

THE DEVELOPMENT OF nD CAD

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ABSTRACT

The development of Virtual Design and Construction solutions needs a target- and vision-oriented approach at three levels: international, national and company. This paper provides an overview of both international and typically Dutch initiatives and how they influence developments at company level. As might be expected, it is challenging to match target-and vision-oriented developments. The following questions will be addressed: What are the business drivers? Are these drivers attainable at the company level? What are the technological opportunities and barriers? How are competitive edges defined, and what are the common goals, means and developments at these three levels? Are activities at these levels related from a company perspective? What results can be expected within the next three years?

KEYWORDS

Implementation, Virtual Design, Barriers, Opportunities, Business Drivers

1. INTRODUCTION

Everywhere and at all levels, developments in ICT play a key role in determining development agendas.

This paper provides insight into developments at three levels: European, member state (Netherlands) and company (Royal BAM Group) and in doing so also at policy, tactical and operational level.

2. APPROACH OF THE PAPER

For the development of research policy in Europe, documents from the European Construction Technology Platform are consulted. A wealth of information, mainly on policy, can be found at www.ectp.org [4]. The national association of enterprises, BouwendNederland, shows the approach at national level [2]. The description of Royal BAM Group's activities provides insight

into initiatives at an operational level. The description of the activities at these three levels in section 3 is followed by a summary of opportunities and barriers in section 4. Section 5 contains a short delineation of the expectations for the near future.

3. THREE LEVELS OF INITIATIVES

This section describes the initiatives taken at European, national and company levels.

3.1 European Level

The European Construction Technology Platform has formulated a research policy that reflects political, economic and social ambitions.

‘The European Construction Technology Platform (ECTP) officially endorsed its Vision for a sustainable and competitive sector by 2030 “Challenging and Changing Europe’s Built

Environment” through its High Level Group meeting held on March 1st, 2005 in Brussels. This Vision fulfilled an important need for a long-term perspective on research needs and set ambitious objectives for the sector. ‘In the year 2030, Europe’s built environment is designed, built and maintained by a successful knowledge and demand-driven sector, well known for its ability to satisfy all the needs of its clients and society, providing a high quality of life and demonstrating its long-term responsibility to mankind’s environment. Diversity in age, ability and culture is embraced. Equalisation of opportunities for all is an overarching principle; the construction industry has a good reputation as an attractive sector to work in, is deeply involved in research and development, and its companies are well known for their competitiveness on the local and regional as well as global levels.’

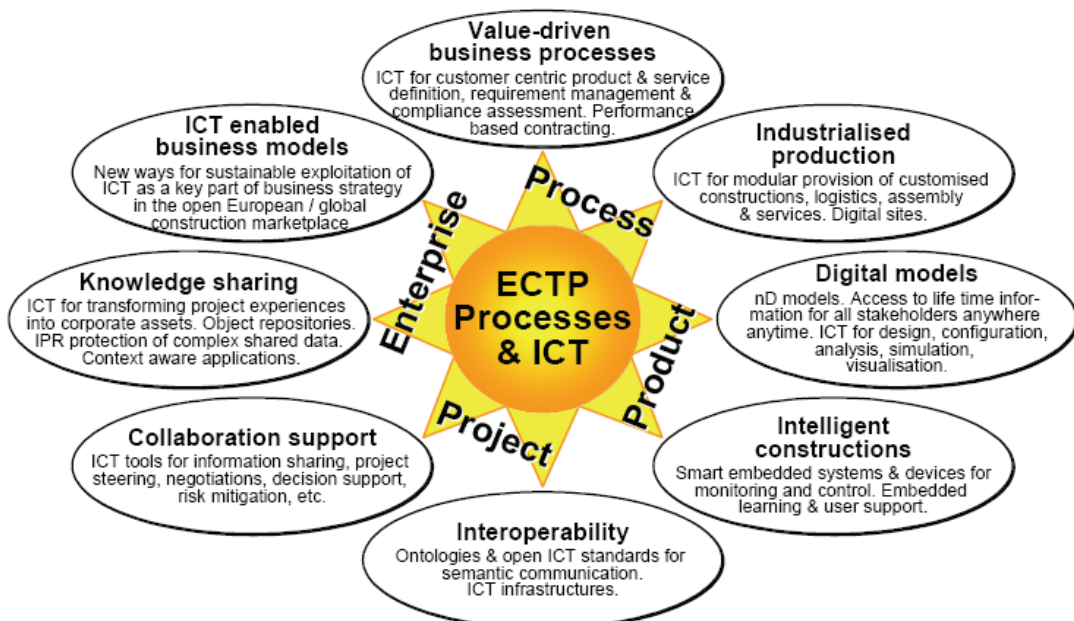
Vision of a sustainable and competitive construction sector by 2030: ‘Challenging and Changing Europe’s Built Environment’. This Vision identified a number of important and desirable objectives that should enable the development of better technologies, and to raising the level of “sustainability” in the sector. This would occur both in terms of the characteristics of the buildings and infrastructures themselves, as well as in the processes of actually carrying out construction works.

The Strategic Research Agenda (SRA) of ECTP was endorsed in December 2005. Based on the objectives set up in the Vision 2030, this SRA was a first attempt to identify a set of Research Priorities organised along three main goals clearly singled out: meeting clients/users requirements, becoming sustainable and transforming the construction sector.

The SRA defines the research that need to be carried out to achieve the vision whilst at the same time taking into account market forces. It is for these reasons that the SRA is inherently difficult to get right and at the same time is a document of crucial importance. Construction is a huge industrial sector that involves more than 2.5 million enterprises. Furthermore, the dimensions of the social demand are multiple, which makes the selection of a coherent set of priorities quite a difficult task. The list of priorities which have been agreed by the ECTP can be gathered in 13 main areas grouped in 3 pillars. [1]

- A. Meeting Client/User Requirements
- B. Becoming sustainable
- C. Transformation of the construction sector.

Innovation is needed to support the growing trend towards integrated construction teams and long-term supply chain collaboration. Although off-site techniques are not applicable in all cases, advanced



manufacturing techniques must be introduced either on- or off-site to enable suppliers and manufacturers to undertake the following: to reduce costs; to enable mass customisation; to reduce installation problems and health and safety risks; to facilitate design; and finally, to improve quality and consistency. The challenge here is to reengineer the construction process, to transform a technology-driven sector, one that is slow to integrate innovation, into a sustainable demand-driven sector, one that is creative, flexible, innovative, knowledge-based, and which offers new business opportunities and attractive work places to all.”

Information and Communication Technology is the main innovation driver in most industries and the principle momentum behind economic growth in the 21st century. Process renewal supported by ICT is the main vehicle of ECTP’s Vision and SRA. Research priorities are presented in four important areas: processes, products, projects and enterprises. Each of these four areas is divided into two complementary areas of research. This leads to eight main research themes [1].

3.2 Dutch National Level

3.2.1 Introduction

Construction companies in the Netherlands are associated in Bouwend Nederland, which has an active Virtual Design Platform. This platform gives the developments in Dutch construction companies a single denominator and provides them with a joint Plan of Action. All companies operate within the same changing environment. ‘If a PPP or other form of integral contract is entered into, it becomes worthwhile to use 3D modelling. 3D modelling can stimulate clear, common work preparations, from design up to execution and even maintenance and/or operation. It should be possible to establish all basic data in the beginning of the project and adhere to them in all of the following stages, with or without controlled changes. A standardised 3D model can provide this. Moreover, a faster and improved cost price overview of the entire project can be obtained at each stage and even one of the whole project life cycle (LCA: life cycle analysis) of the object. In addition, 3D enables an excellent information flow among all construction partners, which makes fixing a contract price less ambiguous and more

transparent. 3D applications should give employees a tool to improve the quality of the delivered product. This improvement becomes apparent in, for example, error cost reduction, less ambiguous price offers, better information flow (e.g. blueprints), easier modification implementation, shorter project terms, better dimensioning, more plan of action support, better information services for licences, visualisation, etc. In the preparatory phase, a wide variety of options can be more easily examined and compared more rapidly, 2D drawings can be generated in the execution phase, the as-built phase can be implemented and during operation, the administrator can use the 3D model for facility management, etc. [2].

This is how ICT can be an aid in internal company process optimisation, as well as an aid for chain integration. In order to achieve this, the following is necessary: ICT basics for exchanging messages and information, product-oriented integration and ICT classification system.

3.2.2 The Dutch approach

During a ‘case week’, various specialists work out a real-life schedule of requirements for a building into a profitable solution. The goal of this case week is to use ICT tools to:

- achieve amazing results;
- learn about using Building Information
- Modelling
- implement new initiatives. [3]

3.3. Dutch Developments at Company Level

The example of Royal BAM Group, one of the leading European construction companies. Royal BAM Group’s ICT policy has 5 themes:

1. Reusable budget frameworks, calculating and planning. This enables better insight into the risks and opportunities, increases offer success rates, makes data reusable in subsequent project phases and enables transparent offers to be made.
2. Client interaction and marketing. Clients are given optimal support in the purchase of their home and individual wishes can be taken into account.

3. Integral design makes it possible to quickly give clients insight into alternatives, including the costs and work.
4. Production planning, which reduces error cost and increases safety.
5. Data integration as a basis for the 4 items above.

4. OPPORTUNITIES AND BARRIERS

4.1 Opportunities

General policy needs determine the goals at the European level. They support general economic and social developments. At the Dutch national level, the co-operation between partners in projects plays an important role. For a company such as Royal BAM Group, the main business drivers are: client contacts, making more transparent offers and data continuity throughout a project's lifecycle.

4.2. Barriers

Lack of leadership: the implementation of Virtual Design & Construction solutions requires re-designing processes and investing in employees and means to benefit from working more collaboratively with new technology. Because VDC is a huge development that affects all internal processes, long-term goals and business drivers should be clear and communicated throughout the organisation.

Lack of collaboration: [NON-COST] investments in consistent data need to be re-allocated upfront in the project.

Complexity: the impact of Virtual Design and construction is enormous. Time is required to explore the re-designed processes and new tools.

Poor tools: although tools evolve quickly, many of the applications are not object-oriented.

5. EXPECTATIONS FOR THE NEAR FUTURE

If the number of opportunities for collaboration increases in the near future, chain integration will help optimise many parts of the processes. Clients can expect better and more need-driven information and companies will be able to operate more rapidly and with less error costs.

6. REFERENCES

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