Structuring the Adoption and Implementation of BIM and Integrated Approaches to Project Delivery across the Canadian AECO Industry: Key DRIVERS from abroad

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Canadian AECO industry

CapEX 2013 = $290G

1.4 M employment

20% Canadian GDP

= 7.5% Workforce

(Statistics Canada, 2014)
(OCDE, 2014)
Construction industry alone ≈ 7% of provincial GDP
Canadian AECO industry

Complexity

Resistant to change

Fragmentation

Notion of value is poorly defined
Canadian AECO industry

10-15% additional cost
(Engineers Australia, 2005)

57% non-value added activities
(Forbes & Ahmed, 2011)

30% waste at worksite
(CURT, 2004)

design errors =

78% quality problems
(Koskela, 1992)

+ 25% construction delays
(Undurraga, 1994)
Canadian AECO industry

**International Consensus**

Strategic reform of the industry
Adoption of innovative approaches

- Integrated Approaches
- Building Information Modeling
- Lean Construction
Initiatives around the world

UK
Total reconfiguration of practices

Scandinavian countries
Technological Advancement / Innovation

USA
Increase performance

Singapore- Korea
Direct interaction with industry
Financial Incentives / academic

Strategic Action
How can the Canadian AECO industry:

1. learn from other countries’ experiences in the transition to innovative project delivery approaches?

2. develop a comprehensive reform strategy in order to improve its performance and efficiency to ensure its sustainability and competitiveness?
BIM adoption in Canada
Current situation

McGraw Hill construction

- 2009: 49%
- 2012: 72%
- 2014: 87%

NBS + IBC 2013

- Canada: 64%
- Finland: 65%
BIM adoption in Canada
Current situation

Limited results
Small sample size
Respondents - familiar with BIM

McGraw Hill construction
2009: 49%
2012: 72%
2014: 87%

NBS + IBC 2013
Canada: 56%
Finland: 64%

Additional notes:
- Limited results
- Small sample size
- Respondents familiar with BIM
BIM adoption in Canada
Current situation

Gaps between the Canadian AECO industry and American industry

Transition to BIM
To be endorsed by public clients
To be supported by research and professional associations

(Forgues and Staub-French, 2011)
Key Drivers for Canada

- Reporting and promotion of BIM
- Designated organizations
- Clear information exchange requirements
- BIM standards and guidelines
- BIM research programs
- Public sector
- Governmental Policy

(Wong et al., 2010)
1. Public sector

International

• Recognition of the power of the public sector as a key actor in the reform of the AECO industry

• A specific government department leads the initiative

• Investments

Canada

• The complexity of multi-layered governmental context

• The need for a national initiative

• National framework for innovative project delivery adapted at all levels of government

A National Building Code for BIM?
# 1. Public sector

<table>
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<tr>
<th>Country</th>
<th>Organization</th>
<th>Investment</th>
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| United Kingdom | BIM Task Group                                   | Public sector funding  
Mobilisation - £ 1.4 million  
Operations – £ 480 000 / year (5 years)  
Total – £ 3.86 million ($ 6.94 million CAN) |
| Finland      | Tekes                                            | Public and private sector funding  
Pre program at RYM oy. R & D – € 21.7 million (4 years between 2010 and 2014) ($ 30.9 million CAN) |
| Norway       | Statsbygg                                        | Public and private sector funding  
R & D – € 21.7 million (4 years between 2010 and 2014) ($ 30.9 million CAN) |
| Singapore    | Building Construction Authority (BCA)            | Public sector funding  
BIM fund – cover up to 50% of costs associated to BIM adoption within firms:  
12 millions SGD ($ 10.4 millions CAN) |
| France       | Transition committee                             | € 20 million for a road map |

**Investment**
2. Governmental policy
2. Governmental policy

No formal policy mandating BIM implementation on all public projects in Canada

Four separate initiatives

Space management and open BIM
Royal Alberta Museum pilot project
Several small pilot projects
Moose Jaw Hospital
2. Governmental policy

No formal policy mandating BIM implementation on all public projects in Canada

Four separate initiatives

Fragmented policies across the county

Space management and open BIM
Royal Alberta Museum pilot project
Several small pilot projects
Moose Jaw Hospital
3. BIM standards and guidelines

Presence of so many different standards
Problem for broadcasting a consistent message and gaining traction within the industry
3. BIM standards and guidelines

Advantage for Canada

Benefit from the **efforts and lessons** learned of other countries in developing its standards

Toolkits, Practice Manual and contract language document

AEC (Can) BIM Protocol
4. Clear information exchange requirements and open standards

**International**

- An international consensus:
  - The use of the exchange standard provides relative stability and confidence

- Joint statement in 2008 to support open BIM (IFC)
  - GSA, Senate Properties, Statsbygg and DECA (Denmark)

**Canada**

- Reconfiguration of practice
- Requirements for reuse of information over the product lifecycle
5. Designated organizations for BIM implementation and promotion

- **TOP**
  - Government

- **Bottom**
  - Industry

**Designated organizations for BIM implementation**

- BIM task group - UK
- BCA – Singapore
- Professional associations – AIA, RIBA
5. Designated organizations for BIM implementation and promotion

In Canada

The need for an organization mandated to lead the national initiative

All professional associations to support and buy into this initiative

- National level: IBC, hSC, CanBIM
- Provincial level: aceBIM, BIM BC User

TOP
Government

Bottom
Industry
5. Designated organizations for BIM implementation and promotion

Roadmap to Lifecycle Building Information Modeling in the Canadian AECOO Community

- Level 0
  - Isolated
  - Ad Hoc

- Level 1
  - Networked
  - Coordinated
  - Practices

- Level 2
  - Interoperable
  - Collaborative
  - Managed

- Level 3
  - Integrated

- Level 4
  - Unified
  - Optimized

2014
- Engage: Foster engagement from government, industry and academia to promote BIM in Canada
- Develop: Develop policies, protocols, technical codes and standards to facilitate and standardize the use of BIM in the Canadian AECOO community.
- Educate: Create training and educational programs to develop the core BIM capabilities in the Canadian AECOO community.
- Deploy: Create and implement collaborative project delivery environments that frame the use of BIM in the Canadian AECOO community.
- Evaluate: Measure, analyze and assess the impact and maturity of BIM within the Canadian AECOO community.
- Sustain: Adopt and maintain the transition to BIM and collaborative project delivery practices within the Canadian AECOO community.

2017
- Engage public owners & push for strong leadership at federal, provincial and municipal levels
- Develop a national BIM strategy
- Build a community of practice of parties offering BIM education and training in Canada
- Develop standard contractual language with the legal community for BIM deployment
- Develop metrics and Key Performance Indicators for compliant performance and capability assessment
- Align and maintain Canadian BIM standards and guidelines with international initiatives
- Support: Support constituent organizations through coaching and strong leadership
- Work with other organizations to develop a life cycle framework
- Create a movement to BIM
- Inform the community through outreach programs and promotion
- Develop BIM guidelines (Practice manuals, tutorials, etc.)
- Develop BIM training packages for AECOO community stakeholders
- Establish a national BIM standard
- Develop a maturity model/capability assessment tool
- Establish a national BIM body of knowledge
- Communicate and compare performance and maturity levels
- Develop standardized requirements facilitating the passage to open data and information (open BIM)
- Provide a platform for building maturity modeling and capability assessment of the AECOO community
- Develop a reference curriculum for BIM education in Canada
- Develop BIM training curriculum for AECOO community stakeholders
- Provide accreditation for institutions
- Provide certification for individuals
- Provide accreditation for AECOO community stakeholders

2020+
- Developed state: Broad industry support and full engagement of government sectors, private sectors and academia
- Constant reporting of success stories, lessons learned and best practices
- Developed state: Complete and coherent toolset
- Unified software platform
- Rigorous certification standards, data exchange definitions and protocols
- Developed state: Defined and accepted educational standards
- Integrated educational programs
- Robust and recognized certification and accreditation process
- Developed state: Widespread and consistent client demand
- Ongoing deployment of programs and framework
- Pervasiveness of collaborative project delivery models
- Developed state: Consistent metrics & measurement processes
- Continuous evaluation of community maturity
- Support for measurement and benchmarking efforts
- Developed state: Constant proportion of BIM use in the Canadian AECOO community
- Maintained Standards, Guidelines and Protocols
6. BIM research programs

International

• Investment in research and development
  – Innovation programs
  – Technology development
  – Transition Support

Canada

• Involvement of research groups, universities and organizations
• Funds from government: Engage Grants, IRAP
• Research projects are one off and remain fragmented and the findings are highly contextual

The need to redefine professional curricula to fit the new context of integrated approaches

(Forgues and Farah, 2013)
Conclusion

• **Innovative approaches** improve the performance and value generated

• **Governments** around the world are **driving the reform**

• Canadian mandate can rely on **international efforts** to inform its initiatives

• Canadian initiative must share a **single vision**
THANK YOU!


References


References


