

UNIVERSITY OF TWENTE.

## BIM MATURITY SECTOR ANALYSIS - 2014

A picture of the BIM developments in sub sectors of the Dutch construction industry

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## MANAGEMENT SUMMARY

This summary presents the results of the BIM maturity sector analysis 2014, which was conducted on the authority of the Building Information Council (in Dutch abbreviated by BIR) and the Dutch Association for Purchasing Management (in Dutch abbreviated by NEVI). The goal of the research was to get a picture of the BIM developments within the various sub sectors of the Dutch construction industry (both organisations within the commercial and industrial building and civil engineering have been examined). The research focussed on the BIM maturity at the organisational level as well as on BIM best practices. This has provided insights in the mutual differences and similarities of the sub sectors. On the basis of the BIM maturity sector analysis' results, priorities have been identified to stimulate the BIM implementation process of the sub sectors.

In order to enable the measurement of organisational BIM maturity, a BIM maturity model has been developed. Subsequently, this maturity model was translated to an interview format to enable data collection from in-depth interviews. The interview process was supported by master students of the University of Twente, who took more than 50 interviews in the autumn of 2014. These organisations have been subdivided in seven sub sectors, namely architect's firms, engineering firms, contractors of commercial and industrial building, contractors of civil structures, MEP contractors and suppliers. Since the organisations with less focus and experience in BIM were often lacking the willingness to participate in the research, the conducted interviews mainly provide insight in the BIM maturity of the leaders in the industry. Therefore, the results of the research do not provide an average representation of the building industry.

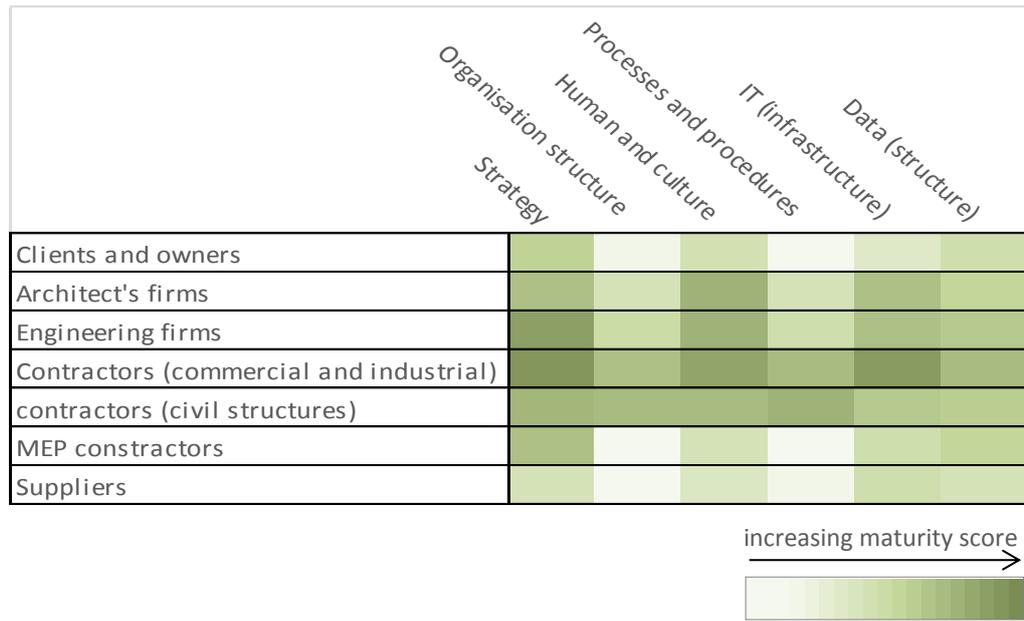
Moreover, one should be aware that an organisation does not require the highest maturity level on all the BIM criteria in order to work (or cooperate) in a BIM project. Nevertheless, the maturity scores provide valuable insights in the aspects an organisation needs to focus on for professionalising its use of BIM.

The BIM maturity sector analysis in 2014 formed the first phase in a two-year design project, which aims at developing a BIM maturity model and BIM best practices. The results of this sector analysis and the accompanying full report (available in Dutch) should be seen as the first deliverable of the two-year design project. The next step will comprise an evaluation of the BIM maturity model based on the outcomes and experiences during the sector analysis. The resultant points for improvement should be accounted for in the further development and refinement of the BIM maturity model. This improved maturity model will be used for a second sector analysis in 2015, which will widely assess the BIM maturity of the industry by means of a survey. Next to this, some case studies will be used to investigate the BIM maturity and BIM best practices on the project level in more detail.

## BIM MATURITY

The BIM maturity of organisations is evaluated on the basis of several criteria. The figure on the next page shows the BIM maturity of the interviewed organisations per sub sector on each of the criteria. Some of the most remarkable outcomes are discussed hereafter.

**FIGURE 0.1 MATURITY SCORES OF SUB SECTORS PER BIM MATURITY CRITERION**



Almost all of the distinguished sub sectors scored high on the criterion strategy. This implies that the management of organisations attaches value to the BIM development by setting an organisational BIM vision, BIM goals and specific BIM implementation plans. Furthermore, this criterion involves the allocation of financial resources as well as the provision of BIM experts who support the implementation process.

Secondly, the results show that organisations still can gain a lot of progression on the formalization of tasks and responsibilities (criterion organisation structure) and on the formalization of processes and procedures regarding BIM. It appears that these aspects often have stayed behind in the fast BIM development over the last years. This shortcoming makes BIM processes highly dependent on individual competences, which could lead to divergent BIM performances, e.g. between projects or between internal departments.

Furthermore, many respondents emphasise the importance of the human and cultural aspects with respect to a successful implementation of BIM. This criterion already receives quite some attention by the front runner organisations in the interviews, which can be explained by their efforts to provide clear BIM information to employees, demonstrate the advantages of BIM for people’s own work and the advantage it may entail for work of project partners or other disciplines. In addition, the active guidance to employees in the practical context and the presentation of case studies (experiences) is essential. The aforementioned aspects can be helpful to encourage the motivation of employees for adapting to the BIM method of working.

## BEST PRACTICES

Besides questions related to the BIM maturity criteria mentioned above, a considerable part of the interviews was devoted to questions about:

- **BIM uses**, which describe the various ways BIM can be applied in practice, for example visualisation of objects via the 3D building model or generating quantities from the building model.

- **Implementation sequence** of the BIM uses, providing insight in the process of BIM implementation an organisation have gone through.
- **Motives** for implementing BIM, which stimulate the use of BIM within an organisation, like increasing the efficiency of business processes or reducing the failure costs on projects.
- **Barriers** for implementing BIM, which hinder the use of BIM within an organisation, like lacking standards for the exchange of data or lacking motivation to carry through the transition to BIM.

The above-mentioned aspects are called the BIM best practices. In the following paragraphs, the interview results of the best practices are discussed.

The most important motives for BIM were found in the own intentions to work with BIM in the sense of working more efficient and reducing failure costs as well as in the external request of the client. The dominance of the external motive is often corresponding to a limited strategic BIM planning and a more flexible position within projects. With respect to the latter, firms are led by the varying demands of clients, like owners and (main) contractors.

Considering the barriers for implementation and further development of BIM, the diversity is much wider. The lacking availability of well-developed and adopted information standards and data exchange standards was often mentioned in relation to the growing number of BIM uses aiming at multi-disciplinary collaboration. Furthermore, the degree of BIM knowledge and experience in the organisations forms an obstacle for implementing new BIM uses. Next to this, respondents criticized the BIM maturity of project/strategic partners. If these partners cannot cope with the intended BIM methods or if they cannot deliver what they've promised in advance, the desired/required project result won't be achieved. Moreover, some interviews revealed the need for improved contractual embedding of BIM. This should address a reconsideration of arrangements with respect to (changed) responsibilities, risks and payments in the context of BIM.

The BIM use 3D coordination (clash detection / interface management) is considered as the most important from the perspective of several sub sectors. This can be explained by the added value this BIM use provides by supporting the process of tracking and solving problems in the virtual BIM environment before the actual on-site construction process starts. In this way, it is an effective method to reduce the failure costs. On the other side, clients and owners attach great importance to a BIM oriented delivery file and the application of BIM for a consistent, up-to-date and reliable source of information during the maintenance and control of assets. Considering the suppliers, the importance of BIM is more focused on feeding their production process with information from the building model.

Looking at the future of BIM, applications are supposed to require more extensive and more accurate data from the building model. Examples of such applications are already apparent at some of the interviewed organisations, like linking BIM with cost estimates and calculations (5D BIM), advanced visualisation and simulation techniques (for example for optimisation or "walking through" the model in a virtual reality environment) and the integration of maintenance and control systems with BIM. In addition, organisations dealing with the on-site construction activities are making efforts to integrate their execution tasks with BIM by means of wireless technology (tablets, laser and machine guidance techniques, RFID-tags).