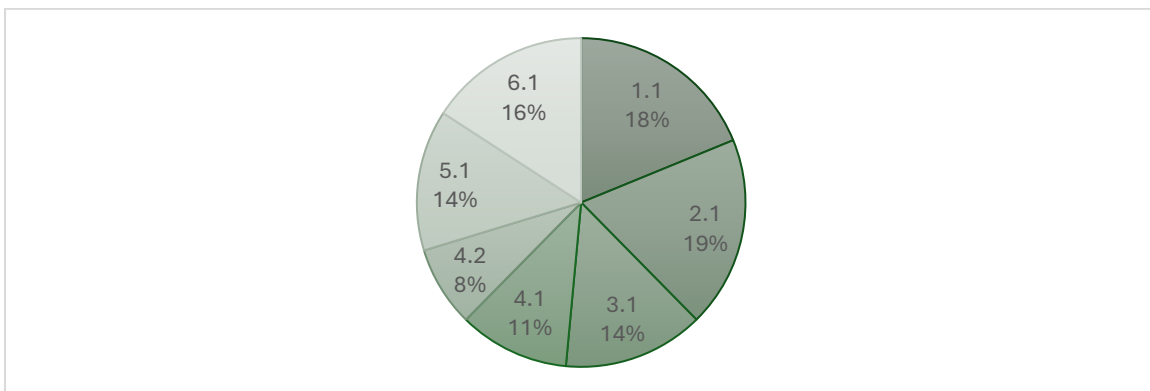
Policy stakeholder



User stakeholder



Real estate stakeholder



Additional Building for Workshop II:

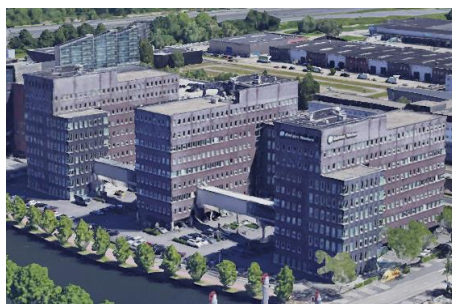


Figure 6.1 Building number 5, PDC Nieuwegein

7. Workshop II (step 5)

7.1 Stakeholders designed and chosen the best alternative (step 5a and 6)

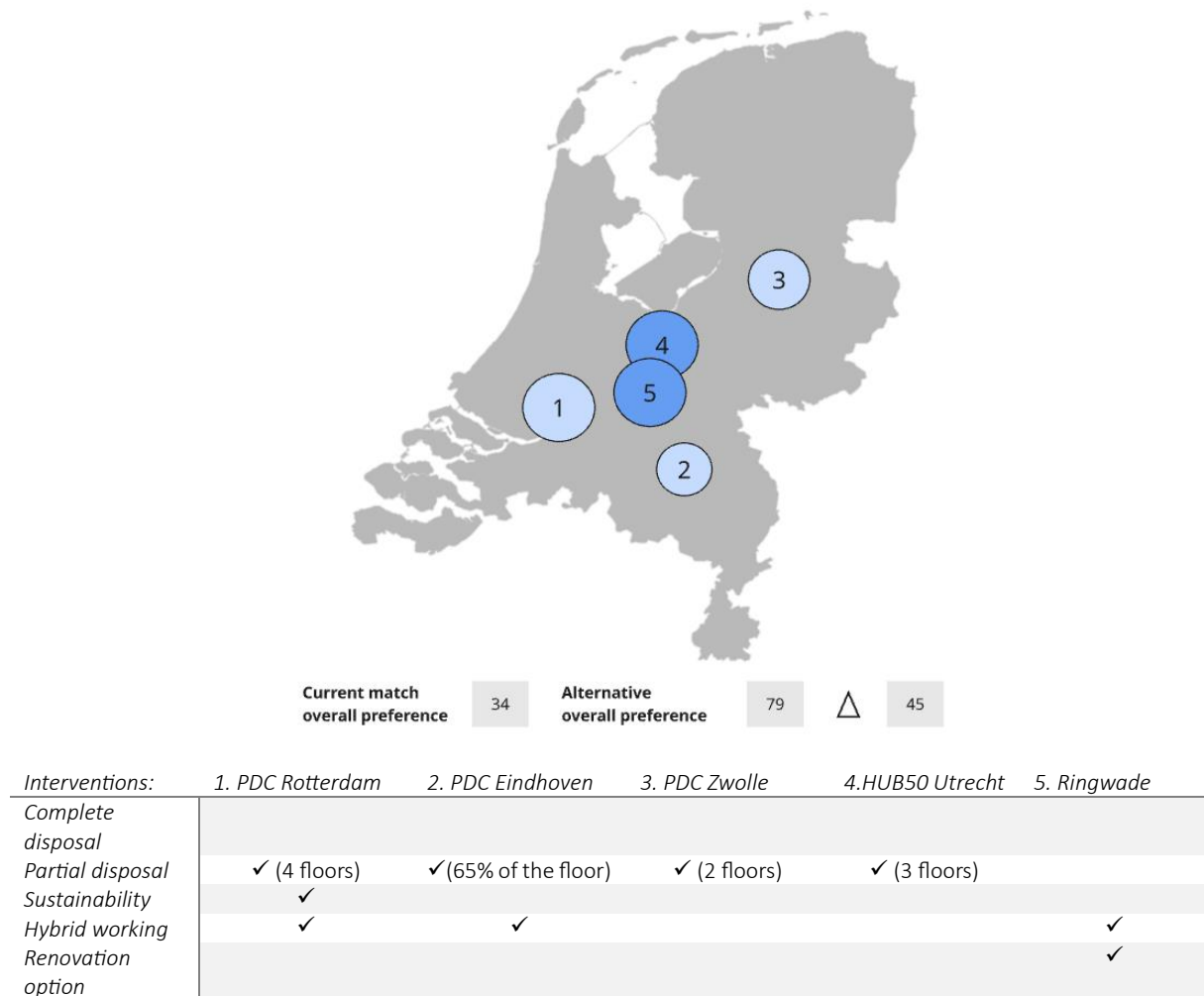


Figure 7.1 The portfolio alternative of the office portfolio from the police during workshop II (legend: Dark blue = owned building; light blue = rented building)

Decision Maker	Decision variables		D ₀	D ₁
Policy	1.1	Preservation of office location	20	20
	2.1	Public transport accessibility	7	7
	3.1	Retain/acquire existing property in the market	10	10
	4.1	Reduce CO ² emissions	7	9
	4.2	Satisfaction level (#)	0	3
	5.1	Reducing space requirements	0	20
	6.1	Office space concept for hybrid working	9	14
			53	82
User	1.1	Reduction of square meters	12	32
	2.1	Reduction of travel moments	0	42
	3.1	Office design matches wishes/need of employees	17	17
			30	92
	1.1	Adaptability / accommodating growth and shrinkage of teams	0	19

Real estate	2.1	Accessibility	19	19
	3.1	Sustainability	0	4
	4.1	A functional building that matches the work process of employees	0	11
			0	6
	5.1	Maintenance	0	2
	6.1	Safety	2	5
			21	67

8. Conclusion

During the workshop, there was a noticeable lack of effort to design new portfolio alternatives that could result in a higher overall score. However, this appeared to be very difficult, given the decision variables of the stakeholders. Areas where the most improvement could be achieved often had a negative impact on other decision variables that were already rated highly, as well as leading to additional costs. This is illustrated in Figure 8.1.

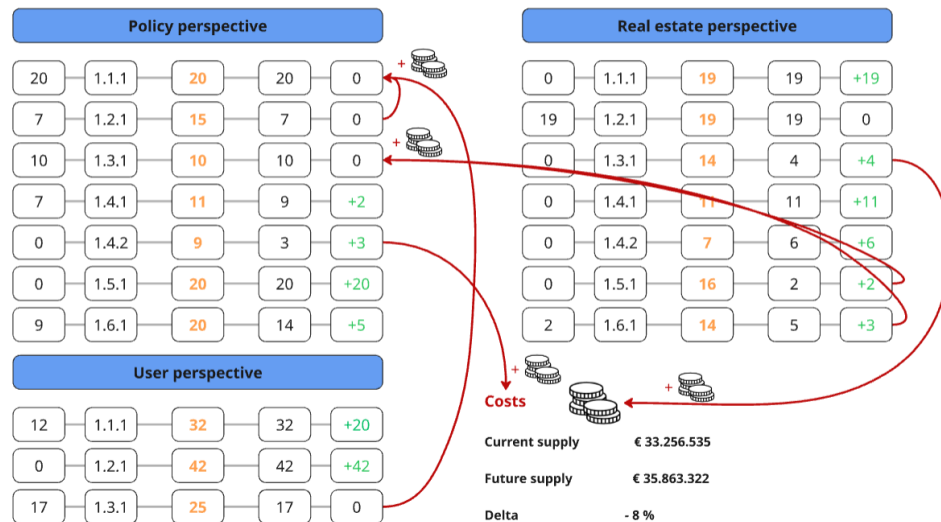


Figure 8.1 The output of the decision variables in Workshop II is where the most value can be added

The orange number in the figure highlights the potential added value of a variable. The decision variables that could have added the most value were reducing the commute time (1.2.1 – 3.2.1), increasing the energy labels (1.4.2 – 3.3.1), reducing the maintenance costs (3.5.1) and increasing the security standards (3.6.1) of the building. Most of the variables increase the costs even more, and to reduce the commute time, some office buildings should have been fully disposed of, which contradicts the decision variable of keeping the office locations (1.1.1). The only intervention that could theoretically contribute to a higher final score was the addition of a rental property, aimed at remaining within financial constraints. However, this option was not further explored by the stakeholders, as it was applied in a rather simplistic manner, with minimal consideration given to the type or location of the building. There was no investigation into the market for free options. Also, during the interviews, the new proposed integrated office types were discussed for each location, but the stakeholders did not specify a building that could be used for this purpose, either within or outside the police’s portfolio. Moreover, due to time constraints, with only about a week between the workshops, it was not feasible to investigate new office options on the market. As a result, the integrated building options were not considered beneficial, as they did not reflect a realistic situation.

Although the decision variables regarding the reduction of square metres had already been achieved (1.5.1 / 2.2.1), there still appeared to be room for improvement according to initial talks with the project leader of the PAS method before conducting the research (Bovy, personal communication, 2025). There were high ambitions to seek solutions to combine offices into one central location, but they were not investigated by the stakeholders. According to a policy decision variable, the locations of the offices could not be changed (1.1.1), as they should remain, as outlined in the organisation’s policy goals. This

variable could only have been removed if the stakeholders had not shared this goal during the workshop; however, this was not discussed.

Moreover, in workshop I, the stakeholders were more motivated to design according to the projected future demand of office space if it was calculated correctly. The decision variables related to the reduction percentage of the design portfolio in the workshop also appeared to influence this motivation. When this variable is properly aligned with the organisation's ambition to reduce the portfolio size, it can lead to an improvement in the overall preference score. In this research, a general reduction target was formulated by the organisation, but it does not necessarily need to align with each specific integrated office portfolio. Therefore, it is important to assess this value individually for each portfolio within the PAS method.

References

- Arkesteijn, M. H. (2019). Corporate Real Estate alignment: A preference-based design and decision approach [Doctoral dissertation, Delft University of Technology]. TU Delft Repository. <https://doi.org/10.7480/abe.2019.12>
- Den Heijer, A. (2011). Managing the university campus- Information to support real estate decisions. Delft: Eburon Academic Publishers.

References list from Netherlands Police

- Politie. (2023). Jaarverantwoording 2023 (pp. 2 164). <https://www.politie.nl/binaries/content/assets/politie/nieuws/2024/mei/jaarverantwoording-politie-2023.pdf>
 - d. Projectteam Anders Werken (2022, July). Anders Werken – een nieuwe balans. Politie Nederland
 - e. Projectteam Anders Werken (2022, September). Handboek Anders Werken in projecten. Politie Nederland
 - f. Projectteam Anders Werken (2022, August). Ruimtenormering. Politie Nederland
- Directie Facility Management (2023, August). Huisvestigingsvisie. Politie Nederland
- c. Directie FM en sector Huisvestiging (2023, October). Streefportefeuille & Vastgoedstrategie. Politie Nederland
 - d. Directie FM en sector Huisvestiging (2023, October). Kaders & Spelregels. Politie Nederland

APPENDIX F

Extra analysis for data in the decision-making model of the Preference-based Accommodation Strategy design and decision approach



Application: Preference-based Accommodation Strategy design and decision approach (Arkesteijn, 2019)

Portfolio: PDC Office Portfolio of the Netherlands Police

Facilitator: M.F.A (Martijn) Eversdijk

Period: February 2025 – May 2025

Contents

1. Introduction 157

2. Context..... 157

3. Analytic steps 158

4. Data..... 159

References 160

3. Analytic steps

Example of an extraction of the decision variable for the office-specific information:

Step 1: Delete all the answers of the employee groups

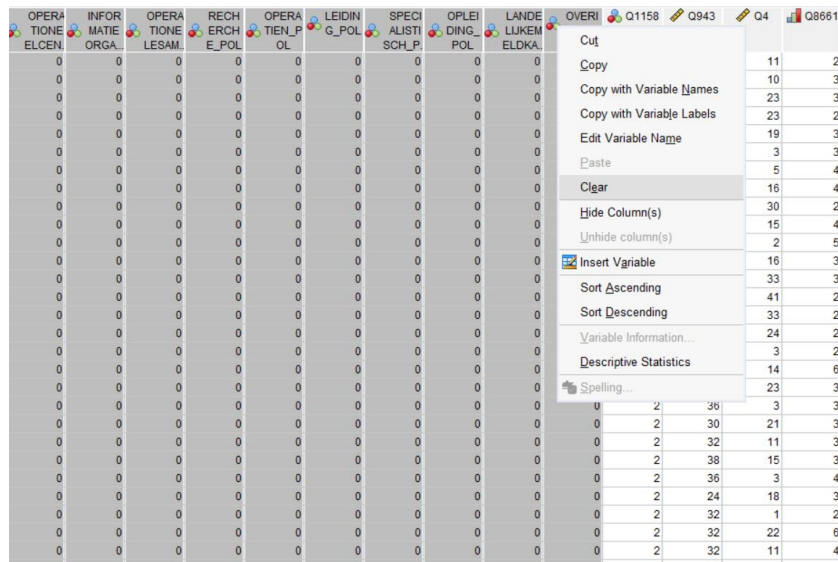


Figure 3.15 Screenshot of process step 1

Step 2: Identify the survey question in the file

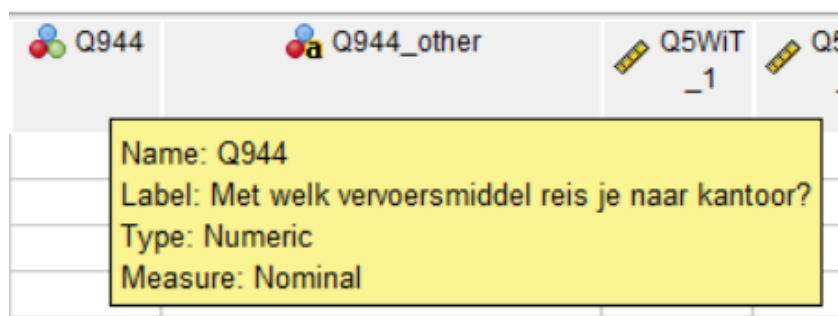


Figure 3.16 Screenshot of process step 2

Step 3: Extract the outcome of the answer

Criteria	The Netherlands Police	Office Employees
Walking	1%	1%
Bike	11%	9%
Electric bike	4%	4%
Scooter	1%	1%
Car	55%	54%
Public Transport	22%	24%
Others	5%	8%

Next Question and repeat step 3

4. Data

Extraction of the variables for the office-specific analysis in the Demand model

<i>Input variables Demand model</i>	<i>The Netherlands Police</i>	<i>Office Employees</i>
Share ratio:		
- <i>Number of days employees work in a week (α)</i>	3.53	2.58
- <i>Desk occupancy rate* (n)</i>		38.2%
ABW implementation		
- <i>Activity profile (e.g. planned meeting)</i>	14.4%	19.0%
- <i>Meeting profile (e.g. meeting with 3-4 people)</i>	22.7%	24.0%

* This was already specified to the office group because of cluster analysis (CfPB,2023)

References

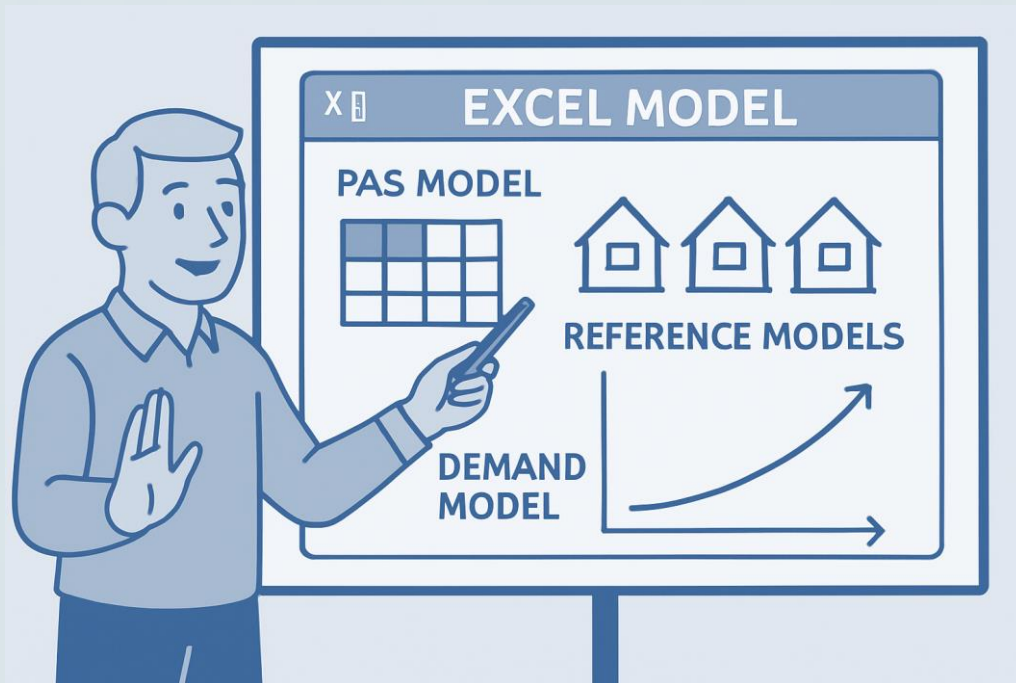
Arkesteijn, M. H. (2019). Corporate Real Estate alignment: A preference-based design and decision approach [Doctoral dissertation, Delft University of Technology]. TU Delft Repository. <https://doi.org/10.7480/abe.2019.12>

References list from Center for People and Buildings

- c. Center for People and Buildings, Eindhoven University of Technology, & Delft University of Technology. (2023, October). *Werk in Transitie: Monitor rapportage – Politie* (General Monitoring Report).
 - d. Center for People and Buildings, Eindhoven University of Technology, & Delft University of Technology. (2023, December). *Werk in Transitie: Interne benchmark – Politie* (Internal Benchmark Report).
 - e. Houtveen, S., Hoekstra, B., & La Brijn, D. (2024, December). *Werk in Transitie: Verdiepende analyse kantoorwerkomgeving – Politie* (In-depth Analysis of the Office Work Environment).
- Center for People and Buildings. (2025). *Survey results from Werk in Transitie: Monitor Rapportage – Politie (CfPB, 2023a)*. Unpublished dataset. Retrieved through personal communication (21-03-2025)

APPENDIX G

The Hybrid Office Portfolio Optimisation – PAS model



Application: Preference-based Accommodation Strategy design and decision approach (Arkesteijn, 2019)

Portfolio: PDC Office Portfolio of the Netherlands Police

Facilitator: M.F.A (Martijn) Eversdijk

Period: February 2025 – May 2025

Due to confidential information, the full model is not shared in the main report but is provided as a separate document.

The worksheets of the Excel model:

Models:	Sheet:	Explanation
PAS model	Dashboard	Sheet for the workshops
	Prefs	The decision variables
	Obj_db	Interventions calculations
	Obj_h	Current situation
	Obj_i...	Intervention sheets
	Obj_k	Costs
	Obj_t	Future design of the workshop
Reference models	Pref_lit	(1) Hybrid Working Trends
	Pref_CfPB	(2) Knowledge Workers
	Pref_Org	(3) Policy Accommodation
Demand model	Overzicht ruimtebehoefte	The demand model general
	Office	Application of the pilot study

Appendix H: Data Management Plan

Plan Overview

A Data Management Plan created using DMPonline

Title: Graduation Thesis: Strategic Optimisation of Office Portfolio for Hybrid Working

Creator: Martijn Eversdijk

Affiliation: Delft University of Technology

Funder: Delft University of Technology

Template: TU Delft Data Management Plan template (2021)

Project abstract:

The increasing adoption of hybrid working models has significantly impacted workplace dynamics, compelling organisations to reassess their corporate real estate strategies. While existing literature highlights the potential of hybrid working to optimise office portfolios, there is limited research on effective methods to achieve this optimisation. This study addresses this gap by developing a transparent decision-making model by integrating three established research instruments. The research focuses on the Netherlands Police, aiming to align their real estate portfolio with evolving workplace demands while ensuring operational efficiency, sustainability, and cost-effectiveness.

The central research question guiding this study is: *How can a transparent decision-making model optimise a corporate real estate portfolio in the Netherlands in response to the increasing demand for hybrid working?* To answer this, four sub-questions explore the needs of employees, organisational goals, future spatial requirements, and the identification of an optimised portfolio design.

A mixed-methods approach is adopted, combining document analysis, quantitative modelling, and qualitative methods such as semi-structured interviews and workshops. Data from surveys conducted by the Centre for People and Buildings, organisational documents, and spatial modelling techniques are integrated within the Preference-Based Accommodation Strategy (PAS) framework. The final phase involves scenario simulations and expert validation to refine the decision-making model.

The research outputs include a validated decision-making model, strategic recommendations for portfolio optimisation, and comprehensive insights into the intersection of hybrid working and real estate management. This study offers practical solutions for the Netherlands Police and contributes to the broader discourse on CRE management in the context of hybrid working.

ID: 165183

Start date: 03-02-2025

End date: 27-06-2025

Last modified: 13-03-2025

0. Administrative questions

1. Name of data management support staff consulted during the preparation of this plan.

The DMP has been shared with my thesis supervisor Monique Arkesteijn via DMPonline, and reviewed by them on 26-12-2024

My faculty data steward, Janine Strandberg, has reviewed this DMP on 04-02-2025 My faculty data steward, Janine Strandberg, has reviewed this DMP on 14-02-2025

2. Date of consultation with support staff.

2024-12-26

1. Data description and collection or re-use of existing data

3. Provide a general description of the type of data you will be working with, including any re-used data:

Type of data	File format(s)	How will data be collected (for re-used data: source and terms of use)?	Purpose of processing	Storage location	Who will have access to the data
Existing Anonymous survey data from Center for People and Building (2023) on perceptions of hybrid working preferences from employees	.pdf file	Collected via a digital survey conducted by the Centre for People and Buildings (CfPB), targeting employees of the Netherlands Police under the "Werk in Transitie" programme. The survey is distributed using an anonymous link, with IP tracking disabled.	Capturing the perceptions on hybrid working preferences, workspace satisfaction and organisational support for integrating into decision-making model of portfolio optimisation.	TU Delft OneDrive	Master student, Martijn Eversdijk and supervisors Monique Arkesteijn & Vitalija Danivska

Anonymised data on organisation vision/mission/goal of hybrid working	.pdf file	Internal documents and policies from the Netherlands Police. Documents are accessed under internal organisational permissions and terms of use.	Capturing the perceptions on hybrid working preferences, workspace satisfaction to understand strategies and (policy) management for integrating into the model	TU Delft OneDrive	Same as above
Data set of the portfolio (buildings) from the Netherlands Police	.xlsx	Provided by the Netherlands Police under agreed terms of use.	The data will be used to analyse the impact of hybrid working on the Police's real estate portfolio and to develop strategies for optimising portfolio management in response to changing workplace demands.	TU Delft OneDrive	Same as above
Personally Identifiable Information (PII): participants' name, email, work address, company name, mobile number	.pdf, .xlsx	Contact information for participants taking part in interviews and workshop, received from professional network. Informed consent forms are signed digitally and contain participants' name + email.	For administrative purposes: obtaining informed consent and communicating with participants.	TU Delft OneDrive	Same as above
Audio-recordings of interviews and workshop with real estate managers of the Police	.mp3	Interviews and workshop with experts are conducted during on-site visits to validate the input factors of the model and to select the best portfolio alternative. Audio-recordings are made on an external device, before being moved to OneDrive. Recordings are deleted after transcription	Capturing the opinions on hybrid working related to real estate portfolio management from participants (experts on portfolio management within the Netherlands Police).	External recording device (temporary storage) + TU Delft OneDrive	Same as above

Anonymous transcriptions of interviews and workshop	.txt	Anonymous transcriptions created manually based on audio-recordings. Participants are asked to review the transcriptions of their interview before the transcript is finalised.	Privacy-preserving data on opinions on policy or any other confidential information about the organisation from participants (Police)	TU Delft OneDrive	Same as above
---	------	---	---	-------------------	---------------

4. How much data storage will you require during the project lifetime?

- < 250 GB

II. Documentation and data quality

5. What documentation will accompany data?

- Other - explain below
- Methodology of data collection

The dataset will not be shared in a data repository, but the methodology of data collection will be explained in the MSc thesis, which is made available in the TU Delft Education repository.

III. Storage and backup during research process

6. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?

- OneDrive

OneDrive: Primary research data storage. Only TU Delft team members (Master student and supervisors) have access. Interview and workshop data will be stored in separate folders, and within the interview folder, there are separate folders for audio-recordings and anonymous transcriptions. Informed consent forms and contact information are encrypted separately from research data to minimise risk of re-identification.

External recording device: Used as a temporary storage location for recorded on-site interviews. Interviews will be deleted from device as soon as they are moved to OneDrive.

IV. Legal and ethical requirements, codes of conduct

7. Does your research involve human subjects or 3rd party datasets collected from human participants?

- Yes

8A. Will you work with personal data? (information about an identified or identifiable natural person)

If you are not sure which option to select, first ask your [Faculty Data Steward](#) for advice. You can also check with the [privacy website](#) . If you would like to contact the privacy team: privacy-tud@tudelft.nl, please bring your DMP.

- Yes

The research data collected in the project will be anonymised, but processing of personal data is required for conducting the research project.

Third-party data from CfPB will be received already anonymised.

8B. Will you work with any other types of confidential or classified data or code as listed below? (tick all that apply)

If you are not sure which option to select, ask your [Faculty Data Steward](#) for advice.

- Yes, politically-sensitive data (e.g. research commissioned by public authorities, research in social issues)
- Yes, confidential data received from commercial, or other external partners

Confidential real estate portfolio data provided by the Netherlands Police. This dataset includes sensitive information about property locations, occupancy rates, and building usage, which, if disclosed, could impact operational security and strategic planning. Access to this data will be restricted, and it will be handled following confidentiality agreements.

Since the research involves the Netherlands Police, a public authority, the data and findings may touch on politically sensitive issues related to public sector resource management, security, and workplace policies in the context of hybrid working. Care will be taken to ensure that the data is anonymised, and any sensitive insights will be shared only in line with agreed protocols.

9. How will ownership of the data and intellectual property rights to the data be managed?

For projects involving commercially-sensitive research or research involving third parties, seek advice of your [Faculty Contract Manager](#) when answering this question. If this is not the case, you can use the example below.

The student conducts the research independently and retains ownership of the interviews and workshops. Anonymised data from these interviews and workshops will be included in the appendix of the MSc thesis, which will be made publicly accessible in the TU Delft Education Repository. However, the real estate portfolio data provided by the Netherlands Police remains their property, and any use or publication of this data will be subject to the terms outlined in a confidentiality agreement established before the project began.

Third-party data from CfpB is available under restricted access, and cannot be distributed without express permission from the rights holder.

The examination committee has **approved the internship agreement provided by the police**, as they are the research collaboration partner. While the police have not signed the formal TU Delft contract, their own signed agreement is accepted as an exception (Examencommissie, Julia Lintelo, 18-02-2025)

10. Which personal data will you process? Tick all that apply

- Other types of personal data - please explain below
- Data collected in Informed Consent form (names and email addresses)
- Signed consent forms
- Gender, date of birth and/or age
- Names and addresses

Personally Identifiable Information (PII): interviewee name, work address, company name, email address, and mobile phone number are processed for administrative reasons (to obtain informed consent and communicate with participants)

Personally Identifiable Research Data (PIRD): Personal research data processed for interview participants:

- audio-recordings
- professional opinion on Hybrid working related to portfolio management of the Netherlands Police
- Occupation: Real Estate Manager
- Years of experience: e.g. under 1, 1-4, 5-10, more than 10.

Participant data for interviewees is anonymised when recordings are transcribed.

The existing survey data from CfpB is received in anonymised form and does not contain personal data.

11. Please list the categories of data subjects

The interview participants are experts in real estate and portfolio management who work for the Netherlands Police.

12. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

I 5. What is the legal ground for personal data processing?

- Informed consent

I 6. Please describe the informed consent procedure you will follow:

All interview participants will be asked for their written consent for taking part in the study and for data processing before the start of the interview. Interviewees will also be allowed to review the anonymous transcriptions from their interviews before they are finalised and used for analysis.

I 7. Where will you store the signed consent forms?

- Same storage solutions as explained in question 6

I 8. Does the processing of the personal data result in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform a [Data Protection Impact Assessment \(DPIA\)](#). In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).

If two or more of the options listed below apply, you will have to [complete the DPIA](#). Please get in touch with the privacy team: privacy-tud@tudelft.nl to receive support with DPIA.

If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to get advice as to whether DPIA is necessary.

If you have any additional comments, please add them in the box below.

- None of the above applies

22. What will happen with personal research data after the end of the research project?

- Personal research data will be destroyed after the end of the research project

- Anonymised or aggregated data will be shared with others

The anonymised research data consists of anonymised interview transcripts, anonymised workshop transcripts. These data will be used in the body of the thesis and included the appendix, but will not be shared in a data repository.

Audio-recordings of interviews are destroyed after completion of anonymised interview transcriptions.

All other personal research data will be destroyed at the latest 1 month after the end of the project.

Third-party data from CfPB is available under restricted access, and cannot be distributed without express permission from the rights holder.

V. Data sharing and long-term preservation

27. Apart from personal data mentioned in question 22, will any other data be publicly shared?

- Not all non-personal data can be publicly shared - please explain below which data and why cannot be publicly shared

The organisational the police documents and the conducted survey at the organisation from CfPB are not publicly available

29. How will you share research data (and code), including the one mentioned in question 22?

- My data will be shared in a different way - please explain below

Anonymised data collected during the project will be included in the body and appendix of the MSc thesis, made available in the TU Delft Educational repository.

The organisational data is not shared in a data repository.

30. How much of your data will be shared in a research data repository?

- < 100 GB

31. When will the data (or code) be shared?

- At the end of the research project

The thesis is made available in the TU Delft Education repository at the end of the graduation project.

Research data are only shared within the thesis

32. Under what licence will be the data/code released?

- Other - Please explain

Research data are only shared within the MSc thesis, which is automatically placed under copyright in the Education repository

VI. Data management responsibilities and resources

33. Is TU Delft the lead institution for this project?

- Yes, leading the collaboration - please provide details of the type of collaboration and the involved parties below

While TU Delft is the primary institution involved, the Dutch Police are a collaborating partner providing data for the research and will have access to relevant findings.

The examination committee has **approved the internship agreement provided by the police**, as they are the research collaboration partner. While the police have not signed the formal TU Delft contract, their own signed agreement is accepted as an exception (Examencommissie, Julia Lintelo, 18-02-2025)

34. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

The first supervisor of the project Monique Arkesteijn (m.h.arkesteijn@tudelft.nl) Management in the Built Environment (MBE) TU Delft.

35. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

Research data are only shared within the MSc thesis: no additional resources are required.

Appendix I: HREC Approval

Date 24-Apr-2025
Correspondence hrec@tudelft.nl



Human Research Ethics
Committee TU Delft
(<http://hrec.tudelft.nl>)

Visiting address
Jaffalaan 5 (building 31)
2628 BX Delft

Postal address
P.O. Box 5015 2600 GA Delft
The Netherlands

Ethics Approval Application: Strategic Optimisation of Office Portfolio for Hybrid Working
Applicant: Eversdijk, Martijn

Dear Martijn Eversdijk,

It is a pleasure to inform you that your application mentioned above has been approved.

Thank you very much for your submission to the HREC. Your submission has been conditionally approved. Please remember that this approval is conditional on ensuring the following conditions are met. 1. We strongly urge you to offer a transcript review to the participants.

In addition to any specific conditions or notes, the HREC provides the following standard advice to all applicants:

- In light of recent tax changes, we advise you to confirm any proposed remuneration of research subjects with your faculty contract manager before proceeding.
- Please make sure when you carry out your research that you confirm contemporary COVID protocols with your faculty HSE advisor and that ongoing COVID risks and precautions are flagged in the informed consent, with particular attention to this where there are physically vulnerable (e.g., elderly or with underlying conditions) participants involved.
- Our default advice is not to publish transcripts or transcript summaries but to retain these privately for specific purposes/checking, and if they are to be made public, then only if fully anonymised and the transcript/summary itself approved by participants for a specific purpose.
- Where there are collaborating (including funding) partners, appropriate formal agreements, including clarity on responsibilities, including data ownership, responsibilities and access, should be in place, and relevant aspects of such agreements (such as access to raw or other data) are clear in the Informed Consent. Please update the ICF to communicate to the participants that transcripts will be shared for review.

Good luck with your research!

Sincerely,

Dr. C. Shelley-Egan
Chair HREC
Faculty of Technology, Policy and Management