FULL PROFESSOR

DESIGN AND CONSTRUCTION MANAGEMENT (DCM)
0.8-1.0 FTE

PROFILE OUTLINE

Department Management in the Built Environment
Faculty of Architecture and the Built Environment
Delft University of Technology

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1. INTRODUCTION

Our world is facing a significant number of challenges requiring urgent action: changing demographics, technical innovation, changing work practices, movement of populations, climate change, resource scarcity, and changing lifestyles are all placing great strains on our economy and society. Accounting for over 5 percent of the European Economy, the Architectural, Engineering and Construction (AEC) industry will play required to a key role in addressing these problems.

While making this transition, buildings both old and new will have to be adapted to rapidly changing use requirements, and ever higher performance expectations. The AEC industry will be tasked with transforming and adapting the built environment to meet changing demands for accommodation, and to provide an environment that meets with our increasing demands for sustainability, health, safety, historical value and attractiveness. A great challenge lies in the fact that 80% of the real estate needed until 2050 is existing. Renovation of this existing stock for changing lifestyles and energy efficiency, while preserving cultural heritage and historic buildings will require innovative approaches to both technology and business. This will require a careful attention to the integration of performance and impact throughout the building lifecycle. Design criteria formulated for both the building itself and the processes of producing it, and the impacts of production, construction, use and demolition, and recycling and reuse must be weighed against each other. This often involves reconciling the distribution of costs and benefits across different parties in different phases of the building life-cycle. DCM contributes to this by providing insights into risk, benefit, and cost sharing across parties.

At the same time the AEC industry is facing a number of challenges to transform itself. Client, user and regulatory demands for building performance continue to increase the complexity of projects and require the participation of a larger number of consultants, contractors and suppliers. Yet, despite the increase in complexity, clients, and society in general, are also demanding a significant increase in project process reliability and performance with better risk, schedule and budget management. New and developing technologies such as 3D printing, Building Information Modelling, file-to-factory manufacturing, the Internet of Things, connected job sites, drones, and smart buildings will all have a large, maybe even disruptive, impact on both buildings themselves and how they are built. However, these new technologies will not it in and of themselves provide the whole answer to meeting these demands. Rather it will be through innovations in organization and management of building projects, of building procurement processes and the AEC industry itself, that we will achieve these goals.

These questions lie at the core of the Design and Construction Management (DCM) chair. The Faculty of Architecture and the Built Environment provides excellent conditions for addressing these issues. The full-time (0.8-1.0fte) scientific DCM chair will lead a unit with a twenty-year record of successful research and education. The DCM chair expands on the scientific insights achieved thus far, and form a lasting international academic counterpart of the smaller chairs in Public Commissioning (0.4 FTE) and Building Law (0.3 FTE) which together form the Design and Construction Management section. Moreover, the unique technological infrastructure, broad knowledge base, worldwide network and

successful alumni of Delft University of Technology gives the new chair an outstanding capacity for exciting and renowned interdisciplinary research, education, and valorisation activities.

2. DCM Domain

As a scientific discipline, Design & Construction Management can be defined as the study of organizational means through which buildings are realised. As such, DCM has many commonalities with the discipline of Infrastructure Construction Management. Both are concerned with the management of construction projects and the organizations that deliver them. Both also embrace the study of the organizations that commission projects, and the interfaces, organizational, and contractual between commissioning and delivering parties. DCM, however, is focused on the building sector, and the problems specific to it. This includes a concern for the coordination of, and sharing of knowledge between the large range of parties involved, the specific nature of building performance and quality, and the, often complex, nature of the client. This contextual specificity also provides the contrast to the study of project management in a generalised business school context. Thus, DCM is a distinct multi-disciplinary field, relying on research techniques drawing from a range of both engineering and social science fields. Its foundations lie in sociology, micro-economics, and design theory. Operational insights and methodology are borrowed from management, organizational and governance sciences. The areas of application embrace architecture, engineering, planning law & building regulations, and the applications of information sciences in the built environment such as BIM, smart buildings, and digital construction methods.

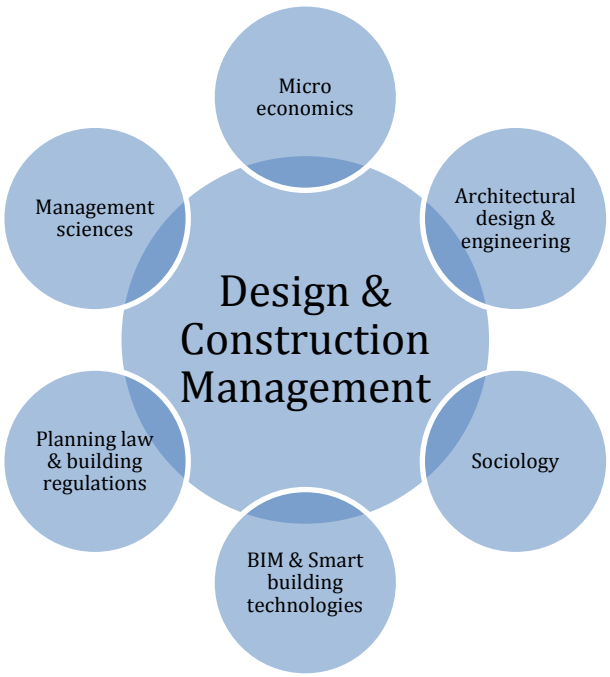

Figure 1: DCM as an interdisciplinary field of research.

Fragmentation within the construction sector is one of the root causes of the construction industry's record of poor performance both in terms of lack-lustre and poorly performing buildings, and in terms of project management criteria such as budgets and schedules. Fragmentation leads to project failures due to poor knowledge sharing, communication and coordination throughout the supply-chain. Further, it leads to a disconnect between the overall outcomes desired from a building project, and the specific outputs commissioned from the individual consultants, builders and suppliers employed on the project. Finally, fragmentation builds sources of conflict into the project organization. DCM has become increasingly concerned with managerial, organizational, and governance approaches to increasing integration throughout the supply chain and the building lifecycle. Integrated project delivery and Design-Build-Maintain-Finance-Operate contracting, and contract management within these contexts are important areas for further research. Strategic alliances too are an important area of research. Developing means of organizing these projects and supply chains, and of assessing the degree to which organizations deliver the desired integration and improved project and building performance is an ongoing area of research. Hence, areas of interest within the domain of design and construction management pertain to new build and renovation, upgrade or transformation projects and include (but are not limited to) issues such as:

- Incorporating whole lifecycle planning and ensuring (design) quality in the briefing process;
- The adaption of project management tools and practices to specific organizations, projects and project situations;
- Procurement, contracting, and partner selection;
- Collaboration and knowledge sharing among professionals, and between designers, clients, asset managers, and builders;
- Integrating design, construction and maintenance Supply chain integration;
- Business modelling for firms, technologies, and projects;
- Innovation uptake;
- Human capital development, both in young people and throughout careers.

3. Mission of the DCM Chair

The DCM chair is guided by the insight that, while the current nexus of technological change and new demands to respond to demographics, urbanisation and climate change may be perceived as a threat, it is actually an opportunity to make substantial improvements in the production, maintenance and quality of the built environment.

The mission of the DCM chair is to generate new knowledge and insight into the management of building design and construction and to work with industry in applying research results to enhance the ability to deliver AEC projects which meet the evolving and increasingly demanding performance expectations of contemporary society. In order to achieve this mission, the DCM chair aims to contribute to knowledge and tools to facilitate managers and other actors in the design and construction process, but also to the ability of AEC organizations to provide services through enhanced or innovative building models, and finally to the development of business models for innovative technologies and processes. By focussing on the translation of policies and strategies into action at the level of the individual building delivery of individual buildings within the overall real

estate and housing sectors, the DCM chair is dedicated to the development of the capacity and tools to deliver, maintain, renovate, and transform buildings in a more reliable, robust, and innovative manner capable of meeting the increasingly high expectations of society at large and of clients. The DCM chair is supported in this mission by the associated Chair in Public Commissioning, focussing on the practice of clients in the public real estate sector and by the Chair of Building Law, focussing on contracting in the construction sector.

Values shaping this mission include:

- Creation of value for all stakeholders, throughout the building lifecycle;
- Professionalism and the quality of service and advice provided to clients throughout the supply chain;
- Recognition of the importance of early decisions to overall project success;
- Integration or knowledge and collaboration across the supply chain including methods of collaboration, organization and contracting;
- Circular Economy, energy efficiency, and sustainability.

To fulfil this mission, the chair develops useful academic concepts, tools and principles for the management of design and construction used for corporate, public and commercial purposes, on the scale of portfolios, buildings and workplaces. The chair has earned its merits in education, is well recognised in practice and has strong connections to international practice and academic networks, such as CIB and ARCOM. The chair aims at strengthening its research efforts to achieve a wider academic recognition and to extend its networks. To this end, the chair needs to expand its efforts in the fields of research and education by:

- Striving towards scientific work that is rigorous in its methods and relevant in its results;
- Continuing working in line with the philosophy of the host institution and subject matter: curious, critical and collaborative, with a worldly orientation;
- Making a clear contribution to sustainable solutions;
- Combining science, design and engineering.

DCM has contributed to the ability to assess the qualities and potential of existing buildings to be economically renovated, upgraded or transformed for new uses. A significant future challenge will be developing sector wide approaches to sharing knowledge and developing methods, procedures and contracts for the renovation of the many small buildings and individual houses that make up the majority of the built environment, including the development of new business models for the development of a circular economy in the construction sector will be a major area of research.

A key element to the approach of the DCM chair, and a fundamental connection with the Faculty of Architecture and the Built Environment is the application of design thinking to the problems of design and construction management – understanding both the research and the practice issues of DCM as areas in which the procedures and principles of management, organization science and project management must be seen against the specific social, financial, legal and physical contexts of building projects. A designerly approach to managing building projects seeks to construct a unique configuration of both existing and innovative procedures and tools (both management and

engineering) to realise each project, avoiding rule based routine and standardised production except where these provide specific value to a project.

4. Position of the DCM Chair

4.1 Embedding within the Section Design and Construction Management

The DCM section, led by the DCM chair, focusses primarily on the design and construction stages of real estate development processes at the level of buildings, and the influence in these stages of asset management, use, and lifecycle issues. The section includes the Building Law chair which is concerned with planning law and construction contracting, and the Public commissioning chair which is concerned with commissioning and contract management for public real estate and infrastructure.

The Design and Construction chair is one of three chairs in the section Design and Construction Management. As the sole full time chair in the section the occupant of the DCM Chair is also responsible for leading the section. Together the three chairs embrace both the supply and the demand side of the building procurement process and the contractual relationships between the parties. The research mission of the DCM Chair and the section are contiguous, with the exception that questions concerning the client side of the process are generally addressed by the Public Commissioning Chair.

Staffing Breakdown within the Design and Construction Management Section.

	Design and Construction Management	Public Commissioning	Building Law
Professor	1.0 FTE	0.3 FTE	0.3 FTE
Staff	6.4 FTE (1.0 FTE vacant)	2 FTE (1.0 FTE vacant)	1.2 FTE
Total	7.4 FTE	2.3 FTE	1.5 FTE

In addition to this the section has at the moment 4 PhD candidates and 2 post-doctoral scholars. Among the staff of the DCM chair are member with specific expertise on BIM and another with expertise on building cost management.

4.2 Embedding within the Department Management in the Built Environment

The Faculty of Architecture and the Built Environment consists of five departments: Architecture (A), Architectural Engineering & Technology (AE+T), Urbanism (U), Management in the Built Environment (MBE), and OTB Research Department for the Built Environment.

The MBE department was established in the early 1990s in response to a rising demand for technically-trained architects with knowledge and skills in managerial aspects of the initiation, definition, development, realization and management of building projects. The MBE department has four full-time chairs: Design & Construction Management (DCM), Urban Development Management (UDM), Housing Management (HM) and Real Estate Management (REM), each corresponding to a

section consisting of the full-time chair and one or two part-time chairs. Other (part-time) chairs in the MBE department are: Housing Systems, Sustainable Housing Transformation, Urban Area Development, Building Law and Public Commissioning.

REM focusses on the management and initiative phase of redevelopment at the level of portfolios and buildings used for the delivery of corporate, commercial and public services, focussing on office and education real estate. HM specializes on managing (portfolios of) dwellings, Housing Systems studies public policies and housing markets,, UDM focusses on management of (complex) urban area development processes.

The DCM chair has long standing collaboration with several other chairs in the department: with the REM chair on issues of building economics, adaptive re-use and briefing; with the Housing chair on issues of housing production and strategic alliances between housing corporations and builders; and with the UDM chair on Circular Economy and Smart technologies in the built environment.

In combination with the other chairs MBE is able to comprehensively study management and (re)development of real estate of all functions, at all scale levels and in all phases of the life cycle of the built environment. To this end, the chairs within MBE work together in theory development and empirical studies.

4.3 Position within the Faculty of Architecture and the built environment

As DCM encompasses the management of architectural design and construction there is a natural affinity with the faculty of architecture at large. The Faculty of Architecture is focused on design, technology, and process in the built environment. DCM research and education addresses the process of developing, designing and realising buildings, and does so with a strong design and management orientation. The DCM section provides courses and instruction in the Faculty's Bachelor Architecture, Urbanism and Building Science program. The research activities of the DCM chair and section are part of the IMBE research programme (Innovations and Management in the Built Environment) and actively collaborates with other departments of the faculty - OTB, Architecture, Architectural Engineering and Technology and Urbanism.

4.4 Position within Delft University of Technology

Within Delft University of Technology, the field of expertise of the DCM chair, including aspects of Building Process Innovation, is closely allied to like minded groups aiming at process management and innovation within the Faculty of Civil Engineering and Geosciences, and the Faculty of Technology Policy and Management.

4.5 Position in relation to other Dutch universities

Nationally, affiliations and cooperation exist with the University of Twente, Eindhoven University of Technology, the University of Applied Sciences in Utrecht, VU University Amsterdam, Erasmus University Rotterdam and the Radboud University Nijmegen, including a joint NWO research project on new business models in architecture. Applied research collaboration exists with the Dutch national TNO Research Institute and several universities of applied science in the Netherlands, including a joint

NWO project on improving construction logistics and mitigating environmental effects in urban areas. Collaboration exists with the Dutch national Government Buildings Agency and the Agency for Public Works and Waterways and the Construction Clients Forum (Opdrachtgeversforum) in performing research and organising workshops and knowledge exchange in the fields of contract management and public commissioning. With various housing associations collaboration exists in the field of supply chain collaboration, procurement and lean management, among others through the so-called Supply Chain Monitor, which assesses the maturity of supply chain partnering.

4.6 Position in relation to international universities

Internationally, collaborations exist mainly within the CIB network including partnering universities of Hong Kong Polytechnic University, and Tampere University of Technology in Finland. Specifically the DCM chair has untill recently coordinated the W65 and W90 CIB working groups, and organized or assited in the organizaiton of several conferences. The section also has a close relationship with the KTH Stockholm and Chalmers University in Sweden (co-authorship of papers & staff exchange), with Bocconi Business School in Italy (co-authorship), and with RMIT (visiting scholar & co-authorship) and the University of Melbourne Australia (co-authorship). The common denominator of the collaborative connections mentioned above is a focus on the process and project management, as well as the innovation of the processes of design, construction, and use.

5. Organisation of the DCM Chair

Design and Construction Management (DCM is a core chair in the Department of Management in the Built Environment (MBE). The mission of the DCM chair will be pursued by a full-time professor (0.8-1.0 fte). Other members of staff will mainly include associate (UHD) and assistant professors (UD), together comprising of a 7.4 full-time equivalent workforce. The chair is also responsible for leading the DCM Section consisting of the chairs of DCM, Building Law, and Public Commissioning, totalling 13.2 FTE. The chair is to continue and improve the DCM research performance, and continue to deliver the chair's educational tasks in designated Bachelor of Science, Master of Science, and post-experience MSc-courses.

6. Teaching Assignment

Within the Faculty's BSc program, the DCM section is responsible for the coordination of the course Society, Process and Planning 2, the 5th BSc Design Studio Project (together with the REM chair, and the department of Urbanism) and the BSc reflection essay. The section contributes to a number of other courses including the courses in the Academic Competency series, the internship course, and 2 honours courses. Within the MSc track on Management in the Built Environment, the chair coordinates several courses: Design and Construction Management (first semester), the Research Methodology Introduction course and the Graduation Thesis Laboratory. The section also provides a major contribution to the Re-Design course (second semester). In and as well as the coaching of a substantial amount of graduation projects.

DCM contributes to the NRP Academy, a professionals' course on renovation and transformation of real estate, founded in cooperation by MBE, NRP, Nyenrode and Utrecht University of Applied Sciences. The section provides graduation thesis mentorship to the 3TU MSc program Construction

Management and Engineering, and supplied instruction in the Master City Developer (MCD), top-level degree course focusing on employing an integrated approach in the development of urban areas offered in collaboration with Erasmus University and the Rotterdam Development Company. Additionally, ad hoc services are delivered to various other universities in the shape of coaching of graduate students and PhD candidates.

7. Activities of the DCM Chair Holder

The tasks of the professor (0.8 – 1.0fte) are to ensure the execution and quality of parts of the Faculty's research programme, to raise funds for the chair's research, to ensure the execution and quality of allocated educational components, to ensure knowledge valorisation and to perform designated management tasks.

7.1 Research

The professor fulfils an important role in one of the MBE department's research programmes: 'Innovations in Management of the Built Environment' (IMBE). This is the research programme in which the MBE sections DCM, REM and UDM work together. In addition, the professor should stimulate collaboration across other research programs within and outside the Faculty of Architecture, including the Housing in a Changing Society program (in which the MBE department is a major contributor).

Research of the chair holder will have a strong academic profile. It is expected that the chair holder will:

- Develop further the academic research programme in the field of Design and Construction Management within the Management and Innovation for the Built Environment (IMBE) framework;
- Acquire research funding from programs such as H2020, INTERREG, and the NWO;
- Undertake (world leading) scientific research;
- Participate as a partner in national and international research projects;
- Initiate and lead international research projects;
- Publish in and edit (international) scientific journals and (national) professional journals; Authoritative journals in the field include: Building Research and Information, International Journal of Project Management, International Journal of Managing Projects in Business, Project Management Journal, Construction Management and Economics, Journal of Construction Engineering and Management, Engineering Project Organization Journal, Design Management and Technology, and Built Environment Project and Asset Management;
- Actively participate in academic and practice-oriented networks;
- Disseminate research results through the organisation of and participation in (inter)national conferences and seminars;
- Recruit and supervise PhD students.

7.2 Education

The chair holder will:

- Develop, organise, execute and evaluate parts of the educational programme within the faculty (BSc programme) and department (MSc programme);

- Supervise MSc thesis students;
- Develop and participate in post academic courses and contract teaching.

7.3 Valorisation

It is expected that the chair holder will:

- take part in the creation of social and economic value on the basis of his or hers scientific knowledge and skills. This may, among other things, include cooperation with companies;
- disseminate knowledge results through activites such as the organisation of or participation in seminars, industry associations, policy groups, living labs, and continuing professional development.

7.4 Management

The chair holder has:

- Management responsibilities for the DCM section including work planning, finance and staffing – all in harmony with the department's chairman;
- Management tasks within the department and faculty.

8. Requirements for the DCM Chair Holder

The candidate for professor must satisfy the following requirements:

- Holding a doctorate obtained at an internationally recognized academic institution;
- Substantial research experience demonstrated through high-quality publications in the fields relevant to design and construction management;
- Broad insight in the disciplines involved in the study of the management of design and construction projects and its connections with other scientific disciplines;
- Experience in setting up and managing interdisciplinary research projects;
- International recognition as a principal researcher and leading project manager of design and construction management research projects;
- Proven track record in acquisition of contract research and other externally funded research, specifically EU grants and national grants such as NWO (the Netherlands) or ESRC (UK);
- International orientation, knowledge of and affinity with developments in the field in Europe and worldwide;
- Very good verbal and written proficiency in English;
- Excellent didactic and communication skills;
- Having a broad research network or the qualities of developing such a network;
- A team worker with sound leadership and management capacities, capable of utilising and developing the competencies of staff.