

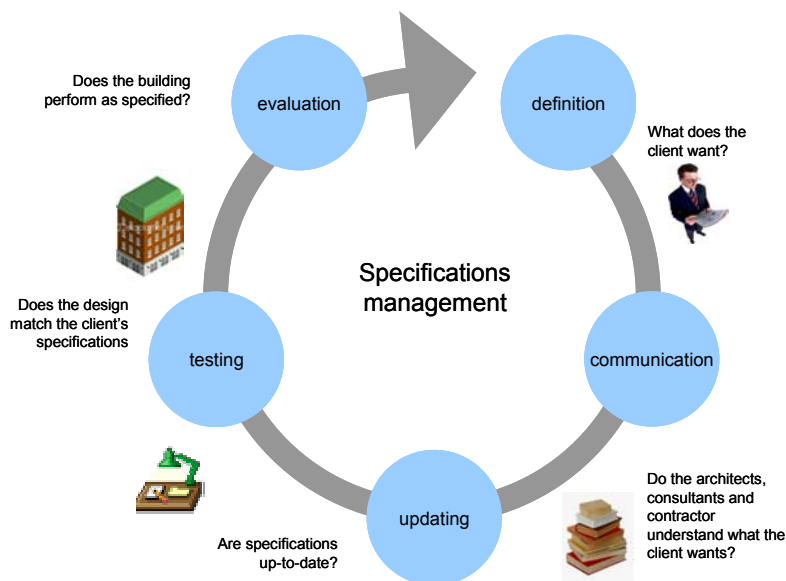
## Specifications management

Using the PKM methodology for identifying, communicating and testing client specifications in construction projects

Dr. ir. Juriaan van Meel and Dr. ir. Fred Lohman

### Introduction

Specifications management (also referred to as *briefing or programming*) concerns the identification, communication and testing of client specifications in construction projects. Client specifications lay down how buildings should perform from a user perspective. They concern issues like flexibility, indoor climate, logistics, space usage and security. These are all issues that have an important impact on the productivity and efficiency of the client's organisation. Therefore, specifications management can be regarded as one of the most important activities in the construction process.



Despite its importance, specifications management remains a chronic problem in everyday construction practice. Especially in large and complex projects, clients tend to have difficulty in communicating and identifying their specifications, whilst designers have difficulties interpreting and capturing client needs. Specifications documents tend to be voluminous paper reports 'stuffed' with overdetailed specifications. Such briefs tend to be poorly read, and are often ignored once the first drawings are on the table.

These problems can have a major impact on a project. It is a matter of course that poorly defined or poorly understood client specifications can lead to project delays and high variation costs. Even worse, the final building may frustrate or hinder the client's business processes. Users may not be able to function well due to problems with acoustics, thermal comfort, illogical routing or a lack of space.

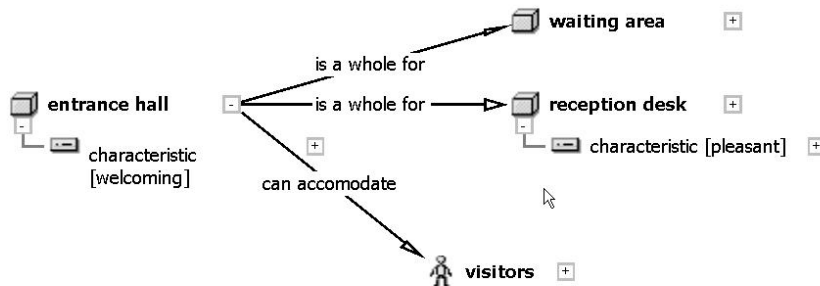
In this paper we will present an innovative way for dealing with these problems: the PKM (Product Knowledge Modelling) methodology. With this methodology, client specifications are captured in an intelligent computer model. This model helps clients to define, communicate and test specifications in a systematic and effective way.

### Modelling

In an information model, specifications are no longer captured in implicit text, but in an explicit computer model. The difference between text and model can best be explained by an example. In a

traditional brief it is possible to find, for instance, the following text: "Visitors enter the building through a welcoming entrance hall where they find a reception desk and a pleasant waiting area."

In a model this information is captured as follows: the entrance hall, reception desk, waiting area and visitors are modelled as objects that have certain characteristics and relations.



One of the main advantages of this way of working is that the captured information becomes 'clickable' entities, rather than just words. They are objects that can be copied, deleted, and changed, but also related to other types of information such as cost data or CAD-drawings.

This way of working is not new. Especially in production and engineering many modelling theories and tools have been developed over the past three decades. However, most of these tend to focus on the modelling of physical objects and technical systems with an emphasis on quantitative data.

The PKM Methodology is based on the strengths of many of the existing modelling techniques, but is more flexible and project-oriented. It is not only able to model technical specifications, but also more organisational information concerning the use, context and objectives of buildings.

### The building blocks of modelling

To capture information, the PKM-methodology makes use of three basic 'information-carriers':

#### Objects

Objects are the key concept underlying the model. Information objects may represent physical components (e.g. windows, furniture), spaces (e.g. restaurant, entrance), or the 'behaviour' of certain systems (e.g. cooling, heating). Also organisational information such as the client's business processes or objectives are modelled as objects (e.g. cultural change, the use of new production techniques).



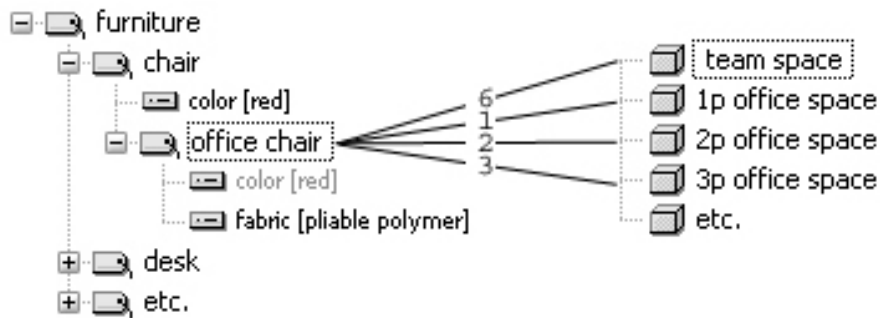
#### Properties

To each object 'properties' can be attached that describe its desired 'state' or characteristics. For example, spaces may have properties that define their size or floor-to-ceiling height. Likewise a chair may have certain ergonomic qualities or a specified colour.

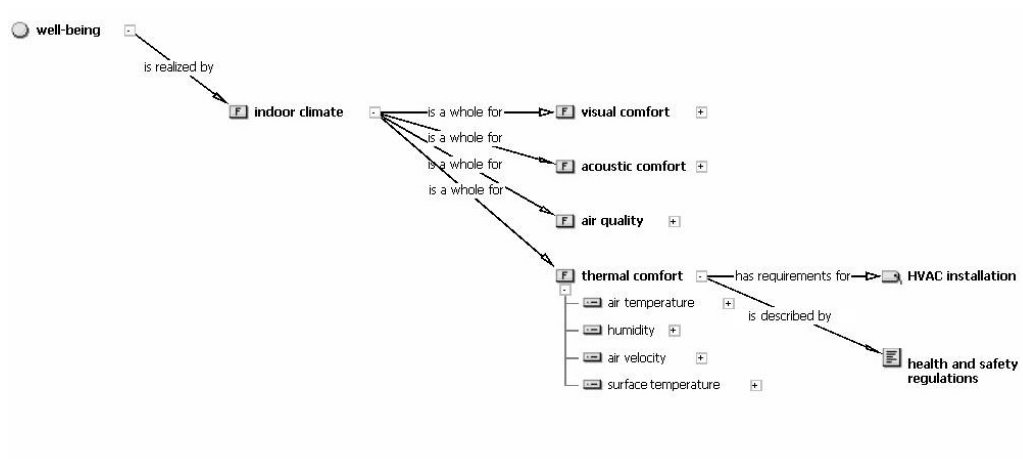


Relations

Relations are being used to connect all objects in an intelligent and meaningful way. For example, "accommodation relations" link spaces and their users; "support relations" link spaces and work processes; "realization relations" link objectives and solutions.



By systematically capturing all information in objects, properties and relations, we create a network of specifications. One of the main advantages of this way of working is that the interrelations between different specifications become clear and testable. By connecting all relevant information it becomes easier to validate the consistency and completeness of such information.



## **Organisation, building and facility management models**

In most projects, we create three (closely linked) submodels

### (1) Organisation model

This model is focused on the purpose and use of the building. It contains several submodels that capture the information about the client's objectives (e.g. cost reduction, cultural change, ...), business processes (e.g. policy making, research, ...) and the building's future users (e.g. employees, visitors, ...). This information forms the basis for defining more design-oriented specifications.

### (2) Building model

This model contains all specifications that are focused on the design and construction of the building: demanded spaces, systems, installations, indoor climate conditions and interior elements. All these specifications have direct or indirect relations with the organisation model. For example, the demand for a prestigious entrance is likely to be related with a business objective concerning corporate identity.

### (3) Facility management model

The third model contains all the relevant specifications that have to do with operating, servicing and maintaining the building. Depending on the type of project, activities can range from cleaning and security services to catering and gardening. Again, specifications will have traceable links to the other two models. For example, specifications concerning security services will be related to the number of entrances as defined in the building model.

In close cooperation with the client, these models are filled gradually. Preferably, this starts with the organisation model, defining the use and purpose of the building. The next step is to translate business needs into design specifications, by defining spaces and functions. Step by step, in an iterative way, more properties, relations and objects will be added.

For example, in an early phase the project team identifies the need for the office building to stimulate communication. Later on, this objective may be translated into an open office concept. Subsequently, this concept will be specified in terms sizes of open spaces, their layouts and their acoustic qualities. The last step is adding tests that describe, for example, how the acoustic quality of the open office has to be tested and measured.

This same process of refinement can obviously also take place in a traditional 'paper' approach, but with the PKM Methodology all information is captured in the same system. Information that is normally scattered over different documents is now explicitly linked.

## **Applications**

Using the described methodology, clients get unprecedented possibilities in managing their specifications. Below the five major applications of the PKM methodology are being described.

### **(1) Creating more complete and consistent briefs**

The main advantage of modelling is the creation of better specifications. Because of the structure of the model, it is possible to validate the completeness and consistency of the specifications. You can, for example, easily check whether all information concerning the size of spaces corresponds with the number of users.

### **(2) Improving communication**

The model is accessible through a projectwebsite. On this website all specifications are presented in a user-friendly way. Users can click, browse, and search through an integrated specifications model. Specifications have clear values and definitions, which helps to reduce miscommunication and interpretation problems.

Gemeente Gouda - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail News Options Highlight

Address http://www.icop.nl/GemeenteGouda/ Go Links >>

Google Search Web News Blocking popups Options Highlight

	Inleiding	Organisatie	Ruimtelijke relaties	Technische eisen
	Achtergrond	Kantoorconcept	Beeldverwachting	Regelgeving
	Doelstellingen	Ruimten	Binnenklimaat	

### Ruimten

Het gevraagde totaaloppervlak van het 'Nieuwe Huis van de Stad' is 11.601 m2 NO (Nuttig Oppervlak). Hierbij kan onderscheid gemaakt worden in verschillende ruimtetypen.

**Algemene ruimten (3.041 m2 NO)**  
Dit betreft het bedrijfsrestaurant, het vergadercentrum en de centrale publiekshal. Met name de publiekshal is cruciaal omdat daar de belangrijkste interactie met de klant plaatsvindt. Deze ruimte moet uitnodigend zijn voor de klant, en een stimulerende en veilige werkomgeving bieden voor medewerkers.

**Kantoorruimten (6.211 m2 NO)**  
De kantoorruimten vormen het grootste deel van het gebouw. Hier worden de gemeentediensten, het bestuur en het backoffice van de CWI gehuisvest. De werkomgeving moet flexibel, efficiënt, professioneel en eigentijds zijn.

**Ondersteunende ruimten (2.349 m2 NO)**  
Dit betreft ruimten met een facilitaire functie zoals het archief, de repro, ICT-ruimten, bergingen etc.

**Buitaruimte/overdekte ruimte (max. 270 plaatsen)**



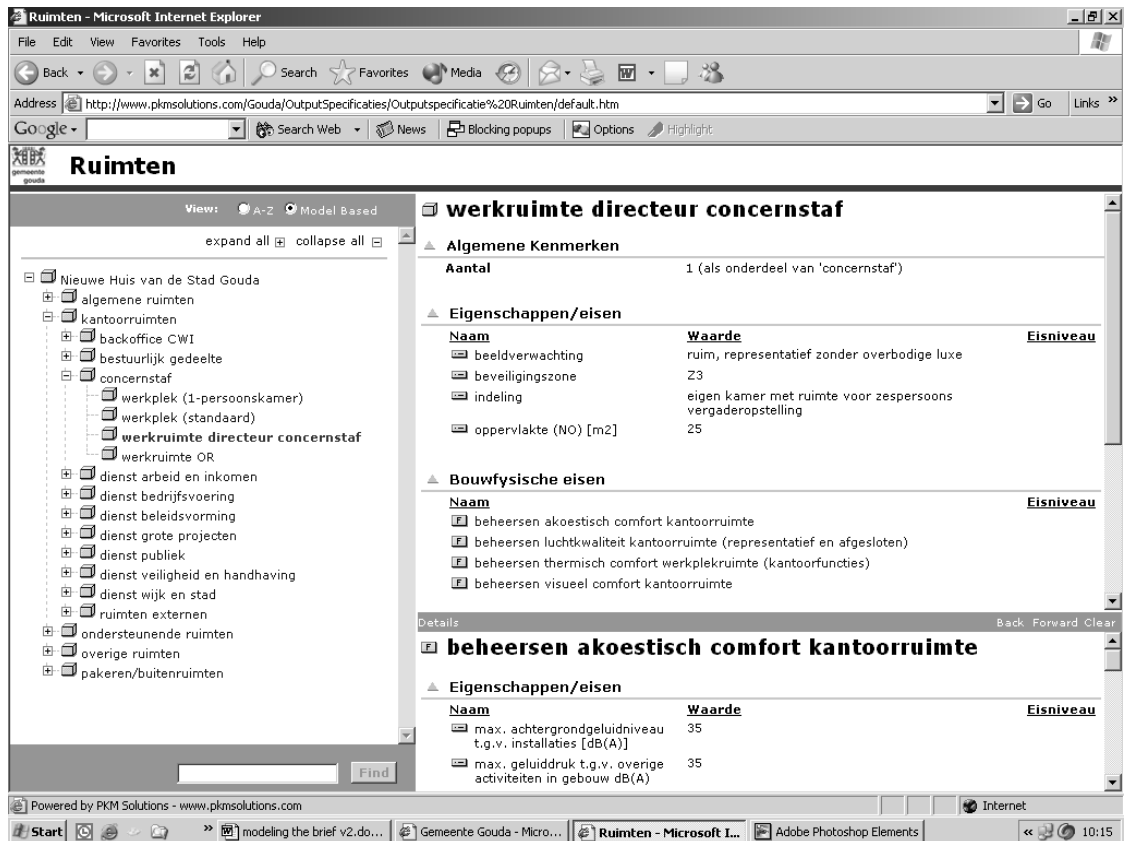
Alle ruimtes en hun eisen  
Opmerkingen t.a.v. ruimtes

Zoeken	Handleiding	PDF-versie	22-feb-2005 © ICOP/PKM Solutions
--------	-------------	------------	-------------------------------------

Done

Start modeling the brief v2.do... Gemeente Gouda - Mi... Internet

10:12



### (3) Managing project dynamics

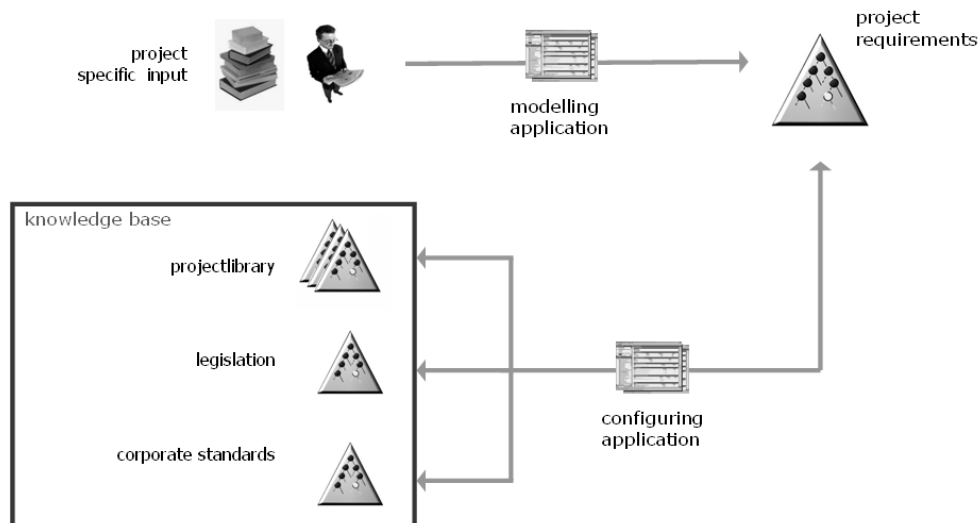
Using a digital model, it becomes easier to register and manage changes. Especially in large-scale projects, specifications are frequently subject to revisions and amendment due new insights, organisational changes, new technologies etc. The digital model makes it possible to register why and when changes are made.

### (4) Testing designs and solutions

During the construction process, design proposals and solutions have to be tested and verified against the specifications. With PKM Methodology this verification can be done in a systematic way. For each specification it is possible to define how, when and by whom it will be tested. Especially in PFI projects where the specification documents is the main procurement document this is crucial for both parties. Suppliers know how their work will be valued, and the client is sure that nothing is overlooked.

### (5) Re-using specifications for new projects

Briefs contain a lot of knowledge that can be re-used in new projects. Think of specifications coming from health & safety regulations, building codes, corporate standards or the knowledge from individual experts. Once these specifications have been captured in a digital model, it is relatively easy to create a 'knowledge base' from which new briefs can be configured. Instead of 'copying and pasting' from earlier text documents (including their errors), users are professionally configuring new briefs using an intelligent specifications database.



**Conclusion**

This paper discussed the use of the PKM Methodology, in specifications management. Its main statement is that modelling provides a number of crucial advantages compared with the traditional 'paper-based' approach. By making specifications explicit and capturing them in a digital format, it becomes possible to improve the identification, communication, change and testing of project specifications. Clients are no longer confronted with a growing pile of papers, but with just one intelligent model.

This new way of specifications management touches directly upon the innovation debate in the construction industry. During the past decades, a lot of interesting and promising concepts on quality management, value management, knowledge management, risk management and many other types of management have been promoted in construction. Few of these concepts, however, have been translated into practical tools for clients.

We believe that the PKM Methodology can provide a crucial break-through in empowering and professionalizing clients. It gives clients a practical instrument to create high-performance briefs. Using advanced modelling techniques, specifications are no longer captured in a voluminous report or elaborate checklist, but a powerful tool for creating successful buildings.