

# 1 Introduction

---



FIG. 1.1 Faculty of Architecture and the Built Environment building (corporate real estate) © Rob 't Hart Fotografie

## Corporate Real Estate

Corporate real estate is real estate that is necessary for an organization to conduct its business. CRE can be owned or leased space and is different than commercial real estate. CoreNet Global (2015) describes that in commercial real estate, real estate is core business, and the goal is to provide a risk adjusted return to the investor; whereas, in corporate real estate, real estate supports the business function. Corporate real estate represents the demand side or user side of real estate, while commercial real estate focuses on the supply side to meet that demand.

### CRE function lacks tools to deliver the most business impact

Sharp (2013) concluded based on 636 survey responses that CRE teams face barriers to meet present challenges. The barriers are “C-suite resistance to capital expenditure; the sometimes small and fragmented structure of the CRE function; inadequate access to deep data and analytics to measure value; and a fundamental skill and knowledge gap within CRE teams ... . Furthermore, many CRE departments lack the tools and training to effectively identify, shape and execute the broader business strategies that would ultimately deliver the most business impact. Only 28 percent regard themselves as ‘well equipped’ to meet the various tactical and strategic demands now being placed upon them” (Sharp, 2013, pp. 232-233).

What if CRE departments were better equipped

... with an approach that enables them to choose the best CRE strategy and portfolio design that adds most value to all stakeholders in the organization?

# 1 Introduction

---

## **Corporate real estate management and CRE alignment**

One of the long-standing issues in the field of Corporate Real Estate Management (CREM) is the alignment of an organization's real estate to its corporate strategy. CRE alignment is even defined by some as the *raison d'être* of CREM, as the range of activities undertaken to attune corporate real estate optimally to corporate performance (Krumm, Dewulf, & De Jonge, 2000, p. 32). Aligning all of an organization's cost and value creation activities (including CREM) is important in achieving enterprise-wide value (Kaplan & Norton, 2006). This makes alignment a core technology in CREM. Alignment is often used in CREM, but in chapter 2, it becomes clear that alignment is often not defined and more complex than assumed. Even though extensive research into existing CRE alignment models has provided us with valuable insights into the steps, components, relationships and variables that are needed in the alignment process, these models still fall short in two ways. Most models pay little to no attention to the design and selection of a new portfolio that adds the most value to the organization.

## **Stakeholder and shareholder perspective in CRE alignment**

In CRE alignment, the models' authors generally use either the *shareholder* or the *stakeholder* approach as will become clear in chapter 2. In the shareholder approach firm value is maximized and in the stakeholders approach managers make decisions that take into account all the stakeholders of the firm. Both approaches received criticism in the past. Kaplan and Norton, amongst others, state that the shareholder approach with purely financial measures of performance are not sufficient to yield effective management decision. Jensen (2010) criticizes the stakeholder approach and states that managers in an organization need to define what is better and what is worse which forms the basis of making decisions. Therefore, Jensen (2010) argues that a single-valued objective function is a needed for purposeful behavior by any organization, which the stakeholder approach lacks.

In Jensen's view, putting the shareholder and stakeholder approach in opposite positions, is not correct because both are of a different nature and complementary. In fact, Jensen (2010, p. 33) states "... whether firms should maximize value or not, we must separate two distinct issues;

- 1 Should the firm [organization] have a single-valued objective?;
- 2 And, if so, should that objective be value maximization or something else ...?"

I agree with Jensen's view that on the one hand the shareholder and stakeholder approach are complementary and on the other hand that one objective function is needed in corporate real estate, if one, indisputably, wants to measure the added value of that real estate. However, I agree with Kaplan and Norton that firm value, or any other financial measure, is unsuitable. A first objection is that a financial measure as the one objective function is not suitable in architecture and the CREM domain, because values of buildings (and thus qualities) fall in two general categories. These categories often interrelate and overlap in practice as explained by Volker (2010, p. 17):

- “Technical, physical, hard, functional, objective or tangible qualities;
- Perceptual, soft, subjective, judgmental or intangible values”.

These intangibles are vital to CREM. If these values are treated separately, the restriction is that one effect can be more difficult to quantify / monetarize than the other effect, as shown by Mouter (2012) when he discussed the disadvantages of the social cost-benefit analysis in practice. This means, as he explains, that effects are presented in an unbalanced manner. "If you take one set of quantifiable impacts and one set of non-quantifiable impacts in an appraisal, one set will dominate" (Mishan, in Mouter, 2012, p. 10).

A second and fundamental objection towards any monetary measure is that price is not a property of a physical object (Barzilai, 2015, 2016). Barzilai (2015) shows that theory can be simplified and he uses an example of buying goods at the market "As is well known, the value of money is different from money. Both Marshall's and Hicks's theories (and the intermediate ones as well) take into account consumers' preferences for tomatoes and cucumbers but ignore their preference for money. This is an elementary error in current economic theory". He further explains that "when consumers buy tomatoes and cucumbers they exchange money for goods. They must- and they do – take into account their preference for money in addition to their preference for the goods. Contradictions are avoided and the theory is simplified when this transaction is viewed as (i) an exchange of goods, (ii) with money being one of the goods, and (iii) preference for all goods is taken into account".

Most CRE alignment models pay little to no attention to the design and selection of a new portfolio that adds the most value to the organization. Even though, some CRE alignment models use a financial overall performance measure, it can be concluded that none of the models has an overall performance measure that incorporates

both quantitative and qualitative criteria. If qualitative criteria are incorporated in a performance measure often ordinal scales are used. In ordinal systems, however, only order is defined. Barzilai (2010, p. 62) states that “addition and multiplication are not applicable on ordinal scale values“ and that correct measurement is needed to enable these mathematical operations. None of the current alignment models uses correct measurement.

**The aim of this research** is to enhance CRE alignment by improving CRE decision making in such a way that corporate real estate managers are able to determine the added value of a particular corporate real estate strategy quickly and iteratively design many alternative real estate portfolios.

In order to overcome the restrictions of the shareholder and the stakeholder approach, in this thesis one single-valued objective is used which includes all of the abovementioned value categorizations. The solution to this problem is found in preference measurement which is the foundation of decision theory. Preference is synonymous to choice, as we choose those objects that we prefer. Barzilai (2010, p. 57) states that “The mathematical foundations of social science disciplines, including economic theory, require the application of mathematical operations to *non-physical variables*, i.e. to variables such as *preference* describe psychological or subjective properties”. From a mathematical point of view, this means that the abovementioned or other value categorizations in CRE alignment are unnecessary; only *physical* and *non-physical* properties need to be distinguished.

To use correct measurement and therewith to enable the application of mathematical operations to *non-physical* properties such as preference, Barzilai (2010) developed a theory of (preference) measurement theory as well as a practical evaluation methodology for constructing proper preference scales, Preference Function Modeling (PFM).

### **Using one overall performance measure in CRE alignment: value is preference**

Preference as overall performance measure is able to include all value categorizations. In this thesis, following Barzilai, all physical properties are translated into non-physical properties (i.e. preference), including the preference for receiving and spending money, and aggregated into one overall preference score. By doing so, the restrictions as formulated by Barzilai (2015, 2016) and Mouter (2012) are avoided.

## **A design and decision approach towards CRE alignment**

Using preference as overall performance measure enables the selection of a new CRE portfolio that adds the most value to the organization. However, Barzilai's PFM evaluation tool evaluates existing alternatives. Therefore, Binnekamp (2010) developed a design and decision methodology which is based on PFM. This methodology is called Preference-Based Design (PBD) and enables decision makers to design alternatives when the alternatives are not known beforehand and subsequently select the best. This PBD methodology has been successfully applied to cases at a building and area level, but, as of now, has not been applied at a portfolio level. It is necessary to convert the PBD procedure in two ways in order to use it on portfolio level. Next to that, the PBD procedure is not yet thoroughly tested in real life situations.

### **Originality**

The originality of this research is to (1) define value as technically equivalent to preference and (2) use a design and decision approach for the alignment problem. By adjusting and expanding the Preference-Based Design procedure, as particular technique from design and decision systems, and testing it in real life situations on CRE portfolio level. This new approach is called the Preference-based Accommodation Strategy design and decision approach (PAS). PAS is a design methodology and decision support tool to remedy the identified shortcomings and thereby enhance CRE alignment.

### **Research question**

How can the Preference-based Accommodation Strategy design and decision approach successfully be developed and tested on corporate real estate portfolio level in order to enhance CRE alignment?

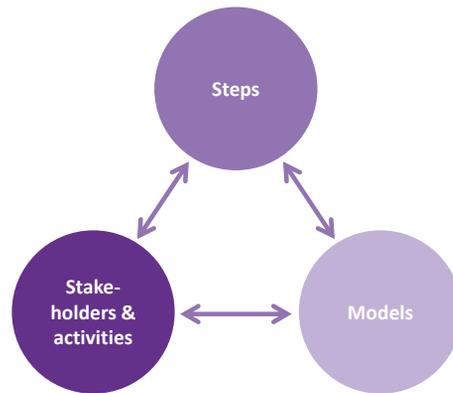
### **Research methods**

PAS was developed and tested in accordance with the five stages of an operations research project. Operations Research is a discipline that focuses on the application of analytical methods to aid decision making and solve organizational problems. The five stages (Ackoff & Sasinieni, 1968, p. 11) are:

- 1 "Formulating the problem;
- 2 Constructing the model;
- 3 Deriving a solution;
- 4 Testing the model and evaluating the solution;
- 5 Implementing and maintaining the solution".

PAS will be tested in three pilot studies because it can be argued that the application of real estate strategy design methods in practice is context-dependent. The results of using the same design method three times can be different depending on the people involved in the process, the roles and responsibilities of these people within the organization, the characteristics of the portfolio / the type of space it is applied to, etc. Applying the design method to multiple context-dependent cases yields more valuable results than just applying it to one case. PAS is considered successful if (1) the participants are able to complete each step of the procedure and (2) if the stakeholders evaluate it positively.

The PAS design and decision method is structured around three components: steps, stakeholders & activities and mathematical model(s) as will be explained in chapter 3 and as is shown in [Figure 1.2](#).



**FIG. 1.2** Three components of PAS with each a different shade of purple Note adapted from Arkesteijn et al., 2017, p. 245

The development of PAS has been done in four main phases with a different focus in each of them ([Figure 1.3](#)). Whereas the components are part of the PAS design and decision method, the development phases are not. In the first development phase, the focus is on the component PAS steps. The steps of Binnekamp's PBD procedure have been further developed and tested in a proof of concept. This was necessary to make the steps applicable on CRE portfolio level. The proof of concept has been done in 2011 on the data obtained from a preliminary study at the Development corporation of the municipality of Rotterdam.

In the second development phase, PAS has been further developed and all three components were tested in two real life pilots at the Delft University of Technology (TU Delft). The first pilot focused on the real estate portfolio of food facilities (2012) while the second (2013) focused on the lecture halls.

In the third development phase, the focus shifted to PAS's three equivalent components and the relationship between them.

In the fourth development phase, two optimization tools have been used in two pilots to complement PAS.

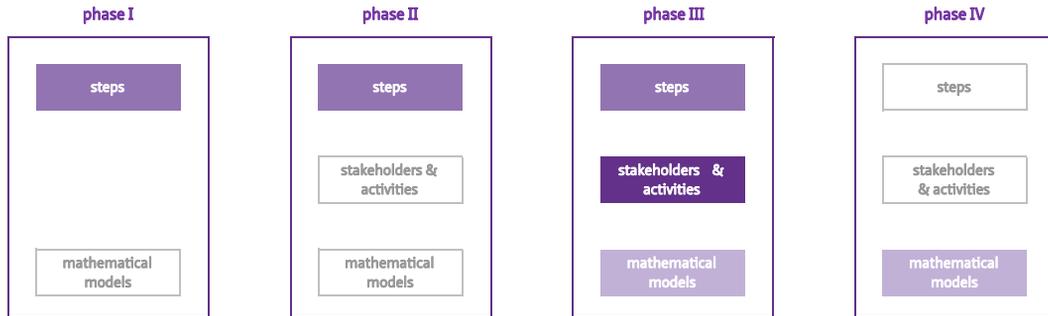


FIG. 1.3 PAS development phases and focus

## Readers guide

The purpose of this thesis is to construct and test a new PAS design and decision method, that consists of many components, like designing, valuing, deciding, selecting, and steering. This has resulted in many elements and components that are used to structure the thesis. The structure of this thesis is shown in [Figure 1.4](#) and can be used as a guide.

In chapter 2, the state of the art in CRE alignment modeling is discussed to set the context of this research. It will be shown that CRE alignment is complex and multidimensional. Thereafter, an assessment of CRE alignment models from a design and decision perspective is made to substantiate the scientific gap of this research.

Subsequently, the Preference-based Accommodation Strategy (PAS) design and decision approach (PAS) is **developed** (chapter 3 and 4), **tested** (chapter 5, 6, and 7) and **evaluated** (chapter 8) and **reflected upon** (chapter 9). In the last chapter, the conclusions and recommendations are given.

chapter 2	CRE alignment state of the art and scientific gap				
Preference-based Accommodation Strategy (PAS) design and decision approach					
Developing PAS		Testing PAS			Evaluating PAS
chapter 3	chapter 4	chapter 5	chapter 6	chapter 7	chapter 8
fifteen basic concepts and definitions from decision, design and management theory	2nd procedural rationality	steps			steps
	3rd structural rationality		stake- holders & activities		stake- holders & activities
	1st substan- tive ratio- nality			model	model
chapter 9	Reflecting upon PAS				
chapter 10	Conclusions and recommendations				

FIG. 1.4 Readers guide (Note this guide is repeated at each chapter)

### *Developing PAS*

In chapter 3, using fifteen basic concepts and definitions from management science, decision theory and design methodology, the methodological aspects, characteristics and features of PAS are outlined.

The two main concepts are Preference Function Modeling and Preference-Based Design methodology. By using these concepts past experience is incorporated in PAS for the formation of a corporate accommodation strategy.

Chapter 4 is about the development of PAS based on the fifteen components as described in chapter 3. PAS consists of three main components and is structured around them. In this chapter, each of the components; steps, stakeholders & activities, and mathematical models is discussed.

### *Testing PAS*

PAS is tested in three pilot studies to determine if the stakeholders are able to successfully perform PAS. All components of PAS were examined described successively in chapters 5, 6 and 7.

With regard to PAS steps, chapter 5 describes and substantiates that all pilot studies show that the stakeholders were able to perform each of the steps. The stakeholders were able to design an alternative CRE portfolio with a higher overall preference than in the current situation.

Chapter 6 further explains that the stakeholders involved in completing these steps need to perform two types of activities: interviews and workshops. Since designing alternatives in the workshops is a major component of the PAS, this design process and its interactive and iterative character is explained and illustrated. This chapter shows the interfaces that the stakeholders can use when designing alternatives including instruction on how to navigate the model.

Chapter 7 shows that the system engineers were able to build a mathematical model of the problem situation for all three pilots. In the model, the group of decision makers is able to design alternatives and use the design constraints to test the feasibility of these alternatives. Per pilot, the models' structure, the models' formulas and the optimization tool is described. In two pilots an alternative CRE portfolio has been generated with an optimization tool. In one pilot a brute force approach was used, and in another pilot a search algorithm. The aim is to generate a feasible alternative with a higher overall preference score.

### *Evaluating PAS*

In chapter 8, the evaluation of PAS is discussed. To determine if PAS is successful four types of assessments are used; firstly, the experiences of the stakeholders with PAS, secondly, whether the stakeholders find PAS attractive, thirdly the stakeholders' observations on effectiveness of PAS and fourthly the facilitators' perceptions of the effectiveness of PAS.

### *Reflection upon PAS as well as conclusions and recommendations*

In chapter 9, PAS is reflected upon. Whereas, PAS, initially was intended as add-on to other CRE alignment in this chapter PAS is also described as independent management system. In chapter 10, the conclusions and recommendations are presented.

Now that the structure of the thesis has been explained, it is good to realize that the thesis does not necessarily need to be read from the beginning to the end. The method has been developed in an iterative process, while the results have been presented in a linear way. For readers interested in the new PAS methodology, it is recommended to start with the PAS design and decision method in chapter 4. The readers that are interested in the practical application of the method should start with the chapter 5, 6, 7. For the readers who are interested in the underlying building blocks and definitions used in the design and decision method chapter 3 is important.

It is important to notice that this thesis is a monograph and not a paper-based thesis. However, the monograph is of a hybrid form because parts of this work have been published since 2012. Therefore, I will refer to larger parts of published text, because they are important to create understanding in this thesis, but need not to be rewritten because they already have been carefully formulated. The publications follow the logic of a pilot and this thesis is (mainly) structured around the PAS components.

## Visual readers guide

PAS is a design and decision method that can be used as add-on to existing CRE alignment management models. In this thesis, PAS is linked to the existing DAS frame because this CRE alignment model is developed in Delft and well-known in the FMRE pilot organization. Therefore it is used as visual guide.

### *DAS frame*

First of all, the Designing an Accommodation Strategy frame (DAS) frame (De Jonge et al., 2009) will be used (see [Figure 1.5](#)). It is used to compare different approaches to each other (in chapter 3) and to display results (in chapter 5). DAS is a cyclic and iterative process that moves along two axes, from demand to supply and from current to future and will be introduced in chapter 2.

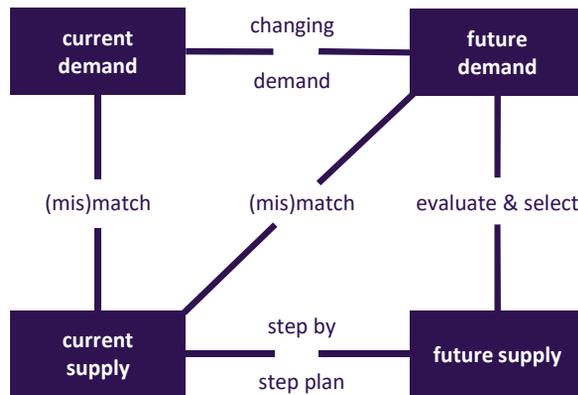


FIG. 1.5 Simplified DAS Frame  
Note adapted from De Jonge, et al., 2009, p. 36, Van der Zwart et al., 2009, p. 3. and Den Heijer, 2011, p. xv.

### Stakeholder perspectives

Secondly, four stakeholder perspectives that Den Heijer (2011) used in her thesis are used as visual guide. The perspectives are: policy makers, controllers, users and technical managers. Each of them is represented with its own icon and color as shown in **Figure 1.6**. These icons and colors will be used throughout the thesis to indicate to which perspective a certain stakeholder belongs to.

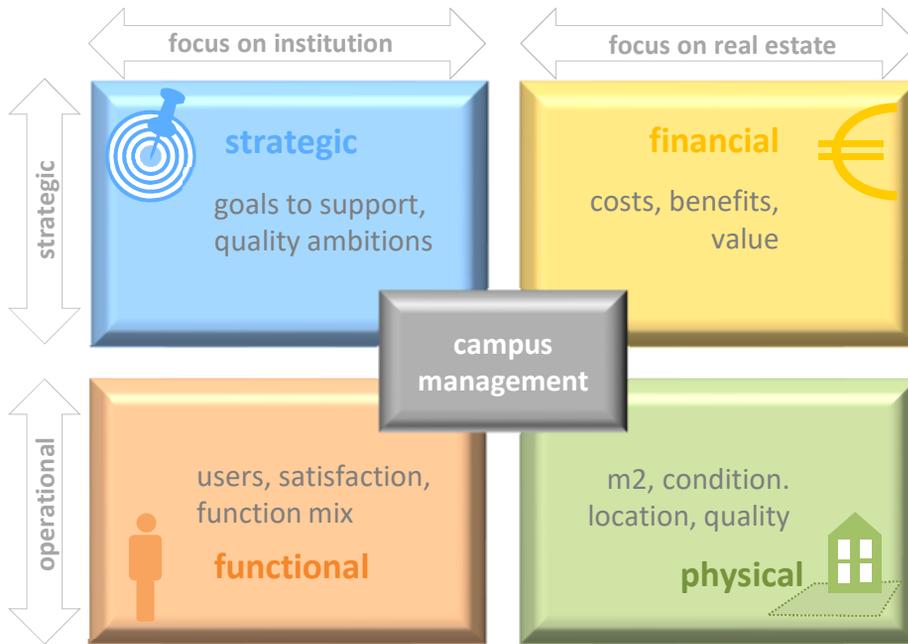


FIG. 1.6 Stakeholder perspectives Note from Den Heijer, 2011, p. xiv

In this thesis, the singular they is used as gender neutral form<sup>2</sup>, especially in paragraph 4.3.2

<sup>2</sup> [https://en.wikipedia.org/wiki/Singular\\_they](https://en.wikipedia.org/wiki/Singular_they)

