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Genesis and nature of the Delft CREM model

Delft CREM
model

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Abstract

Purpose – Since corporate real estate management (CREM) emerged in the 1990s, it has been modelled in many ways. The Delft model views the corporate real estate management function as a coordinator of four distinct accommodation perspectives. Although the model has been used in education and practice for years, there is no consensus on its interpretation and application, and various versions circulate. This paper aims to first reconstruct the history of the conceptualisation of the Delft CREM model and then seeks to develop an understanding of its nature that provides clearer interpretations of the model.

Design/methodology/approach – Because the developers of the Delft CREM model did not maintain archives, the reconstruction of the model's genesis is based on the developers' publications from 1985 to 2015 and eight semi-structured interviews conducted with these developers in 2017 and 2018. The collected information, which was by its very nature incomplete and imperfect, was triangulated, contextualised and assembled chronologically. This served as the basis for an analysis of the model's nature, which in turn generated a list of practical implications for its future application.

Findings – The historical reconstruction revealed two parallel but distinct lines of reasoning, whose resulting models appear similar but are distinct. One line of reasoning models CRE viewpoints, while the other models CRE management activities, i.e. the first line of reasoning models CREM across the organisation, while the second models CREM within the function. These two lines of thought have converged in the research-through-design approach of the developers, which evolved against the backdrop of a growing interest in the contribution of organisational resources to organisational objectives and the emergence of the demand-supply model in management practices in general and in the built environment in particular.

Research limitations/implications – The research is limited to reconstructing the genesis and analysing the nature of the Delft CREM model. It is not intended to provide a conclusive narrative, update the model or compare it to other CREM models. As is typical in oral history, it is based on imperfect documentary evidence and imperfect recollections. The reconstruction and analysis are stepping stones towards a more precise interpretation and application of the model in both research and practice, and may eventually contribute to its evolution. When using the model, it is recommended to (1) be clear about whether the model applies to the CREM department, the entire organisation or the organisation's environment; (2) be clear about what is being modelled (activities, viewpoints or something else); and (3) use labels that reflect the selections made in (1) and (2).

Originality/value – The value of this paper lies in the historical reconstruction of the intentions of the developers of the four-view scheme, including the detailed analysis of its consecutive graphical representations and the investigation of its relationship with the seminal strategic alignment model.

Keywords Corporate real estate, Corporate real estate management, Historical review, Strategic alignment model, Accommodation management, User requirements, Organisation model, Resource management

Paper type Conceptual paper



The authors would like to thank the interviewees: Hans De Jonge, Theo Van Der Voordt, Peter Krumm, Alexandra Den Heijer, Wim Pullen, Geert Dewulf, John Suyker and Frans Evers. The interviews were held in 2017 and 2018.

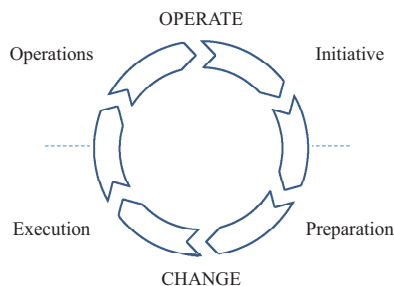
Introduction

The Faculty of Architecture at the Delft University of Technology (TU Delft) established a new department in 1991 to study and teach management practices in the built environment. This initiative was a response to a national and international demand to provide architects with a broader understanding of client and user factors, time and budget constraints and decision-making procedures (Van Wolferen and Verkenningcommissie Bouwkunde, 1989; Prins and Hobma, 2016, p. 64). The new department based its research and education on the life cycle of the built environment (Figure 1), as this matched well with the faculty's design approach. The operations phase in the life cycle model focused on "management of buildings in use" (Prins and Hobma, 2016, p. 64); it became the subject of the Real Estate Management course, which addressed the accommodation of (large) organisations, as housing management was already covered by the Housing department of the faculty. This decision necessitated the rapid development of corporate real estate management knowledge, making Delft a centre for the growth of the discipline.

In the early 1990s, corporate real estate (CRE) and its management were new disciplines. Weimer (1966) observed three decades earlier that accommodation decisions in organisations differed from other management decisions. Zeckhauser and Silverman (1983) initiated the (re)discovery of companies' real estate when they advocated for "a shift from facilities management to property management". They explain that the accommodation of an organisation is "more than its usefulness in supporting activities" (p. 117). The subsequent research initially centred on determining how corporate real estate was (under) managed within large organisations and arguing that it merited more consideration (Seiler, 1984; Curson, 1986; Bell, 1987; Bon, Joroff, and Veale, 1987; Veale, 1989). Early in the 1990s, the focus shifted to the position and role of CREM within organisations (Nourse, 1990; Roulac and Roberts, 1990; Nourse, 1992; Duckworth, 1993; Joroff *et al.*, 1993; Nourse and Roulac, 1993; Bon, 1995; Gibson, 1995).

TU Delft's new department joined this research initiative in the mid-1990s (De Jong *et al.*, 1994; De Jonge, 1994; Dewulf *et al.*, 1995; Krumm and Dewulf, 1995). Soon, the department came up with the four-view scheme (Figure 2), also called the Delft CREM model, to describe the position of the corporate real estate manager in the organisation (Krumm, 1999; Krumm *et al.*, 2000; Krumm, 2001). Peter Krumm, the first author of these publications, was the early PhD researcher of the department. In the four-view scheme, the corporate real estate management function is represented as a circle in the middle of and partially covering four squares, each embodying a different perspective on the accommodation.

Figure 1.
The life cycle model of the built environment, developed in the 1990s by the newly established department at TU Delft



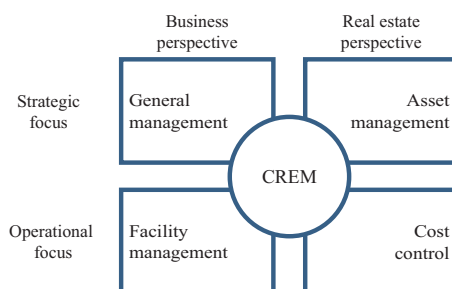
Source: De Jonge *et al.* (2004, p. 3) – translation by the authors

The model was used largely in the department as a tool to structure and understand stakeholders, fields of action, and many more aspects of the new domain. Twenty years after its inception, the model is still in use in the department's education and publications (Den Heijer, 2005; De Jonge *et al.*, 2009; Den Heijer, 2011; Hoendervanger *et al.*, 2012; Van der Zwart, 2014; Beckers *et al.*, 2015a; Curvelo Magdaniel, 2016; Dewulf, 2016; Alghamdi, 2018). The problem is that, despite this long use, the roots of the four-view scheme, its evolution and its application are not well documented, and its nature remains vague.

To better understand and interpret the four-view scheme, this paper clarifies its genesis and nature by historically reconstructing the model and its evolution, revealing how CRE and its management were seen in their early days and how they have evolved. As the developers of the model have not archived anything related to the design process of the model, the reconstruction is based on (1) publications from the developers and publications that mention the Delft CREM model between 1985 and 2015, and (2) eight semi-structured interviews set up with the co-authors and co-developers of the model in 2017–2018. We asked the interviewees about their background, when, how and with whom they had worked with the model, how they understood the different elements in the particular versions, how they planned the use of the model at that time, and we asked specific questions to clarify some details in the development of the model. The interviews lasted 90–120 minutes; they were recorded, transcribed and analysed. The eight interviewees are listed on the first page of this article and are introduced in the text when referred to.

The collected information, imperfect and incomplete by nature, was triangulated, contextualised and assembled chronologically. The publications allowed for the reconstruction of the main ideas; the semi-structured interviews with the relevant co-authors and co-developers filled in the gaps and explained the conceptual relations. This technique comes close to the oral history method that uses recorded interviews between a narrator and a well-informed interviewer together with other primary and secondary sources to gain an understanding of history without the intention of presenting a final narrative (Ritchie, 2012, p. 19; University Library of UC Santa Cruz, 2020). The historical reconstruction of the genesis formed the basis for the analysis of the nature of the model that we executed through internal consistency checks and the comparison of the developers' aims and outcomes as understood. Based on this analysis, we made recommendations for the future use of the Delft CREM model.

As tempting as it is, the research design does not aim to re-conceptualise (Edmondson and Mcmanus, 2007; Snyder, 2019) the model or CRE management, nor to compare it with other CREM models. The research is limited to understanding the genesis and nature of the



Source: Krumm *et al.* (2000)

Figure 2.
The Delft CREM model: CREM is considered the coordination of four perspectives on CREM, hence its name: “the four-view scheme”

Delft four-view scheme, which will support its more precise use and can become the basis for its further development.

The first part of the paper reconstructs the history and evolution of the model. This is followed in the second part by the analysis of its nature and suggestions on how to use the model for a clearer reading.

The predecessors of the model of Krumm *et al.* (2000)

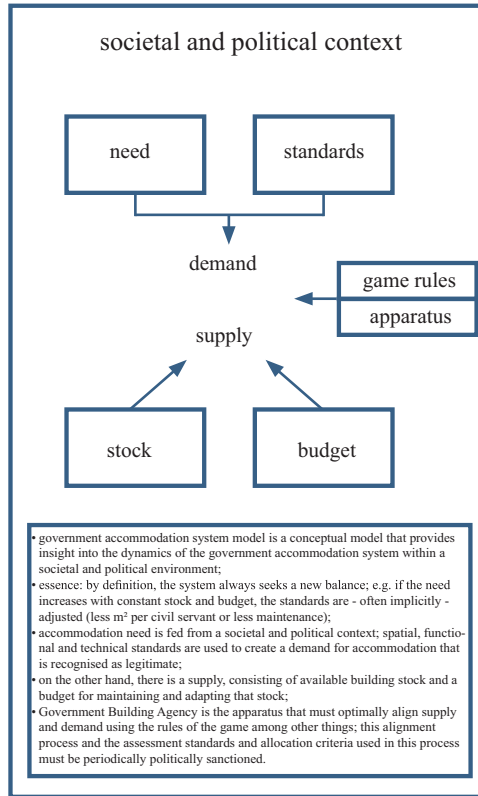
The origins of the four-view scheme of Krumm *et al.* (2000) lie at least as far back as the 1980s, when CREM was mostly non-existent and pioneers struggled to prove the relevance of their task. They wanted to define their organisational role and to develop the first management concepts that could describe their enterprise.

In management sciences at that time, the resource-based view of the firm had gained momentum (Penrose, 1959; Rubin, 1973; Wernerfelt, 1984) and the demand-supply paradigm had started to settle in organisation resource management (see, e.g. a DEGW presentation from 1985 that uses the demand-supply terminology (Worthington, 2016, p. 52)). The resource-based view considers a firm as a bundle of productive resources (Rumelt, 1984) such as human resources, information and communication technology (ICT), financial means, land, patents, knowledge, customer base, etc. through which this firm may obtain a competitive advantage (Wernerfelt, 1984). This prompted better management of the firm's resources and the development of resource-specific management models. In human resources, the Ulrich model aimed to shift the role of human resources from administration to strategy (Ulrich *et al.*, 1989). In ICT, the strategic alignment model targeted increased effectiveness of the investments (Henderson and Venkatraman, 1989). CREM could not stay behind.

The demand-supply paradigm, developed by the economist Alfred Marshall (1919), describes how price and quantity variations on demand and supply install market equilibrium for a particular good. His theory expanded to all scarce resource environments, including organisations. There the demand-supply paradigm charted organisation functions according to their interdependence. The dependent function was seen as the demander, and coordination and cooperation were seen as means to achieve the equilibrium between demander and supplier (Valentinov and Thompson, 2018).

Hans De Jonge, founder of the new department at TU Delft and co-author of the four-view scheme, explains in the interview that he was working at the Dutch Government Building Agency at the end of the 1980s when he noted a tension in its mission. There was a demanding user to be satisfied; there were rules to be followed, mainly financial ones; and there were the expectations of politicians to be met as well. But, these three were often in conflict. Together with his colleagues at the Agency, De Jonge wrote a policy document, called *Rijkshuisvesting* (government accommodation), which addressed the Agency's future position and *modus operandi*, and submitted it to the Dutch parliament (Tweede Kamer der Staten-Generaal, 1989).

This document presented a system model for the government's accommodation (Figure 3) that contained the basics of the four-view scheme developed a few years later at TU Delft. The model distinguished between an accommodation demand, an accommodation supply and an apparatus that aligned supply and demand according to certain rules. At the Dutch Government Building Agency at that time, the main tools for this alignment were standards such as the space usage per civil servant, along with the national budget. In addition, the model mentioned the societal and political context wherein the apparatus – this is the Government Building Agency – operates. This aspect would resurface in an update of the four-view scheme in 2011.



Source: Tweede Kamer der Staten-Generaal (1989, p. 5) – translation by the authors

Figure 3.
The system model of
the government
accommodation
("systeemmodel
rijkshuisvesting")

In 1995, Frans Evers, the director of the Government Building Agency, took this system model a step further. Evers was a guest lecturer at the new department in Delft, as was Michael Joroff, the CRE manager at the Massachusetts Institute of Technology (MIT). In the interview, Evers explains that Joroff invited him that year to co-teach a summer course on public real estate management at MIT, where he was joined later by Hans De Jonge. At this course, Evers presented a model that positioned the public real estate manager (PREM) in the middle of a triangle, as an agent amongst users, politicians and treasurers (Figure 4) (Evers *et al.*, 2002). By doing so, Evers introduced a distinction between the practical accommodation needs of the users and the abstract, long-term accommodation goals of the politicians. He published his lecture seven years later (Evers *et al.*, 2002), but his ideas had spread among his collaborators in Delft since his lecture in 1995.

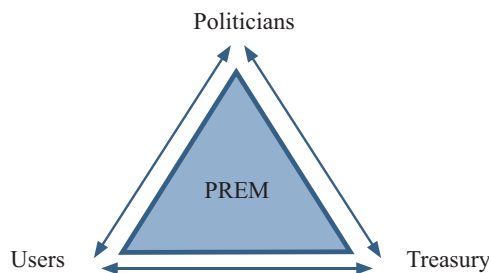
In 1996, John Suyker published a four-view scheme in a facility management handbook (Suyker, 1996). Suyker, a process engineer by training, was the CRE manager of Tandem Computers' European branch and the president of IDRC Europe, the International

Development Research Council that merged with Nacore in 2002 to form Corenet. Interviewees mention that, through this role, there has been a frequent contact since 1994 between Suyker and the CREM researchers at TU Delft, who shared a strong desire to advance the field. Similar to his predecessors, Suyker described the position of the CRE manager based on his personal experience. In the interview, he explains that during his first year at Tandem Computers, he needed an accommodation process model that could explain to executives what real estate and facility management were in charge of. He wished to direct information on business unit demand (planning), property and lease obligations (finance), construction and design (project management) and accommodation management and maintenance (FM). Suyker:

I was triggered in the early 1990s by a publication in an IT magazine about a tool that integrated different perspectives within the process of ICT development. [...] This tool mirrored my perception of what corporate real estate managers do: we integrate information and feed it back to the organisation, much like ICT managers.

In the handbook, Suyker presented two alternative models: one with four arrows that form a circle (Figure 5) and one with four boxes arranged in two rows and two columns (Figure 6). In both, the CRE manager is positioned in a cloud in the middle, which in the first model is visually linked to the four arrows in the circle to show the interaction. Unlike the models of Tweede Kamer der Staten-Generaal (1989) and Evers *et al.* (2002), the four arrows and boxes in the Suyker (1996) models do not represent viewpoints on accommodation in the organisation, according to our reconstruction, but instead signify sets of accommodation-related activities currently executed in the organisation and in need of coordination to maximise the resource's return. In the models of Suyker (1996), the activities need feedback from each other through a coordinator. Another difference with the two other models is that Suyker (1996) structures the four arrows and boxes on the basis of two dichotomies: primary activities versus secondary ones; and strategic activities versus operational ones. Suyker (1996) also adds a clockwise flow to both models, which places the sets of activities in a sequence and echoes the life cycle model of the built environment in Figure 1. This idea of a flow has not been continued in any of the later versions of the four-view scheme.

In 1994, 1996 and 1997, Hans De Jonge gave three conference lectures [1] on CREM. Krumm (1999, 2001) and Krumm and de Vries (2003) refer to these lectures as the source for the four-view scheme published in Krumm *et al.* (2000). Unfortunately, these lectures are untraceable. In the interview, De Jonge explains to us that he never published these lectures, and that he lost the original slides in a 2008 fire on the university's Delft campus. Several

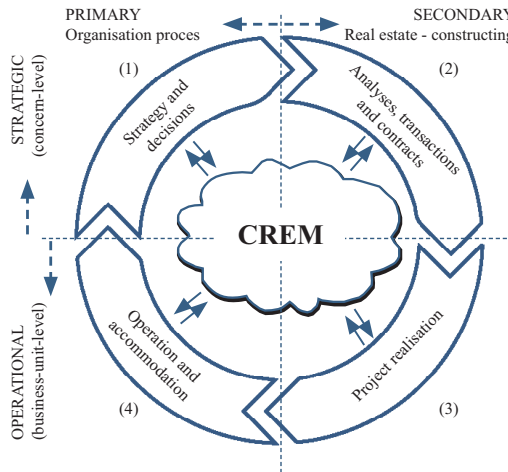


Source: Evers *et al.* (2002)

Figure 4.
The public real estate manager (PREM) positioned as an agent between three parties

Accommodation cycle and company fields of interest

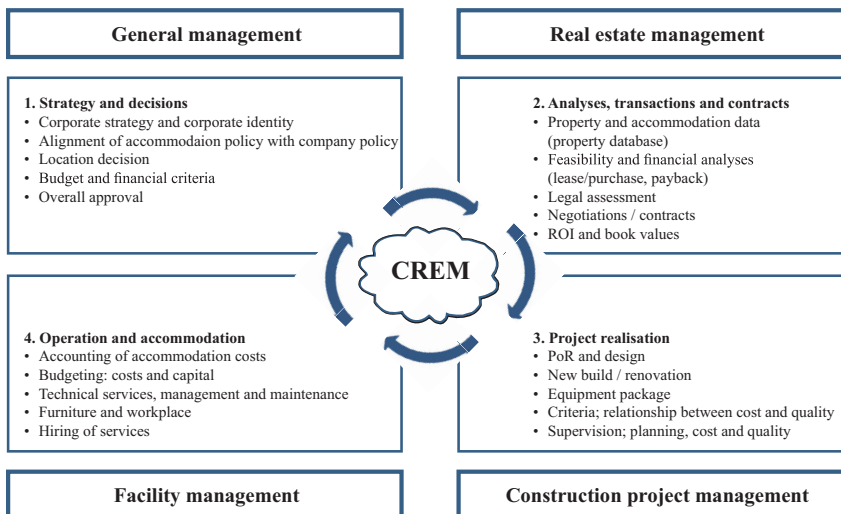
Delft CREM model



Source: Suyker (1996, p. 3) – translation by the authors

Figure 5.
The accommodation cycle and the fields of interest of the company

Company and management expertise: tasks and link with CREM



Source: Suyker (1996, p. 4) – translation by the authors

Figure 6.
Company and management expertise: tasks and links with CREM

interviewees recall that there were numerous intensive design sessions between Geert Dewulf and Hans De Jonge in those early years of the department to establish the position of the CRE manager in the organisation, and that other people often joined the sessions. Some interviewees indicate that the four-view scheme at the TU Delft department was developed in parallel to that of Suyker. Some suggest that the first versions of the four-view scheme were made at the Dutch Government Building Agency in the early 1990s. As one of the interviewees states, it seems that “it is almost impossible to designate a unique author of the four-view scheme”.

Neither the interviewees, except for Suyker, nor any of the available documentation of the Delft CREM model refers to publications outside the department as a source of or influence on the model. In 1989, Henderson and Venkatraman (1989) published a report called “Strategic alignment: a framework for strategic information technology management”. The same model (Figure 7) was published four years later in the *IBM Systems Journal* (Henderson and Venkatraman, 1993). The model is ICT-oriented but has a similar representation to the four-view scheme. “To realise the benefits of the ICT investments” (p. 2), the authors pleaded for an integration of the management of the ICT resources and the management of the business, and the strategic and operational levels of both. They stated that the use of two or more loops with starting points in different quadrants and with opposite directions would achieve the aimed-for integration, which they called strategic alignment.

Another influential publication is “Linking real estate decision to corporate strategy” by Nourse and Roulac (1993). The model created by these authors distinguishes between organisation and real estate, as have all models since Tweede Kamer der Staten-Generaal (1989). But whereas Evers *et al.* (2002) apply the “strategic/operational” distinction on the organisation side, Nourse and Roulac (1993) apply this distinction on the resource side: they separate real estate strategy from real estate operating decisions. On the organisation side, Nourse and Roulac (1993) consider the strategic level only. The three arrows connecting these three – corporate strategy, real estate strategy, real estate operating decisions – indicate the need for consistency between these realms, which is the essential argument of

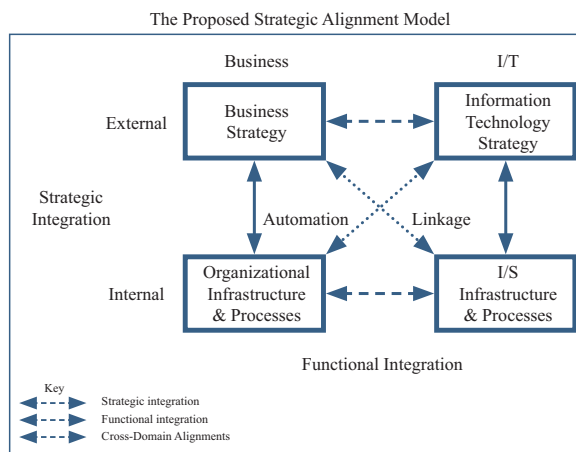


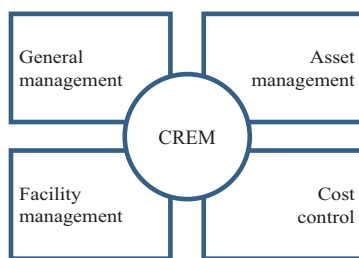
Figure 7.
Strategic alignment model

Source: Henderson and Venkatraman (1989)

the paper and which recalls the concept of strategic alignment proposed by Henderson and Venkatraman (1989).

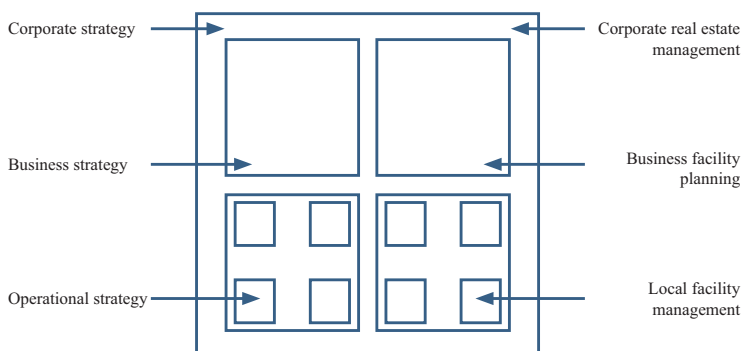
Before co-authoring his 2000 publication, which contains the most referenced version of the four-view scheme (Figure 2), Krumm presented two models in his PhD thesis (Krumm, 1999). The first is a version of the four-view scheme that lacks titles for rows and columns and in which the views are labelled “general management”, “asset management”, “facility management” and “cost control” (Figure 8). This model reads as a collection of four corporate real estate activities – Krumm (1999) uses the term “perspectives” – that need coordination, as was the case with Suyker (1996). The cost control activity in Krumm (1999) reflects the experiences of his mentors De Jonge and Evers at the Dutch Government Building Agency, where the treasury department was in charge of “controlling expenses, achieving financial goals and following guidelines set by the corporation” (Krumm, 1999, p. 48).

A second noteworthy model in Krumm (1999) presents three planning levels in the organisation: corporate, business and operational (Figure 9). Krumm (1999, p. 46) refers to the observations of Ansoff (1988, p. 13) and notes that, within holdings, the company managers reason differently about corporate real estate than the facility managers in the



Source: Krumm (1999, p. 48)

Figure 8.
Four perspectives on
managing corporate
real estate by De
Jonge 1997



Source: Krumm (1999, p. 46)

Figure 9.
A view of the firm
(left column) and the
CREM organisation
(right column) in
three levels: the
largest square (on the
outside) represents
the corporate level,
the four squares of
middle size represent
the business level and
the two times four
squares, the smallest
squares in the figure,
represent the
operational level

business units, and that corporate real estate decisions are made in the boardroom as well as on the work floor. [Krumm \(1999\)](#) structures the corporate real estate activities according to these three decision levels.

The four-view scheme of [Krumm et al. \(2000\)](#)

Five building blocks

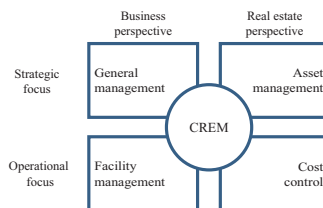
In 2000, when [Krumm et al.](#) published their four-view scheme, five building blocks of the model had been prepared according to our reconstruction:

- The first building block concerned the position of the CRE manager, for which two approaches had been developed. One outlined the entire organisation with CREM positioned therein, considered the viewpoints of internal stakeholders and expressed the need to align these viewpoints ([Tweede Kamer der Staten-Generaal, 1989](#); [Nourse and Roulac, 1993](#); [Krumm, 1999](#), p. 46; [Evers et al., 2002](#)). In the ICT sector, [Henderson and Venkatraman \(1989, 1993\)](#) had a similar approach. The other approach outlined the internal structure of the CRE management department, considered its activities and expressed the need to provide structured feedback between these activities ([Suyker, 1996](#); [Krumm, 1999](#), p. 48).
- The second building block involved the categories used to structure these viewpoints or activities. The reconstruction identifies two dichotomies: demand/supply and strategic/operational ([Tweede Kamer der Staten-Generaal, 1989](#); [Nourse and Roulac, 1993](#); [Krumm, 1999](#); [Evers et al., 2002](#)). Additionally, [Krumm \(1999\)](#) had contributed a tripartite division: corporate/business/operations.
- The third building block defines the CRE manager as a coordinating agent ([Tweede Kamer der Staten-Generaal, 1989](#); [Evers et al., 2002](#)).
- The fourth building block situated CREM in a societal and political context ([Tweede Kamer der Staten-Generaal, 1989](#)).
- The last building block suggested to set the viewpoints and activities in a sequence for their coordination ([Suyker, 1996](#)). In the ICT sector, [Henderson and Venkatraman \(1989, 1993\)](#) followed the same idea.

The model by [Krumm et al. \(2000\)](#)

In 2000, [Krumm et al.\(2000\)](#) published the notes of the department's postgraduate CREM course, wherein the most referenced version of the four-view scheme appears ([Figure 10](#)). This version replicates [Krumm \(1999\)](#) and adds labels for rows and columns; it is of the type that collects and structures the CREM activities in the department, as explained in the first

Figure 10.
The four-view scheme of [Krumm et al. \(2000\)](#) is the most referenced version of the four-view scheme



building block above. This can be determined from the naming of the quadrants and the title of the model. Furthermore, the scheme includes the third building block by designating the CRE manager as an acting agency. Den Heijer, who observed the development of the scheme at that time, first as a student and later as a young researcher at the department, states in the interview that:

The essential aim of Peter Krumm and his co-authors was to position the CRE manager as the connector of the many CRE views that exist in an organisation, as someone who balances the perspectives, since the groups from which these views stem often operate in separate worlds within the same organisation and within society.

She adds that “the circle in the middle of the boxes well represented this role”. The scheme omits the fourth and fifth building blocks regarding the context and the coordination sequence.

The development by Den Heijer (2011)

The four-view scheme of [Krumm et al. \(2000\)](#) received an update in the doctoral thesis of [Den Heijer \(2011\)](#). In the interview she explains that, since its publication, the four-view scheme of [Krumm et al. \(2000\)](#) has evolved from a structured enumeration of CREM activities in an organisation that need to be coordinated by the CRE manager, into a tool to structure many kinds of CREM information.

[Den Heijer \(2011\)](#) kept the look of the four-view scheme of [Krumm et al. \(2000\)](#), but adapted the labels to cover the accumulated content and fit the institutional environment of universities ([Figure 11](#)). The quadrants were now labelled “strategic”, “financial”, “functional” and “physical”. These were more general and helped to reduce ambiguity. Drawing on the language of [Gibson \(2001, p. 38\)](#), who considered corporate real estate “a physical, functional and financial asset”, these labels have been broadly used in the field ([Gibson, 2000, p. 150](#); [Lindholm et al., 2006, pp. 451–452](#); [Lindholm and Leväinen, 2006, p. 39](#)).

Furthermore, [Den Heijer \(2011\)](#) added the key stakeholder to each quadrant, moved “cost control” to the top right and removed the “facilities management” label from the bottom left. Concerning the latter revision, Den Heijer clarifies in the interview that practitioners disagreed with CREM taking the central position in the model and relegating facilities management to a place on the side, as if facilities management were subordinated to CREM. Den Heijer agrees that:

Both disciplines overlap in many ways and their respective naming and content are merely rooted in organisation culture and local tradition. And although the model was never intended to explain the differences between the two disciplines, it apparently provoked misperception.

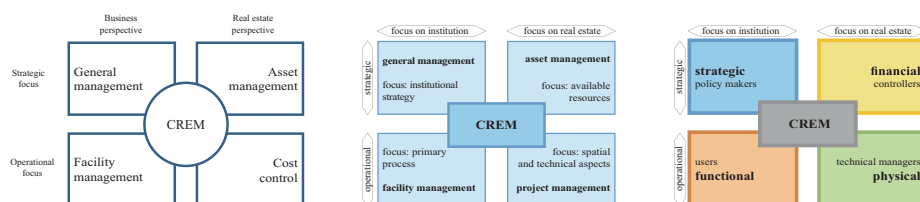


Figure 11. From left to right: the original model of [Krumm et al. \(2000\)](#), its representation by [Den Heijer \(2011, p. 106\)](#) and the model of [Den Heijer \(2011, p. 106\)](#)

She further stresses during the interview that the four views cannot be seen as disconnected boxes. [Krumm et al. \(2000\)](#) had already emphasised that no practitioner fully identifies with one of the four views, and that these views represent a primary point of approach only. For example, in some organisations, often smaller ones, the views overlap significantly; in others, often larger ones, the views are very different and belong to departments that have little in common, Den Heijer concludes.

[Den Heijer \(2011\)](#) also came up with the idea of adding a colour to each of the perspectives, and she used these colours throughout her thesis. This facilitated communication as more and more dimensions were added to the model. In the version of [Figure 12 \(Den Heijer, 2011, p. 248\)](#), the four-view scheme reached beyond the border of the CREM department – this is the context, the fourth building block – and encompassed the internal and external stakeholders for each view. The version of [Figure 13 \(Den Heijer, 2011,](#)

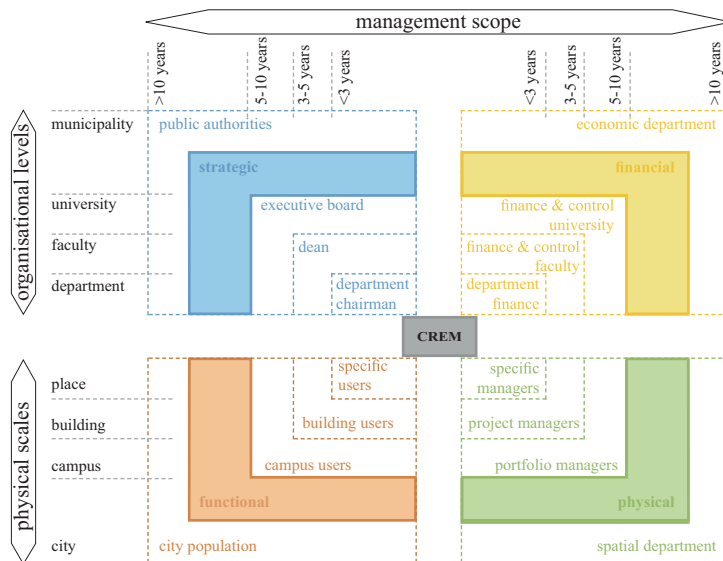


Figure 12. The four-view scheme as extended by [Den Heijer \(2011, p. 248\)](#): representatives are added for all perspectives, a time horizon, the organisational structure levels and the physical scales

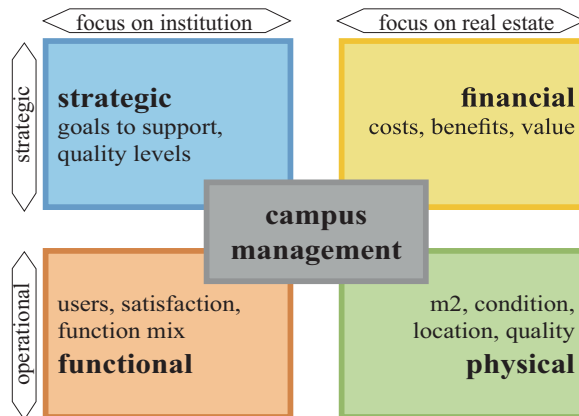


Figure 13. [Den Heijer \(2011, p. 108\)](#) added variables (aspects) to the perspectives as shown in this model

p. 108) contained the variables and performance indicators for each view. [Den Heijer \(2011\)](#) also used the model to structure goals, achievements and many more aspects of CRE and its management.

In the interview, Den Heijer shares the observation that in addition to functioning as a tool to model information, the four-view scheme has started to be used prescriptively, “for instance to search for blind spots in the criteria used for CRE decision making, to look for the main goals of projects” or “to take other variables than the obvious ones into account”. She concludes that “at universities, where CREM was mostly supply-oriented in the 1990s, the four-view scheme helped to address the demand perspective”.

The versions after [Den Heijer \(2011\)](#)

Several authors have further used and modified the model based on their research context. [Van der Zwart and Van der Voordt \(2013\)](#) used the version of [Den Heijer \(2011\)](#) to classify the stakeholders’ subjective perceptions of the added value of hospital accommodation. They usefully broadened the interest of the financial view to the “consequences of the accommodation on resources, real estate value, and life cycle costs”.

In his doctoral thesis, [Van der Zwart \(2014\)](#) developed an overall hospital management framework that was based on Deming’s plan-do-check-act circle ([Figure 14](#)) and recalled [Henderson and Venkatraman’s \(1989\)](#) strategic alignment method. He positioned the four-view scheme as an internal CREM tool. This was also the position taken by [Hoendervanger et al. \(2012\)](#) and [Hoendervanger et al. \(2017\)](#).

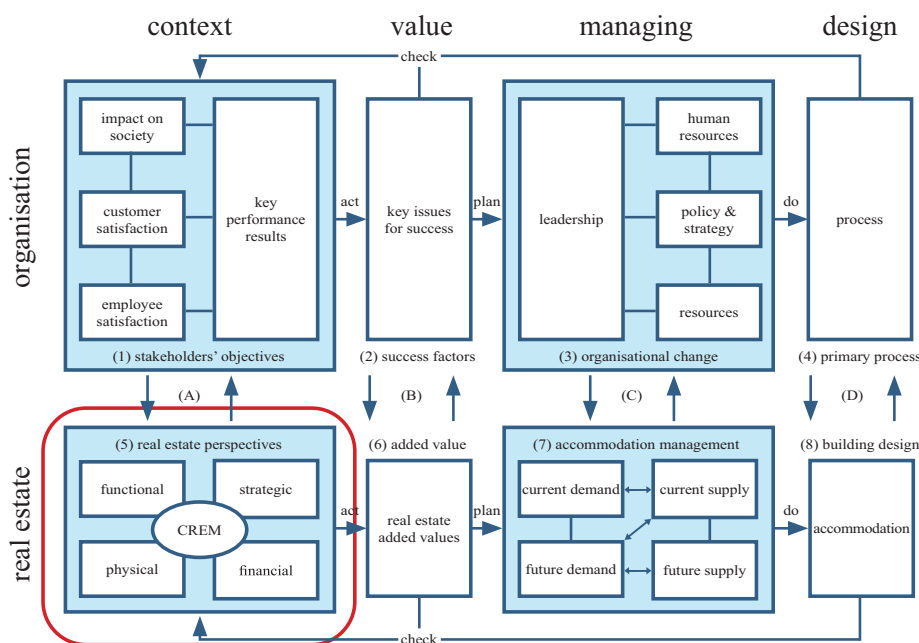


Figure 14. The framework of [Van der Zwart \(2014, p. 13\)](#) wherein he positions the four-view scheme (bottom left) as a tool to reset the baseline of the accommodation

Note: The four views have been repositioned to better integrate with the overall layout of the framework

In her doctoral thesis, [Curvelo Magdaniel \(2016\)](#) called the model a representation of the need to “maintain a balance between conflicting interests inside the organisation”. She read the model as a tool for strategic alignment. [Beckers et al. \(2015b\)](#) implicitly share her approach.

Discussing the nature of the model

The above historical reconstruction of the model’s genesis serves as the basis for its nature analysis. In this second section of the paper, we discuss four findings that facilitate a clearer understanding of the model and its variants. The findings pertain to the research method used by the model’s developers, to the model development process, to the developer’s choices for the model’s aim, visualisation, activities and labels, and to the distinct lines of reasoning that the model appears to represent.

Identified research method

The Delft CREM model was developed using a research-through-design approach. [Frayling \(1994\)](#) coined the term research-through-design to describe “an approach to conducting scholarly research that employs the methods, practices and processes of design practice with the intention of generating new knowledge” ([Zimmerman and Forlizzi, 2014](#)). In this method, sketching plays a central role. The interviewees describe how the reflections of department members, professionals and visiting professors on their CREM practices were incorporated into conceptual sessions where sketching was the primary communication tool. Several interviewees also drew sketches during the interviews, which they continually revised. We noticed that drawings resulting from such research-through-design sessions are “surprisingly ephemeral” and “usually cannot communicate the extensive knowledge they embody”, as [Agnew \(1993, p. 121\)](#) stated.

Development process of the model

A second finding is that the model development process was not scripted beforehand. The initial developers were pushed forward by the ongoing CREM courses, for which they wanted a theoretical basis. As interviewees explain, they were eager to advance the emerging discipline of CREM and saw this as a means to improve the end-user centrality in the built environment they aimed for. Their approach can be described as disjointed incrementalism or muddling through, “continually building out from the current situation, step-by-step and by small degrees” ([Lindblom, 1959, p. 81](#)).

Developers’ choices

The third finding: the design choices, which have a central role in the research-through-design method, were not well-documented. Interviewees describe how the model’s interpretation was passed on orally between developers and to the students in the department. This explains why interviewees comment differently on several aspects of the model. To get a better grip on the model, we will hereafter discuss four identified choices by the developers. We draw on analyses of the internal consistency of the model and compare the developers’ aims and outcomes as understood. Occasionally, we reconstruct the alternatives from which the developers could choose, a method that mirrors the research-through-design approach of the developers.

The first choice is what the developers aimed for. Interviewees explain that their initial intention was to capture the position of the CRE manager in the organisation, as did other

researchers in the field at that time and as was done by Henderson and Venkatraman (1989, 1993) (Figure 7). But, the developers' first models seem to discard this intention and contain CRE activities and viewpoints, mostly within the CREM department (e.g. the models of Hans de Jonge from 1994, 1996 and 1997 published in Krumm, 1999, p. 48) (Figure 8). A few years later, this shifted aim is extended when developers add labels for columns and rows to position the activities and viewpoints in relation to each other and the wider corporate context (Krumm *et al.*, 2000) (Figure 10). This could have brought them closer to their initial aim, but labels in the quadrants are not entirely in line with this intention, as we will show. This leaves open what exactly the Delft CREM model captures.

The second choice we will discuss is the form of four quadrants. Initially, developers used a set of loose blocks (Figure 3) or a triangle (Figure 4). The four quadrant scheme emerged at Suyker (1996) (Figure 6) and De Jonge in 1997 (Figure 8). It is unclear why developers opted for this visualisation that allows for just four positions when they wanted to model the variety of CRE activities and viewpoints. We argue that a simple list, star or rosette (Figure 15), where the number of positions is not determined, might have been more suitable. The historical reconstruction shows that the form of the four quadrants emerged suddenly, and that none of the interviewees could explain its exact origin nor why it was preferred. The form is identical to the strategic alignment model of Henderson and Venkatraman (1989, 1993), but the reconstruction could not conclude on whether the Delft developers knew about the existence of the strategic alignment model and got inspired by it.

Since the mid-1990s, all versions of the Delft CREM model have used four quadrants. Between the different visualisations, developers picked the simplest one as the most likely, as the law of parsimony suggests (Ariew, 1976). The model acquired an iconic status and reshaped the developers' view. The relabelling of quadrants, rows and columns can be seen as mediations between the status the model had achieved and the reality of the practice to be captured.

The third choice relates to the selection of activities in the model. The reconstruction does not explain the reasons for their appearance. For example: real estate maintenance and project management exist in every CRE organisation but are not selected in Krumm *et al.* (2000). Nor is there any explanation for why the model versions hold different activities. Sometimes, developers broadened the target and aimed for all activities in the CRE department; sometimes, their changes narrowed the target. In all cases, the reader has to assume the reasons.

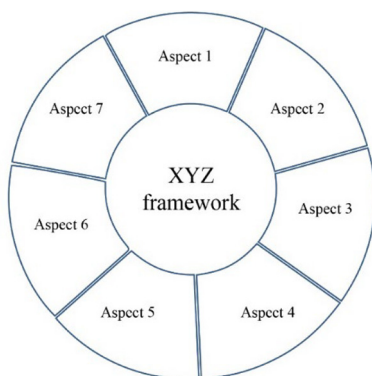


Figure 15.
Drawing of a
collection like the
petals of a flower

The fourth choice concerns the labels for the rows and columns. The reconstruction shows that these labels do not meet the expectations of completeness and precision that they raise with the users of the model. We discuss two reasons.

First reason. The labels support the descriptive use of the model quite well, but fail when the model is used prescriptively. When the model is read from labels to cell contents, as did some interviewees, readers expect a matching CREM activity at the intersection of a particular row and column. For example, the bottom right quadrant of [Figure 10](#), at the intersection of operational focus and real estate perspective, is called “cost control”. Cost control is indeed an operational real estate activity (this is a descriptive use of the row and column labels), but other CRE activities apply to this category as well (this is a prescriptive use of the labels). With a more general quadrant label such as “operational CRE management” or a list of activities such as “acquisition and disposal, maintenance, project management, cost control” ([Figure 16](#)) as did [Suyker \(1996, p. 4\)](#) and [Nourse and Roulac \(1993\)](#), the model’s nature – descriptive or prescriptive – would be less ambiguous.

Second reason. The labels of the rows and columns are sometimes unclear. For example, “business perspective”, the label of the first column in [Figure 10](#), can have several meanings. It can be read as the company itself, which is the interpretation given by [Henderson and Venkatraman \(1989\)](#). It can be read as the perspective on accommodation of the organisation for which the accommodation is managed. It can be read as that part of the CREM activities that maintains the relationship with the customer or user, on a strategic and operational level. And, it can be read as the business of the CREM department. The term “general management” in the top-left quadrant does not resolve this ambiguity.

Two distinct lines of reasoning

The fourth finding regards the resemblance between the Delft CREM model ([Figure 10](#)) and the strategic alignment model ([Figure 7](#)). When asked, several interviewees considered the two models identical. The reconstruction shows that two parallel but distinct lines of reasoning created models that look similar – each featuring four views and a central coordinator – but are different. The first line of reasoning targeted the entire organisation and positioned the CRE resource therein ([Tweede Kamer der Staten-Generaal, 1989](#); [Nourse and Roulac, 1993](#); [Krumm, 1999, p. 46](#); [Evers et al., 2002](#)). This is similar to what [Henderson and Venkatraman \(1989, 1993\)](#) did for the organisation’s ICT resources. The intended alignment takes place between the CRE resource and the business, at strategic and operational levels. For the CREM department, this is (mainly) an external alignment duty.

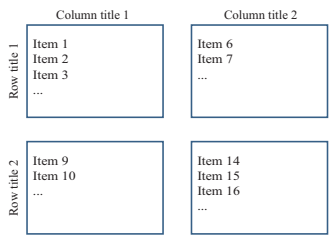


Figure 16. Scheme with four quadrants where the quadrants contain a list

Source: Own illustration

The second line of reasoning targeted the CREM department: it models the activities within the CREM department and positions the CRE manager in the role of coordinator. For the CREM department, this is an internal alignment task.

The historical reconstruction shows that with the developers the first line of reasoning got domineered by the second but did not vanish. Interviewees tend to explain the meaning of the Delft CREM model according to the second line of reasoning, but switch to the first line of reasoning when they use the model to describe the position of the CRE department in the organisation. Other remains of the first line of reasoning can be found in the search for adequate labels for the quadrants, rows and columns. The label “general management” in Figure 10, for instance, has roots in the first line of reasoning. Maybe developers unwittingly tried to make a model that responds to both lines of reasoning, which further explains its ambiguous and elusive nature. Table 1 compares both lines of reasoning.

Figure 17 visualises the reading that the Delft CREM model and the strategic alignment model are identical; this corresponds with the first line of reasoning. Figure 18 shows the reading that they are different; this corresponds with the second line of reasoning. When different, the Delft CREM model works as a means for the strategic alignment model: the coordination within the CREM department serves the alignment of this resource with the business, which in turn serves the effectiveness of the resource investments.

Still, according to the second reading, the left-hand column in the Delft CREM model represents that part of the CREM organisation that is involved with the end user. It should not be confused with the left column of Henderson and Venkatraman (1989), which represents the entire business (Figure 19).

The two lines of reasoning can be related to the societal pressure during the 1990s to pay more attention to the end user in the built environment, which was an offshoot of the demand-supply paradigm in the management sciences. This led to two categories of solutions, which correspond with the two lines of reasoning. The first category expanded the

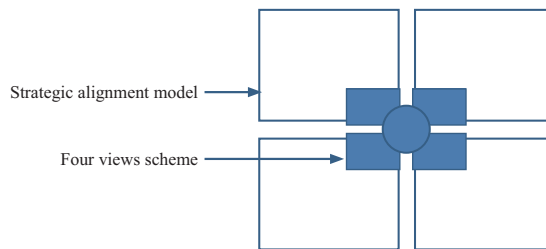
	First line of reasoning: positioning the CRE resource in the organisation	Second line of reasoning: modelling the activities in the CREM department
Target of the model	The CRE resource in the organisation Viewpoints on CRE in the organisation	The CREM department Activities in the CREM department
Sort of alignment	Integrate viewpoints on the CRE resource throughout the organisation	Structured feedback between CREM activities
	External to the CREM department	Inside the CREM department
Aim of the model	Improve the effectiveness of the CRE resource investments	Structure the CREM department activities and position the CRE manager as a coordinator
Adopters	Henderson and Venkatraman (1989), Tweede Kamer der Staten-Generaal (1989); Nourse and Roulac (1993), Evers <i>et al.</i> (2002); Krumm (1999, p. 46) shown in Figure 9	Suyker (1996); Krumm (1999, p. 48), but these authors' models contain traces of the first line of reasoning

Table 1.
The two distinct lines of reasoning that created similar models

Source: Authors

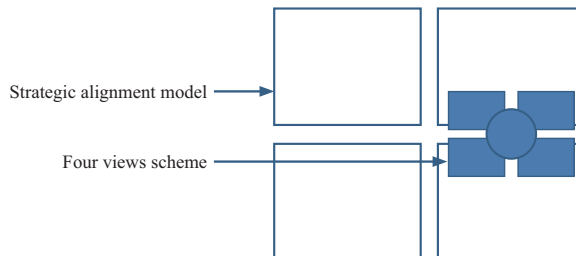
range of stakeholders involved in the management processes, e.g. through end-user participation. Managers have developed the means for aligning their practices with the broader societal context. This corresponds with the first line of reasoning where the resource is expected to align with its context for reasons of effectiveness. The second category of solutions improved the internal coordination within the management team. This resulted in additional means for this coordination, such as a programme of requirements. This solution category corresponds with the second line of reasoning, where the expected alignment is considered a department internal affair.

Figure 17.
Visualisation of the Delft CREM model and the strategic alignment model when considered identical



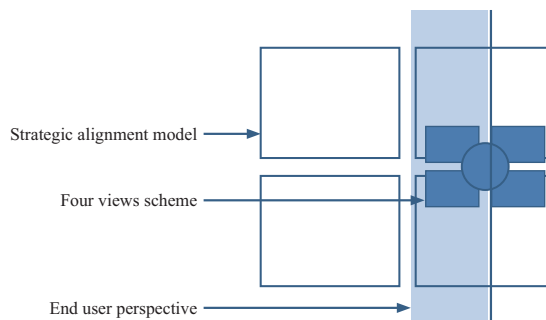
Source: Own illustration

Figure 18.
Visualisation of the Delft CREM model and the strategic alignment model when one is nested in the other



Source: Own illustration

Figure 19.
The end-user perspective in CREM, visualised on top of the two nested models



Source: Own illustration

The findings about the nature of the model, as discussed above, show its innate ambiguity. In particular, the two lines of reasoning point towards two different natures, at least. To reduce confusion for the future users of the model, we distilled a list of recommendations from the above discussion.

Using the model

The experience of several interviewees and our personal experience in education and consulting practices show three main strengths of the model. First, it has an appealing simplicity. The developers of the model were captured by it, as the reconstruction showed, and this appeal is still present. A simple cross, easy to memorise and fill out, seems sufficient for practice.

Secondly, the model is suggestive. Its revealed ambiguity triggers creativity and stimulates reflection in its users. Users have to decide about the target – what is modelled? – and about the adopted line of reasoning – how is it modelled? This is what developers did when they reinterpreted the scheme according to their situation (compare e.g. [Krumm, 2001](#); [Den Heijer, 2011](#); [Van der Zwart and Van der Voordt, 2013](#); [Curvelo Magdaniel, 2016](#)).

Third, the model is less a finished model than a way of framing an observed reality. Once internalised – and this happened to the developers when the model attained its iconic status – its users apply it intuitively. See for instance [Den Heijer \(2011\)](#) ([Figure 12](#)) who shifted its use from CREM practice to the organisation and its environment. Its application may even extend into other organisation resources, due to its affinity with the strategic alignment model of [Henderson and Venkatraman \(1989\)](#).

Based on the historical reconstruction and study of the model's nature, we suggest eight practical implications on how to use the model for a clearer reading.

- (1) Being clear about whether the model covers aspects from the CREM department, the whole organisation or the organisation environment. By mentioning the location of what is being modelled, the model's ambiguity can be reduced.
- (2) Being clear about the CREM aspect that is modelled: activities, viewpoints or something else. Mixing aspects creates confusion, as shown in the analysis.
- (3) Using row and column labels that reflect the choices of 1 and 2. This may avoid the confusion that developers unknowingly created, as revealed.
- (4) In the case of covering the CREM department: using lists in the quadrants rather than single labels, or considering a rosette or star rather than a four-view matrix. This sets the user freer from the ambiguities and references that go with the model.
- (5) In the case of covering the whole organisation: referring to the original version of the four-view model of [Henderson and Venkatraman \(1989\)](#). Being explicit about the adopted line of reasoning further reduces the ambiguity.
- (6) When the centre of the four-view scheme is not left empty, it should contain a well-labelled process. The reconstruction showed that for all developers the centre is not like a state or degree of coordination but “a set of actions or management tasks” ([Heywood and Arkesteijn, 2017](#), pp. 149–150) to achieve greater coordination, which [Henderson and Venkatraman \(1989\)](#) call alignment.
- (7) In all cases, stressing the overlapping and softness of the quadrant borders. This informs the users about the difficulties of categorisation, as explained by the interviewees.

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- (8) Explaining the descriptive or prescriptive intention of the model. The way developers mixed both intentions caused a needless ambiguity.

Conclusions

This paper reconstructs the history of the conceptualisation of the Delft CREM model and searches for its nature with the aim of understanding it better and promoting a clearer reading. The research is based on published documentation of the model and eight semi-structured interviews with the developers from the 1980s to 2010s.

To summarise, the Faculty of Architecture at TU Delft started educating CREM in 1991 and created a research group to underpin this education. Soon, the department came up with the four-view scheme that positions the CRE manager as the coordinator of four views on accommodation (Krumm *et al.*, 2000). The reconstruction of the genesis of this model shows that developers used a research-through-design approach. They were in close contact with national and international peers and established CRE practices, who often joined them in Delft. Except for Suyker, no sources refer to publications outside the department that may have functioned as a basis for the model's development. In 2000, Krumm *et al.* published the most referenced version of the four-view scheme, which was followed by an update from Den Heijer in 2011. Many more applications and specific interpretations of the model were published all the while.

Based on the historical reconstruction of the genesis of the model and motivated by the variety of versions and interpretations, we searched for the proper nature of the model. The analysis revealed that two distinct lines of reasoning came together in the research-through-design process of the developers: one line conceptualises the viewpoints of the organisations' accommodation in the entire organisation, the other conceptualises the internal coordination within the CREM department. It became clear that developers made no choice between both lines and, probably unwittingly, aimed to model both, which created the model's apparent ambiguity.

The strength of the Delft CREM model is its simplicity, the way it triggers reflection and its broad applicability. The ambiguity may be reduced by its future users by making choices on what is modelled and according to which line of reasoning. This will allow for a more consistent labelling.

This paper presents a first cut of the history and nature of the Delft CREM model. It leaves room for the engaged reader to add other narratives. It provides a starting point for the future evolution of the model and its more precise reading and use in research and practice. The paper also prepares for comparing the Delft CREM model with other CREM models, to which researchers are invited.

Note

1. The three non-documented lectures of Hans De Jonge are referred to in literature as follows:
 - De Jonge, H. (1994). The future of corporate real estate management. Paper presented at the IDRC Europe professional seminar, 29 – 30 September 1994, Amsterdam.
 - De Jonge, H. (1996). De toegevoegde waarde van concernhuisvesting. Paper presented at the NSC-conference, 15 October 1996, Amsterdam.
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