Open information exchange (BIM) of National Road Authorities is of vital importance for Asset management

CEDR
Conférence Européenne des Directeurs des Routes
Conference of European Directors of Roads

National Road Authorities (NRAs) are becoming more and more dependent on the information about their network during their whole lifecycle.

Therefore information is of vital importance for the fulfilment of the responsibilities of the NRA. These are:

- Providing the infrastructure for safe traffic and facilitating transport at all times
- Providing asset information about the state of their network.

For the maintenance of existing networks, asset managers need reliable information for the day to day operation of the road as well as for their strategic planning. Among the NRA's it is well known that inefficiency in information exchange may lead to:

- Extra failure costs;
- Extra costs due to wrong delivery;
- Extra transaction costs;
- Poor delivery of information to database systems;
- Vendor locked in situations due to the use of proprietary IT standards (e.g. company specific) in software products.

Therefore NRA's and other public authorities (from buildings) are investing in building information management tools based on open standards for information exchange and structuring data (so-called Open BIM). The open character is important because this may create a level playing field for all market parties. This is a leading principle for the work carried out by government organizations. With the use of open standards it becomes possible to exchange digital information in a vendor neutral fashion without any loss. Not only for design and construction but also for asset management this is an important development because BIM is a key to their business.

CEDR "standardisation of information"

CEDR, the Conference of European Directors of Roads, has acknowledged this and launched a strategic project on "standardisation of information" - encoded CEDR S3 Information. In this project NRA's from a number of European countries (The Netherlands (chair), Sweden, Norway, Finland, Denmark, United Kingdom and France) who are active in the field of building information management, collaborate together. The goals of the project are:

- Sharing knowledge about open BIM; building a sustainable International (social and knowledge) community;
- (More effective) influence on EU decision making, regarding development, maintenance and use of open standards;
- Shared investments in the development and use of open standards to a larger extent.

BIM modell: Trondheim Kommune/Statens Vegvesen

Their first deliverable is the publication of their interim report, published in June 2015. In this publication the 'state of the art' has been used to describe the application of open standards.

A short impression of results

BIM stands for Building Information Management (or Model) and is used in the construction industry; until now mainly in buildings but now it can also be used for infrastructure. "Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle." Source: National Building Information Model Standard Project Committee (USA).

As an Asset-owner/-manager, NRA's want good information to manage their maintenance and construction portfolio. Market parties use BIM to reduce their failure costs and to improve the quality of their constructions/infrastructure.

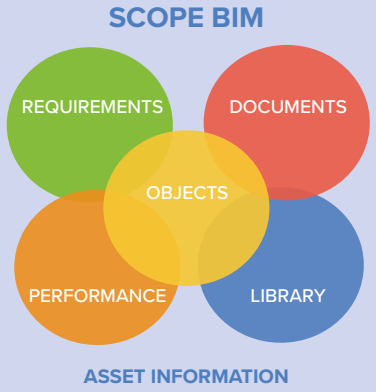

Figure 1: BIM scope concerns Asset Information of the infrastructural objects and their related documents, requirements and Performance

Standardisation and simplification of the working processes of your NRA and improved validation of your data and improved infrastructure at lower costs is the expected result of using BIM. BIM will be one of the most important drivers for transition in the infrastructure sector. Constructors work on a European level and Infrastructure objects should therefore use uniform definitions (one language) to describe them, one classification to structure them and they should be procured in such a structured way.

Implementation of BIM in the infra sector will benefit road authorities. Studies show that savings can be up to 10% of the building/construction costs. Information loss during construction phases can be limited using BIM and related failure and communication costs as well. For adequate life cycle management of the infrastructure at NRA's, good asset information is essential.

North-Western European NRA's show the benefits of BIM in their ongoing projects. Although calculation and monitoring is sometimes difficult in large projects (due to market and political changes), literature clearly states that the use of BIM reduces costs of infrastructure and building projects for up to 10%. The main benefits of BIM are:

- Reduction of failure costs and reduction of transaction costs;
- Better communication with stakeholders;
- A solid information base for Asset Management and life cycle management;
- More transparency and better accountability at political level;
- Clear contracting and efficient working processes leading to better infrastructure quality.

Starting with BIM at your NRA has to be done step by step, because some risks are involved. If you ask market parties to use BIM-models, then your NRA's information need has to be the basis. BIM models tend to become big, so make sure what kind of information you need in the Maintenance phase in order to limit the size. All digital data has to be operated, which might involve high costs to maintain and might need specific applications/databases in order to use it yourself.

There are different BIM approaches, some of them starting bottom-up from a technology push and some of them starting more top-down from a strategy pull, or a combination. There are also differences between the countries because of:

- Maturity of the organisation and policy setting;
- Maturity of BIM development and technical knowledge;
- Current efficiency in dealing with (digital) information;
- Effectiveness of BIM implementation in project practice;
- Chain connection in the sector as a whole.

The maturity aspect in general shows that the section management and organization has a relatively high score (more developed) and the section technology and applications seem to lag behind. The aspects (tools, mentality and education) have a lower score (less developed). This corresponds to the barriers for BIM adoption as found in literature (NBS report 2013). General current software products need to become accustomed to new open standards.

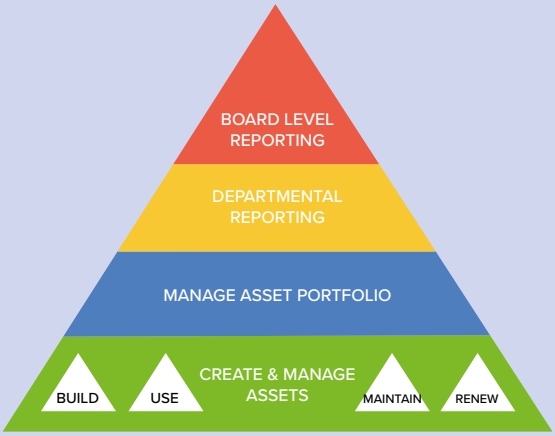

Figure 2: Different information products at different asset management levels

The European CEDR S3 countries invested about €59m in BIM development programmes for the period 2007-2017. The investments are carried out on national level, but the S3 countries feel a need for development on a European level via a joint investment (recently granted by a CEDR BIM call; Assetinformation using BIM in 2016-2018). BIM implementation projects at NRA's are delivered in OpenBIM (often created in 'closed' BIM in the supply chain) and are mostly at the design and construction level.

The BIM implementation projects in the different countries show that there is a real market for open data and OpenBIM technology, and also a clear need from the CEDR S3 countries. Via open standards we can use structured open data, which is a basis for developing tools/apps. NRA's can use the structured open data during the lifecycle (data models will not change but the technology will, via open data standards; there is no vendor lock-in). So it is about interoperability, which will be important for modern methods of asset management.

The total order portfolio for the design, construction and maintenance of roads in Sweden, Finland, Norway and the

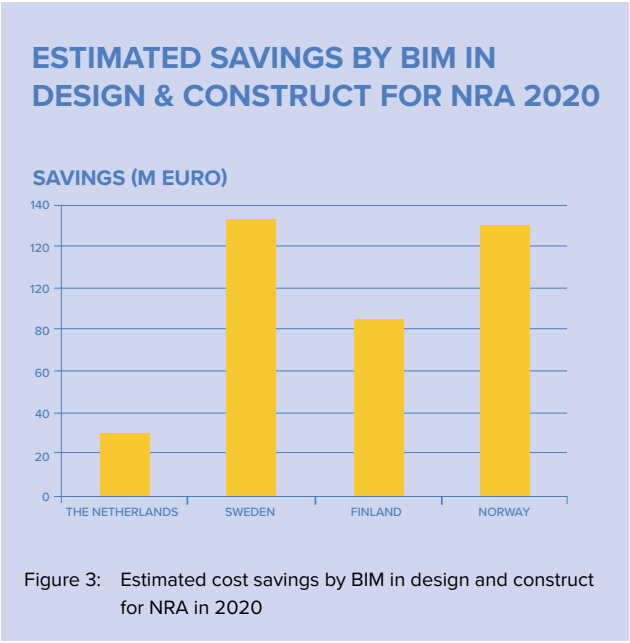

Figure 3: Estimated cost savings by BIM in design and construct for NRA in 2020

Netherlands together in 2014 was €12.2bn. The design and construction order portfolio of these countries is €4.6bn. The estimated structural cost savings for these countries for design and construction is about €378m per year from 2020 and beyond (ca 8.2%), based on the amount in the portfolio 2014. In 2025 this percentage is set to become even higher: about 30% in the UK ("three for the price of two").The total cost savings, with the order portfolio for maintenance taken into account, will be even higher. It is important that there is a stronger connection to asset management; the awareness has to grow. There is a very high return on investment in BIM programmes versus cost savings.

Conclusions and next steps

Conclusions we have drawn are:

- Management of information is becoming of vital importance for NRA's and has a big effect on costs and quality (such as the structural savings on failure costs);
- Markets are becoming more international and harmonising on a European scale is therefore needed;
- A sustainable governance structure for OpenBIM standards is important for realising cost savings and to implement the EU policy on open standards in an effective way.

The next steps of the CEDR S3 Information project will be in collaboration of BIM with the European Commission (dissemination through articles/reports and the funding of projects), and involvement and alignment with the CEDR projects on asset management, standardisation, and procurement.

The need for an EU OpenBIM policy in the construction industry

The NRA's of CEDR S3 are active in a number of fields and co-operate closely with the construction companies in their countries. At a national level, they are active in BIM implementation aiming to embed and to practice OpenBIM in the procurement of infrastructure and national standardisation. In these countries BIM also has a focus on buildings and housing, and BuildingSmart International aligns by aiming to develop international standards for the construction industry.

The EU supports a number of projects, such as Connect and Construct (BIM for SME's) and Virtual Construction of Roads (V-con) and DG Growth supports the EU BIM Task Group. The latter is a network of client organisations in Europe aiming at sharing knowledge and experience and embedding OpenBIM in European procurement. Furthermore European standardisation was started by a CEN group on BIM in 2015. However, the implementation process is rather slow in the EU construction industry as compared to the rate of development of innovation in the IT sector. This is because it is not only complicated on a technical level but also the implementation has a severe impact on the working processes. The IT sector is willing to invest, but lacks a common understanding of the working process and semantics at NRA's and European level. The NRA's therefore believe that there is a need for acceleration in order to benefit from the recent innovations in the IT sector. These innovations will stimulate and support innovation in the construction industry.

The European Commission especially could play quite an important role as a catalyst for the stimulation of OpenBIM via their instruments, such as the funding programmes on European infrastructure and innovation, legislation and guidelines regarding procurement and interoperabilty. After all, it is in the collaboration of two sectors where the rate of innovation is the highest. Europe needs a BIM policy, it needs to be innovative in construction IT and public clients must support this!

Also see: S3 Information - Interim Report CEDR

Further information:
Herman Winkels, Rijkswaterstaat, The Netherlands (herman.winkels@rws.nl)
Tiina Perttula, Liikennevirasto, Finland (tiina.perttula@liikennevirasto.fi)