# BIM Adoption and Implementation – Lessons from Denmark

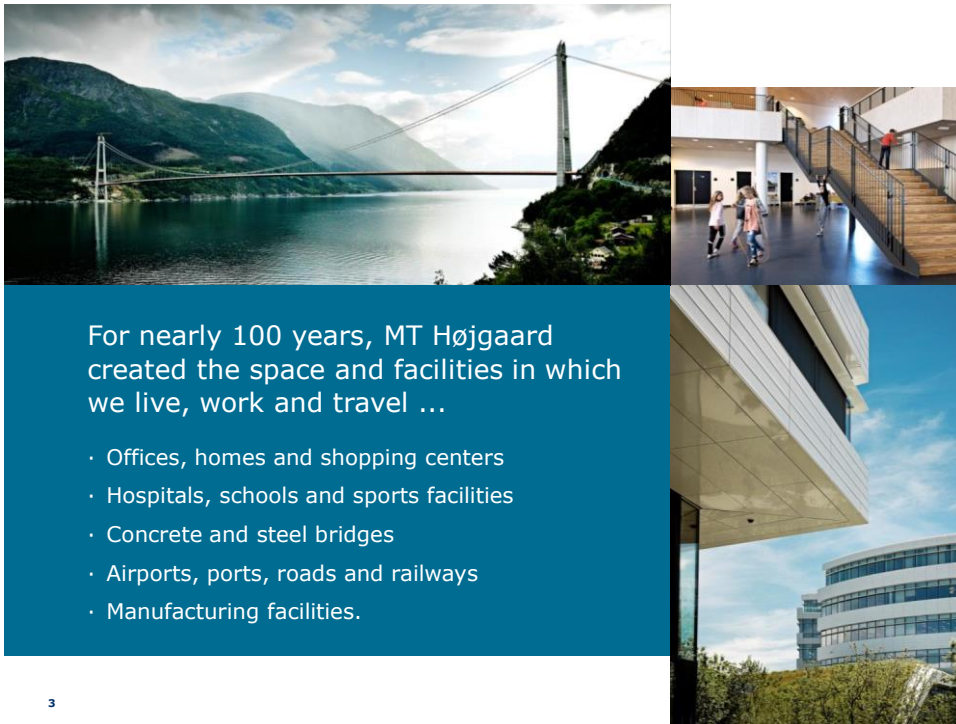5. May 2016

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# BIM Adoption and Implementation – Lessons from Denmark

Agenda:

I. **MT Højgaard** | The contractor

II. **Lessons from Denmark** | Sharing Best practices from our projects – spring 2016

III. **BIM Adoption and Implementation** | Denmark and Canada

IV. **Best practices as open source** | Sharing tools and best practices from our projects

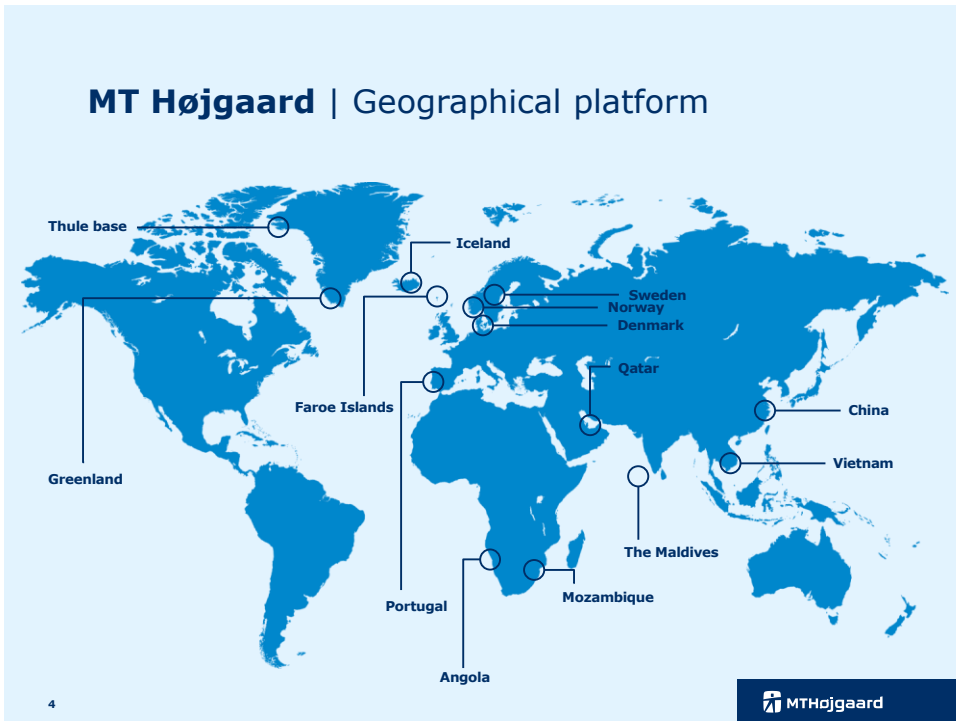V. **Next step** | Incorporating international experiences

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For nearly 100 years, MT Højgaard created the space and facilities in which we live, work and travel ...

· Offices, homes and shopping centers
· Hospitals, schools and sports facilities
· Concrete and steel bridges
· Airports, ports, roads and railways
· Manufacturing facilities.

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## MT Højgaard | Geographical platform



Thule base

Iceland

Sweden
Norway
Denmark

Qatar

China

Faroe Islands

Vietnam

Greenland

The Maldives

Portugal

Mozambique

Angola

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**MT Højgaard** | The collaboration with BIM

# We execute the project virtually - before we build in real life



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**Lessons from Denmark**

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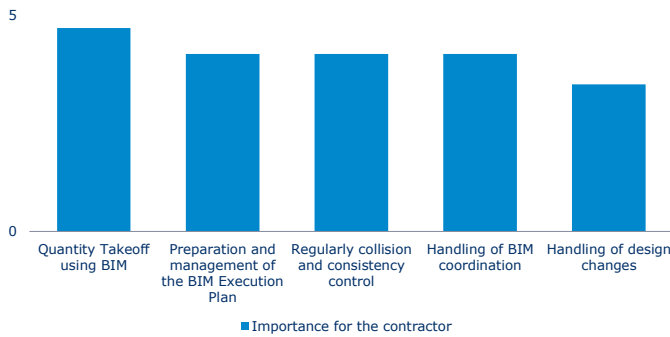
## Lessons from Denmark | Sharing Best practices from our projects – spring 2016

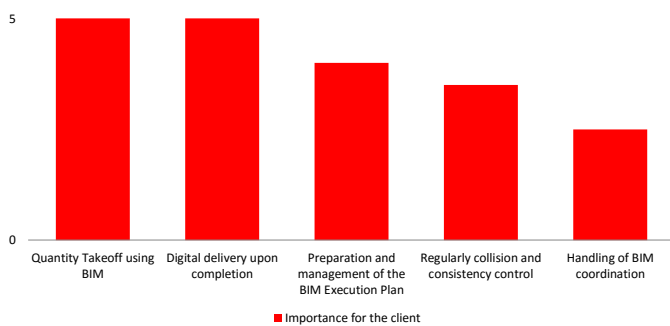**The BIM initiatives that give the contractor the greatest value**



■ Importance for the contractor

Source: white paper: The strength of the local BIM efforts in a larger perspectiv – May 2016

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## Lessons from Denmark | Sharing Best practices from our projects – spring 2016

**The BIM initiatives that give the greatest value to the client**



■ Importance for the client

Source: white paper: The strength of the local BIM efforts in a larger perspectiv – May 2016

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**from Denmark** | Sharing Best practices
Adoption in Denmark – Spring 2016

*We can not always do everything, but we can always do the most important.*

**The BIM initiatives that give the greatest value to the construction project**



Legend: ■ Importance for the contractor ■ Importance for the client

Source: white paper: The strength of the local BIM efforts in a larger perspective – May 2016

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**Lessons from Denmark** | Sharing Best practices from
BIM Adoption in Denmark – Spring 2016



*We have a framework with requirements and weighting of value*

Source: white paper: The strength of the local BIM efforts in a larger perspective – May 2016

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# Lessons from Denmark | Sharing
## BIM Adoption in Denmark – Spring 2016

**We use IFC every day**

| Weighting on a scale of 1 -10, where 1 is least important for the client (Regarding Value) | The contractors BIM proces | The ICT regulations requirements | The text of the ICT regulation 118 |
|---|---|---|---|
| 10 | Quantity Takeoff using BIM | Handling of digital construction objects (classification, bill of quantities .) | 9. To the extent that the tender includes bill of quantities, the Client must ensure:<br>3) that models are made available to the bidder in **IFC** format |
| 10 | | Digital delivery upon completion (IFC objects and properties, "as built") | 10.-(2) The Client must ensure:<br>3) that object-based construction models are provided in **IFC** format. |
| 8 | Preparation and management of the BIM Execution Plan | ICT agreement | 7.-(1) During project design and execution the Client must require that object-based construction modelling be used. |
| 7 | Regularly collision and consistency control | Use of digital construction models (IFC, collision control) | 6.-(2) The Client must ensure:<br>3) that object-based construction models are provided in **IFC** format.<br><br>7.-(2) The Client must ensure:<br>4) that the models are made available in **IFC** format. |
| 5 | Handling of BIM coordination | ICT coordination | 3. The Client must ensure that throughout the construction project there is coordination of the overall use of ICT between all of the parties involved. |

Source: white paper: The strength of the local BIM efforts in a larger perspective – May 2016

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# Lessons from Denmark | Sharing
## BIM Adoption in Denmark – Spring 2016

**We use IFC every day – also in the BIM collaboration**

| Weighting on a scale of 1 -10, where 1 is least important for the client (Regarding Value) | The contractors BIM proces | The ICT regulations requirements | The text of the ICT regulation 118 |
|---|---|---|---|
| 10 | Quantity Takeoff using BIM | Handling of digital construction objects (classification, bill of quantities .) | 9. To the extent that the tender includes bill of quantities, the Client must ensure:<br>3) that models are made available to the bidder in **IFC** format. |
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Source: white paper: The strength of the local BIM efforts in a larger perspective – May 2016

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## Lessons from Denmark | Sharing Best practices from
BIM Adoption in Denmark – Spring 2016



White paper regarding the Danish BIM framework and BIM adoption

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## Lessons from Denmark | Sharing Best practices from
BIM Adoption in Denmark – Spring 2016



BIM in Canada

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**BIM Adoption and Implementation –** What the Canadian and Danish community are doing similarly

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## BIM Adoption and Implementation | What the Canadian and Danish community are doing similarly

I. BIM implementation is hard and take a long time – but worth the effort

II. Developing BIM training packages with educational institutions

III. Openness to look at BIM in an international context.
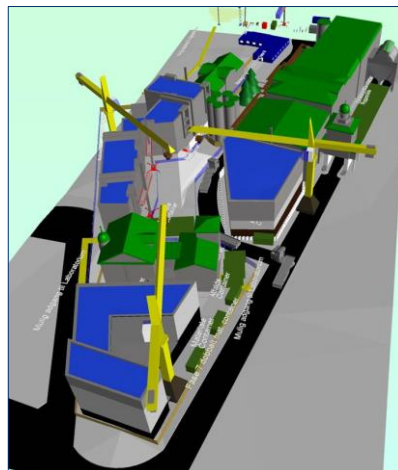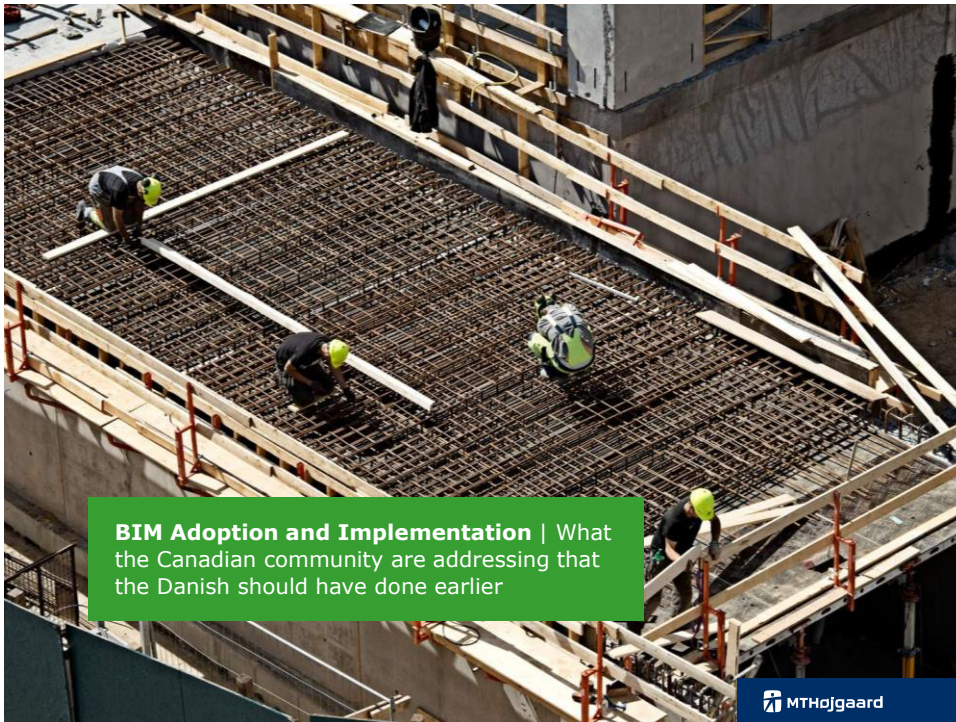


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**BIM Adoption and Implementation** | What the Canadian community are addressing that the Danish should have done earlier

# BIM Adoption and Implementation | What the Canadian community are addressing that the Danish should have done earlier

I. Openness about a number of national issues involving BIM is included in the BIM development

II. A BIM Roadmap for the National BIM development

III. Openness about the national BIM implementation.
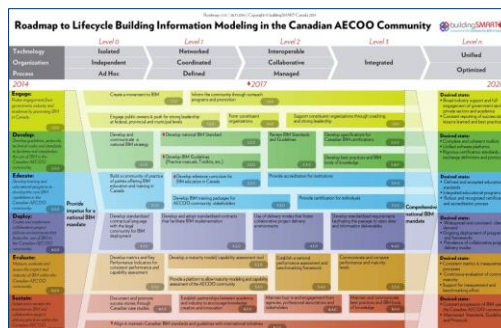


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**BIM Adoption and Implementation** | What the Danish community have done differently that we can recommend to others

# **BIM Adoption and Implementation** | What the Danish community have done differently that we can recommend to others

Applying our open source approach by sharing the value of the digital collaboration across our projects using BIM and open standards (IFC) and relevant requirements in the form of the Danish ICT Regulation 118

I.  The current **framework for digital collaboration using BIM in public construction projects** in Denmark came into effect in April 2013 in the form of ICT Regulation 118

II.  Denmark leads the way in **IFC use**

III.  **Systematic analysis of the digital deliveries** (BIM) on construction projects.
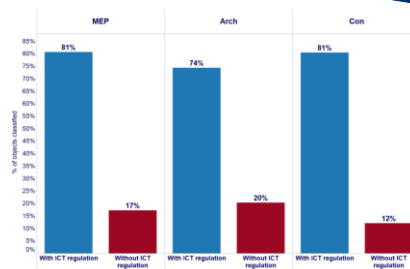


Source: white paper: Addressing classification in the Danish AEC industry – June 2015

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We don't have a BIM-Roadmap in Denmark, but….

## National BIM-framework in Denmark from 2013

Since April 2013, Denmark had a BIM framework for all public building projects in ICT Regulation118 and for all subsidized housing in ICT Regulation 119, and accordingly the industry has adapted its practices and paradigms for the BIM tools for our digital collaboration with BIM:

Government construction projects of at least 0.96 Mio CAD

and

other public construction projects at minimum 3.8 million CAD.



Standard for BIM on public construction projects

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## **Best practices as open source** | BIM educational materials



Developing BIM training packages with educational institutions

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## **Best practices as open source** | BIM educational materials



Establish partnerships between academia and industry to encourage knowledge creation and innovation, e.g PhD students

Cooperating with the educational institutions, so trainees and students can work with BIM on our construction sites

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## **Best practices as open source** | PhD research

The research at MT Højgaard is also based on practices in Canada:

2009-2010: Senior Project Manager and Office Project Coordinator with Integrated Designs Inc., Saskatoon, SK, Canada

(http://www.i-designs.ca/)

2007-2010: Employed as graduate architect and project administrator with Genesis Network part of SNC Lavalin Inc.

(http://www.snclavalin.com/)



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## **Best practices as open source** | Sharing the tools from our projects



Develop BIM Guidelines (BIM_manuals, Toolkits, etc.)

## **Best practices as open source** | The level of development (LOD)



Align & maintain BIM standards and guidelines with international initiatives, e.g. COBie and LOD

Available language:
English
Norwegian
Danish
Upcoming language:
German
Icelandic.

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## **Best practices as open source** | The level of development (LOD)



Develop and adopt standardized contracts that facilitate BIM implementation - Annex 9a and 9b of our contracts

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## Best practices as open source | Sharing our insights

Maintain and communicate best practices and BIM body of knowledge

**BUILDING THE FUTURE TODAY**

A practical guide to BIM in construction and infrastructure projects

Appendix 2: BIM Coordination – Guide

Create a movement to BIM and engage public owners & push for strong leadership at national and municipal levels

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## Best practices as open source | Sharing Best practices from our projects in white papers

Develop metrics and Key Performance Indicators (KPI) for consistent performance and capability assessment

**Quality of Design Documentation in Denmark**

- 14%
- 37%
- 49%

Low / Medium / High

**Quality of Design Material for Projects Covered by the ICT-regulation**

- 7%
- 16%
- 77%

Low / Average / High

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## **Best practices as open source** | Sharing Best practices from our projects in white papers

The results show a 33% increase in the quality of the design material when projects include IFC as a part of the design material – August 2014



The use of IFC within the frame of a national ICT regulation contributes with 45% higher design quality compared with non-IFC projects

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## **Best practices as open source** | Sharing Best practices from our projects in white papers

Projects covered by the current ICT regulation 118 has a 205% increase in BIM value compared to projects covered by other BIM-frameworks – December 2014



Establish a national performance assessment and benchmarking framework

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## **Best practices as open source** | Sharing Best practices from our projects in white papers

The individual disciplines ability to use classification is also influenced by the framework of the ICT regulation 118, the percentage of classified objects increase by 270% - 575% - June 2015



The right requirements ensure the necessary for the BIM collaboration

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## **Best practices as open source** | Sharing Best practices from our projects in white papers

This paper provides insight to how a data driven approach is used to provide a better use of BIM – October 2015



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## **Best practices as open source** | Sharing Best practices from our projects in white papers

The client must require that:

I.   The overall framework for digital collaboration requires that all parties must ensure that their digital production can be used by and together with other stakeholders in the project.

II.  The collaboration shall at a minimum take place around an open industry standard as IFC (Industry Foundation Classes). The goal is that the project's BIM shall provide the client with a good basis for decision-making in terms of execution time, total cost of ownership and subsequent operation and maintenance.

III. The contractor must be involved as early as possible in order to realize the project. The first focus must be on the choice of solutions and 4D production planning that enhances project efficiency and reduces execution time by up to several weeks. The early involvement of the contractor will also contribute to more effective production and the client will have high-quality buildings and infrastructure assets, among other things because project documents based BIM results in less rework.

The client that translates these recommendations to the requirements contained by the project's BIM Execution Plan ensure a framework for collaboration where the projects profitability is increasing and the stakeholder's exposure to risks and conflicts is reduced – March 2016

*Develop a maturity model/ capability assessment tool*

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**Next step** | Incorporating international experiences
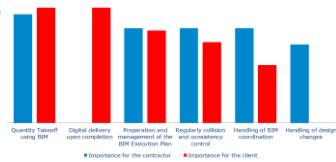
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## **Next step** | Incorporating international experiences

The Danish ICT Regulation 118 can be used as a paradigm for a BIM-framework:

I.   The paradigm may be divided and given priority in relation to the resources that industry and organizations in Canada have available

II.  The paradigm has a relationship between requirements and the effect for both the contractor and the client

III. The paradigm is supported by analysis and measurement tools regarding BIM from the period 2014-2016.

Source: white paper: The strength of the local BIM efforts in a larger perspective – May 2016

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