Identifying, Sustaining and Strengthening the Digital Thread:

The Key Role of BIM Standards in shaping / transforming our Collaboration Infrastructure and realizing High-Performance Buildings

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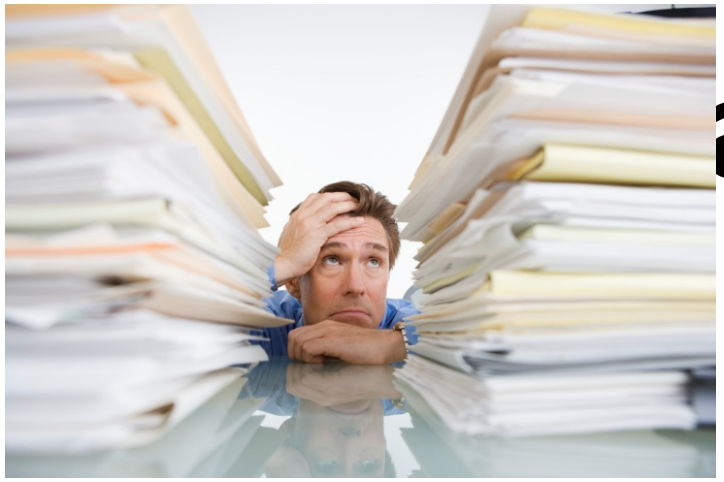
STRABAG AG

Building Information Exchange

Informat a

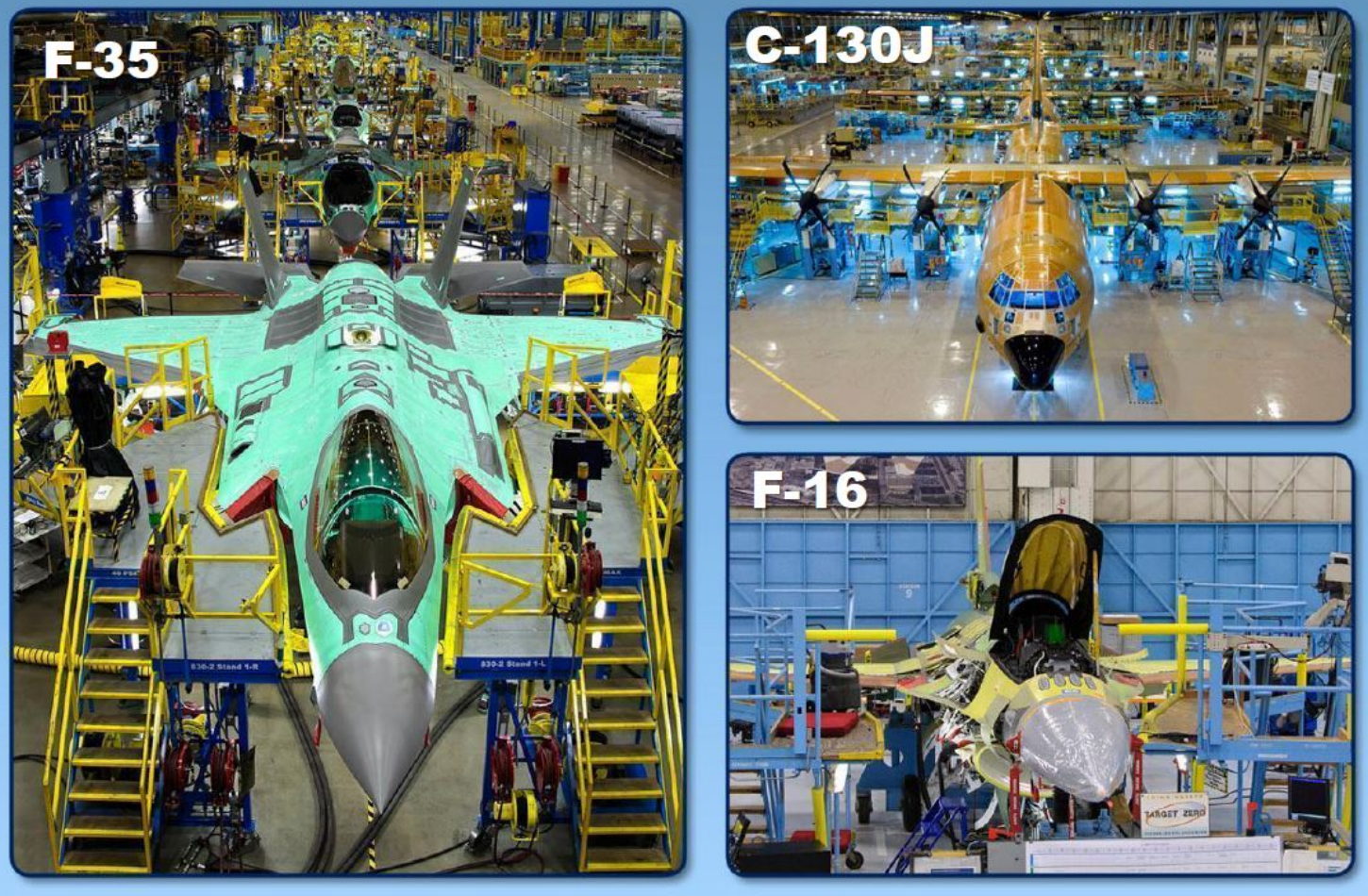


Death of Achilles, Paris left shooting , in the center Apollo directs the arrows to Achilles Heel, c. 460 BC Pelike, Niobid Painter

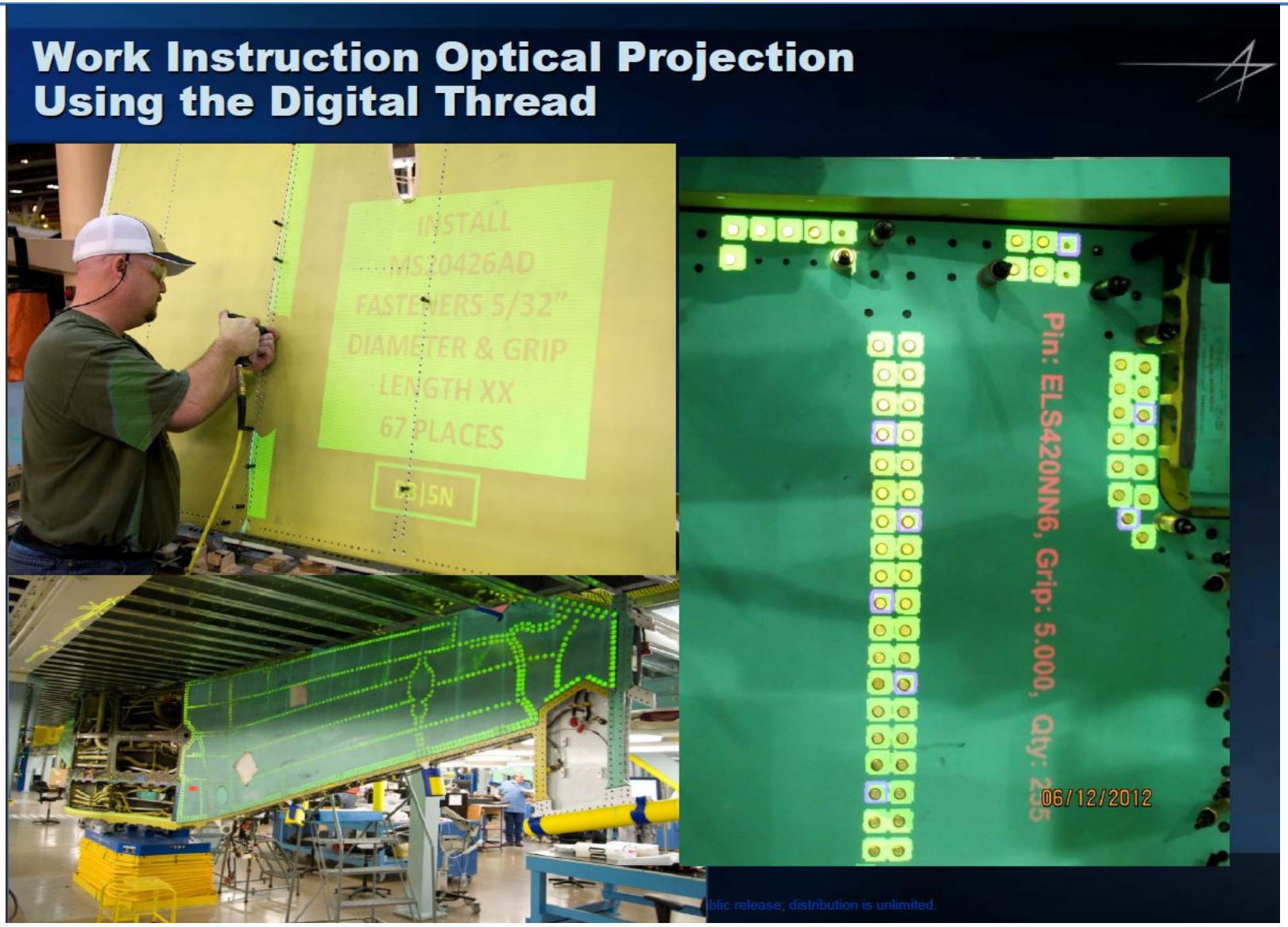
Agenda

- Introduction: Digital Thread
  - Concept from manufacturing
  - Current & Future States
- National BIM Standard – United States™
  - Background & Anatomy of a Standard
  - Standards Development / Voting Process
  - The Intelligent Client
  - Challenges: The Interface with US Legal System / Construction Laws
  - Vision of NBIMS: the Trajectory
  - Lessons Learned & Recommendations
  - Conclusion

Production Lines



Source: Kinard, D.: New Reality Development, Migration, and Strategic Transition of Manufacturing Technologies to address future Weapons System Platforms, 2013.



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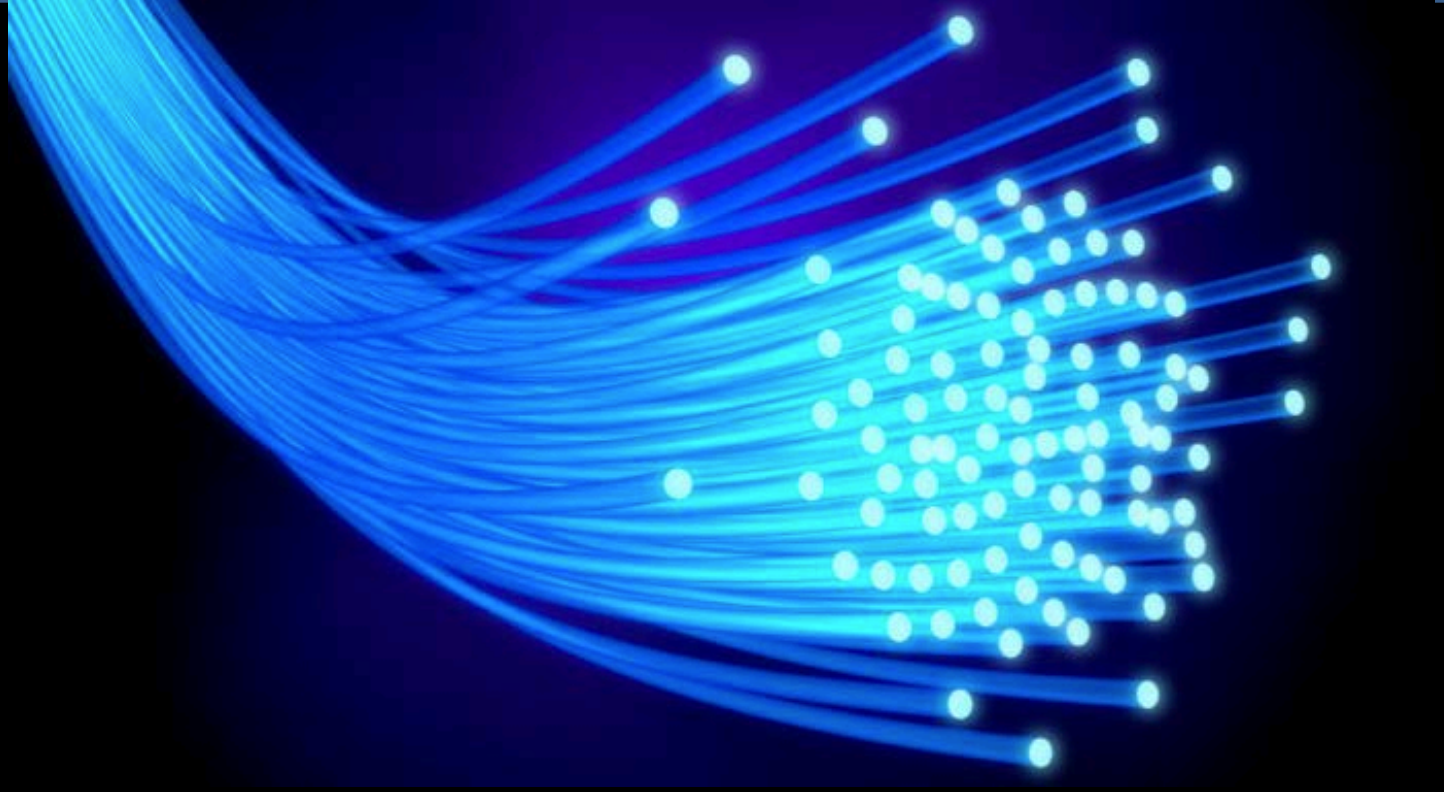

BIM can be viewed as **a medium**
used to form the fibers of a unifying ‘Digital Thread.’

Standards define the **Cohesion, Continuity, and Robustness** of this Digital Thread.


Current State: a Discontinuous & Fraying Thread

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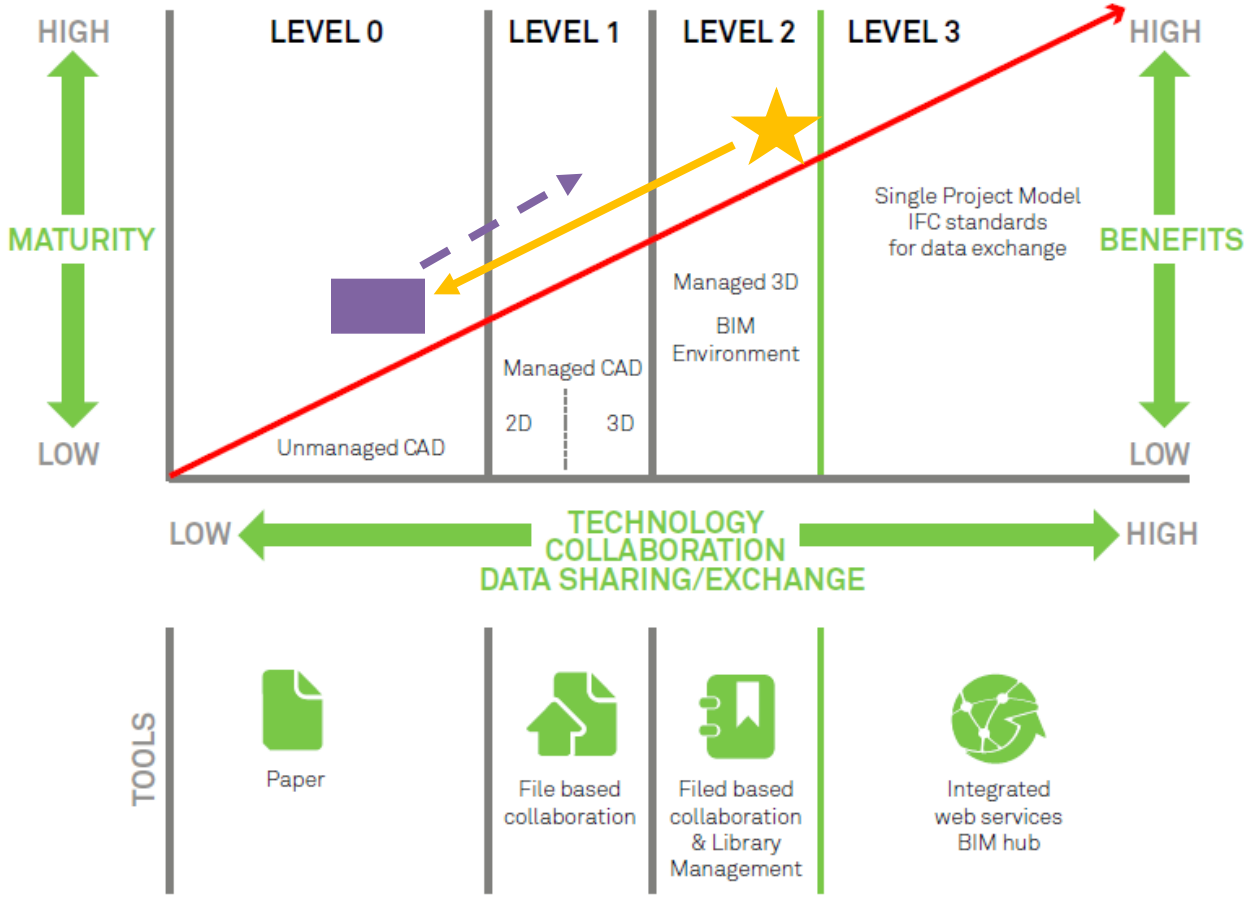
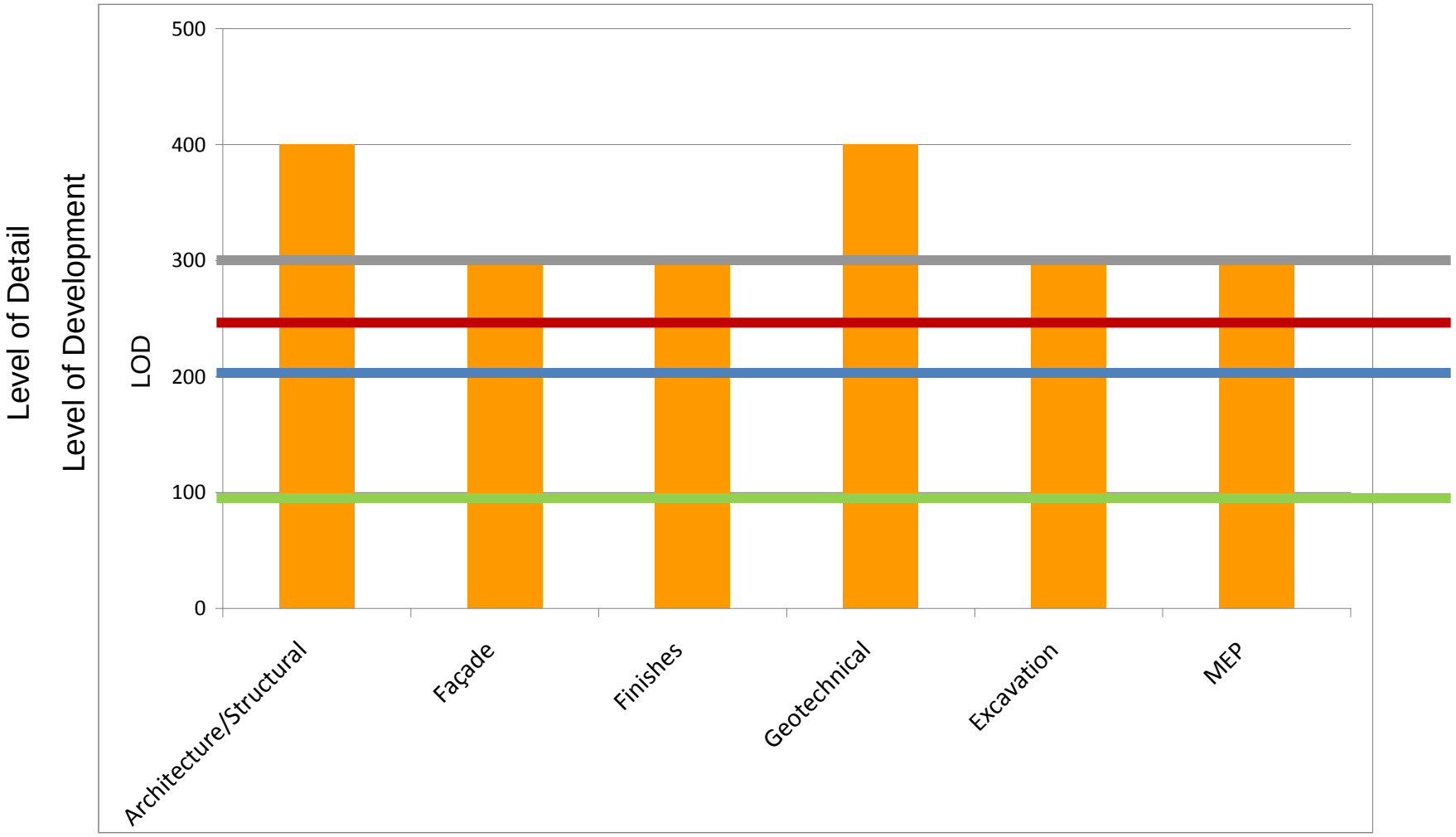


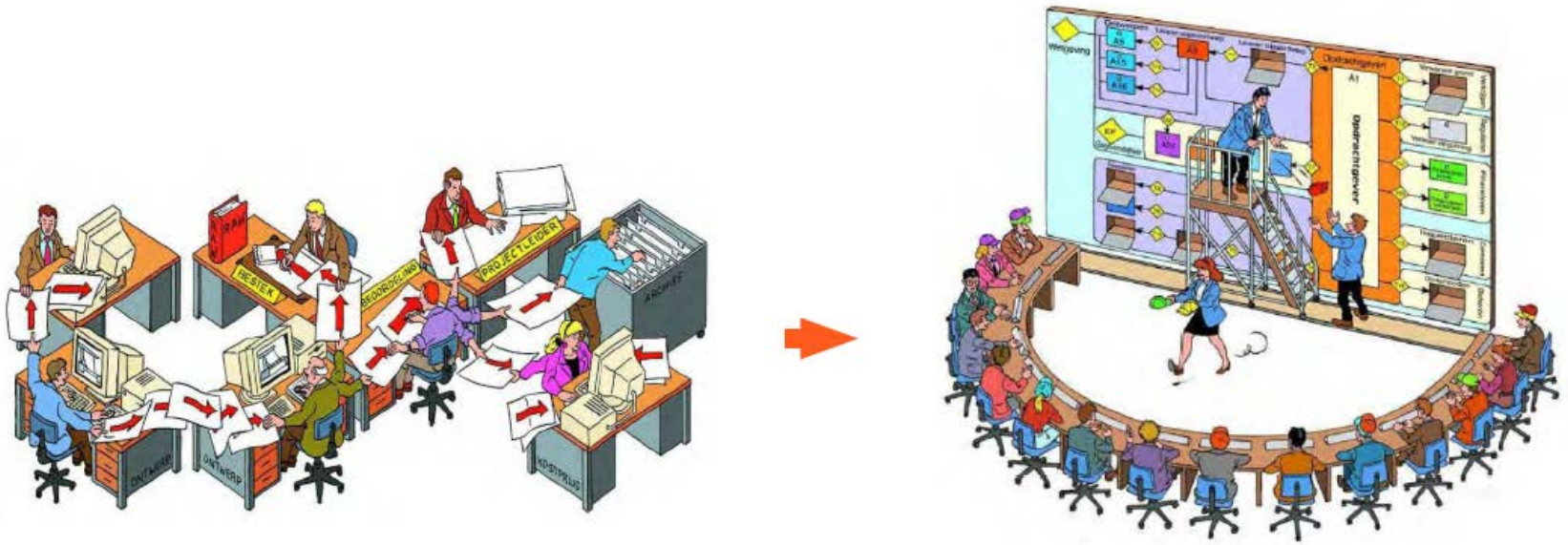
Conaughton, John: Getting the Most out of BIM, a Guide for Clients, AECOM-Davis Langdon, 2013.

Future State: a Cohesive Thread



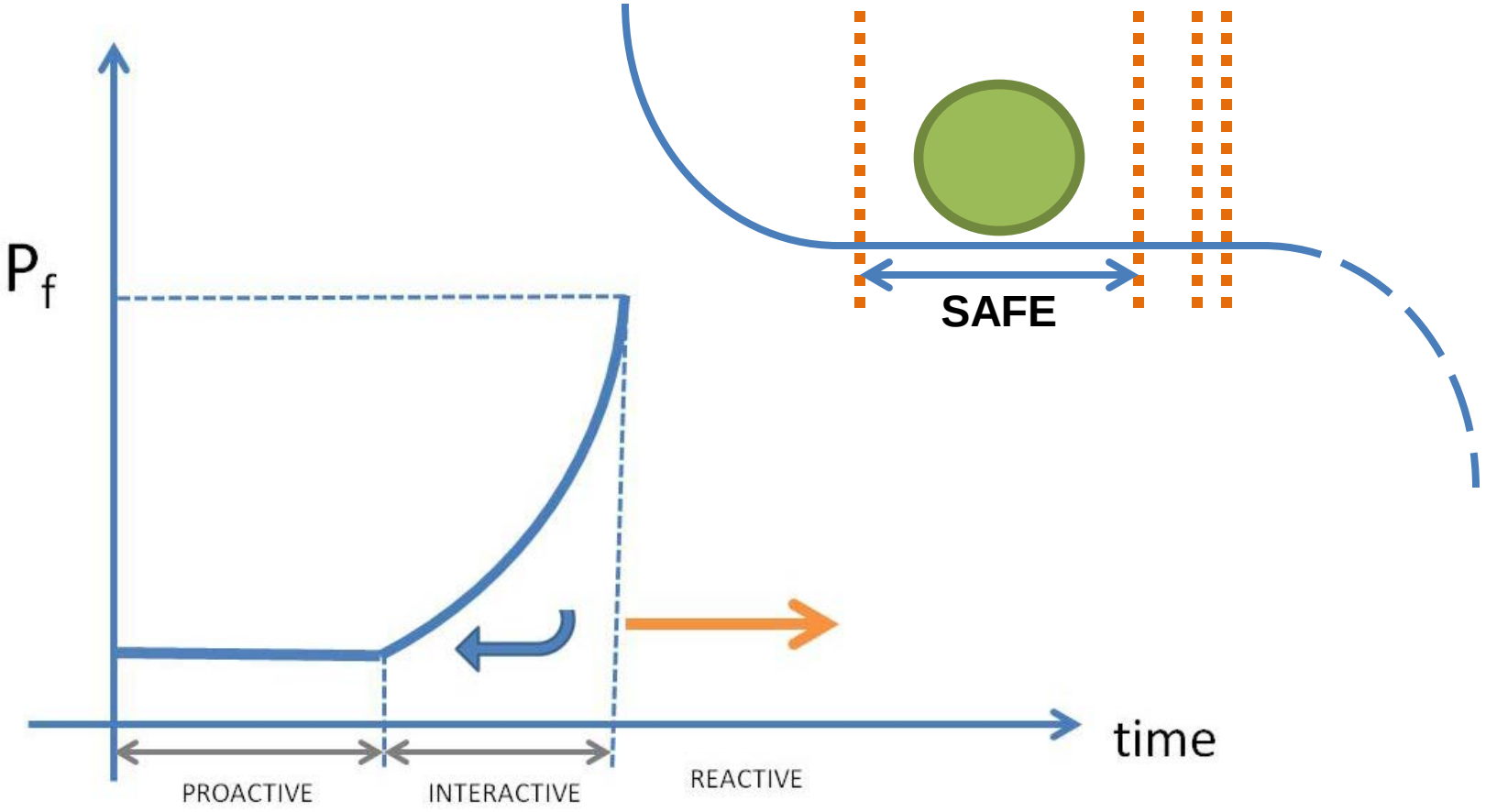
Hiel, L.: 'A Survey of Building Information Modeling in the German and United States Construction Markets,' Personal Communication, 2012.

Future State: a Continuous Thread



(WTCB: Virtueel Bouwen. http://www.wtcb.be/homepage/index.cfm?cat=services&sub=virtualconstruction)

Future State: a Robust Thread

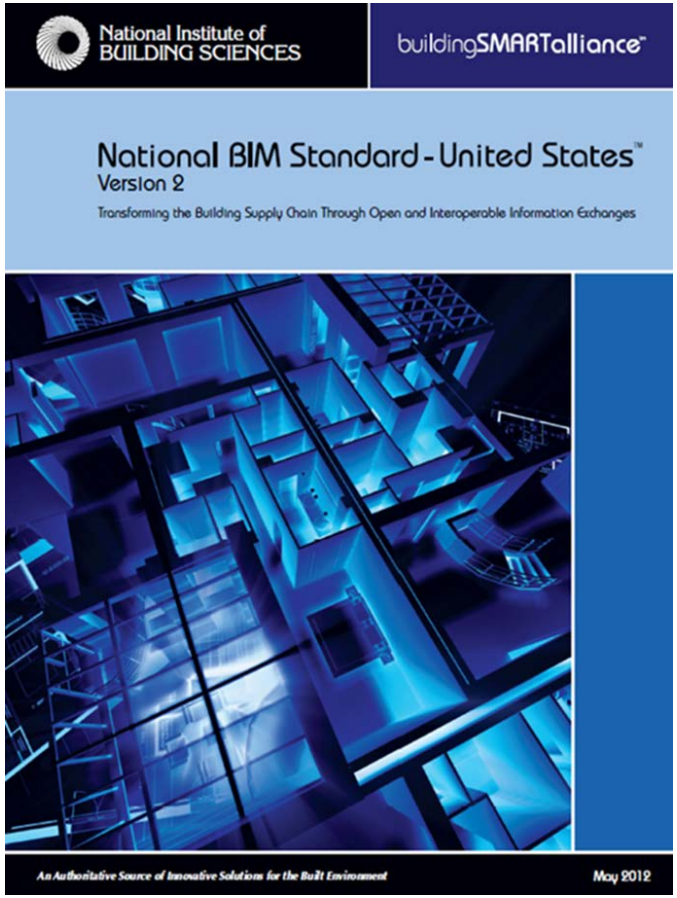


Bea, R.: Leanring from Failures: Lessons from the Recent History of Failures of Engineered Systems., Berkeley University of California at Berkeley, 2006. [Online] Avilable: http://ccrm.berkeley.edu/pdfs_papers/bea_pdfs/learning_from_failures2.pdf. [Accessed 26 June 2013]


Strong & Visionary Leaders

Weaving the Digital Thread

National BIM Standard - United States™ Project Committee



Key

D = Design
P = Procure
A = Assemble
O = Operate

Name	Company	City, State	D	P	A	O
Christopher Ackerman	U.S. Department of Energy - Office of Science	Germantown, MD		■		■
Amadou Agne	Koydol, Inc.	Washington, DC		■		
Dave Alley	Church of Jesus Christ of Latter-Day Saints	Salt Lake City, UT	■			
Robert F. Anderson	Nemetschek North America	Columbia, MD	■			■
Alex Araujo	Texas A&M University System	College Station, TX	■	■	■	■
Larry Asaro	Symmes Maini & McKee Associates	Cambridge, MA	■		■	
Howard Ashcraft, Jr.	Hanson Bridgett, LLP	San Francisco, CA	■	■		
Paul Audsley	NBBJ	Columbus, OH	■			
Salman Azhar, Ph.D.	Auburn University	Auburn, AL			■	■
Cindy Baldwin	ACAI Associates, Inc.	Fort Lauderdale, FL	■		■	
Andrew Baranowski	ESD	Chicago, IL	■			■
Patrick Barry	Reaction Architects, L.L.C.	Farmington Hills, MI				■

1a. Background

Strategic View

Operational / Systems View

Technical View

User View – funded at this level

This level needed for validation

This level is accomplished in Support of other two

1a. Background

Design

- Existing Conditions Modeling
- Energy Analysis
- Site Analysis
- Structural Analysis
- Architectural Programming
- Lighting Analysis
- Quantity Take Off
- Mechanical Analysis
- Cost Analysis
- Other Engineering Analysis
- Life Cycle Costing
- Building System Analysis
- Specification Production
- 3D Coordination
- Design Authoring & Briefing
- 3D Control & Planning
- Sustainability LEED Planning
- Site Utilization Planning
- Engineering Analysis
- Design Reviews

Procure

- Product Library
- Manufacturers Information
- Product Selection
- Perform Procurement

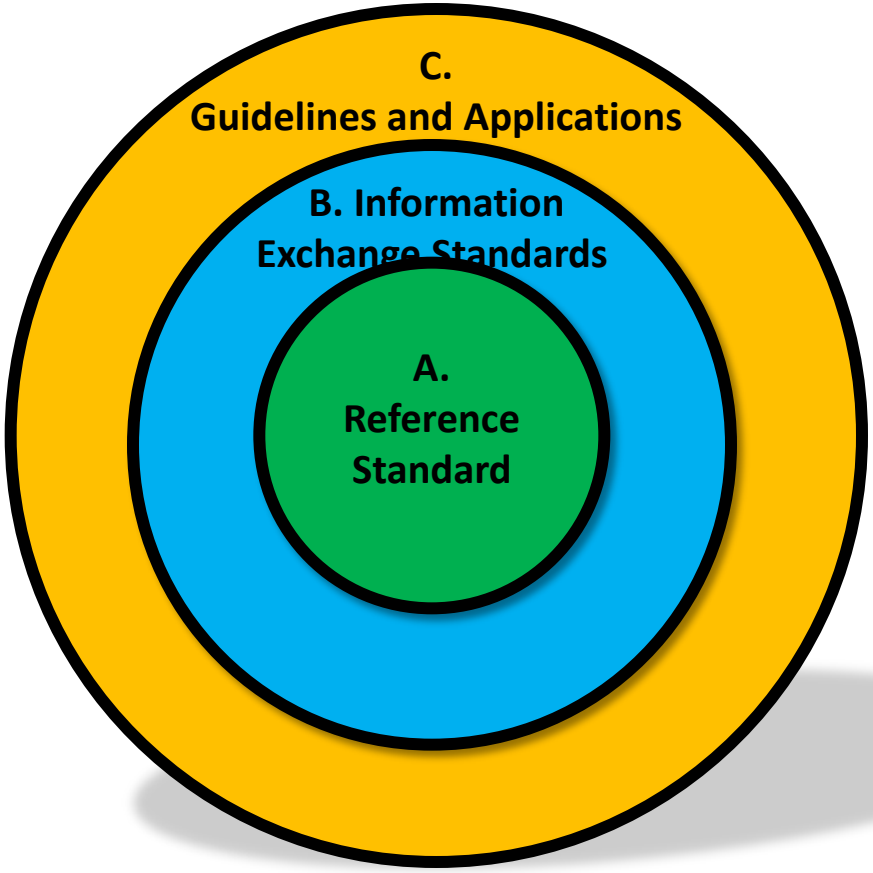
Assemble

- Construction Systems Design
- Phase Planning (4D)
- Commissioning
- Code Validation
- Digital Fabrication

Operate

- Space Management
- Asset Management
- Building Maintenance Scheduling
- Security / Key Management
- Way finding
- Telephone Management
- FM Documentation
- Disaster Planning / EM Preparation
- Record Modeling
- Maintenance & Repair Information

1b. Anatomy of a Standard



A. Reference Standards

- A.1. ISO Standards
- A.2. Normative Standards
- A. 3. Conformance Specifications
- A. 4. Test Suite

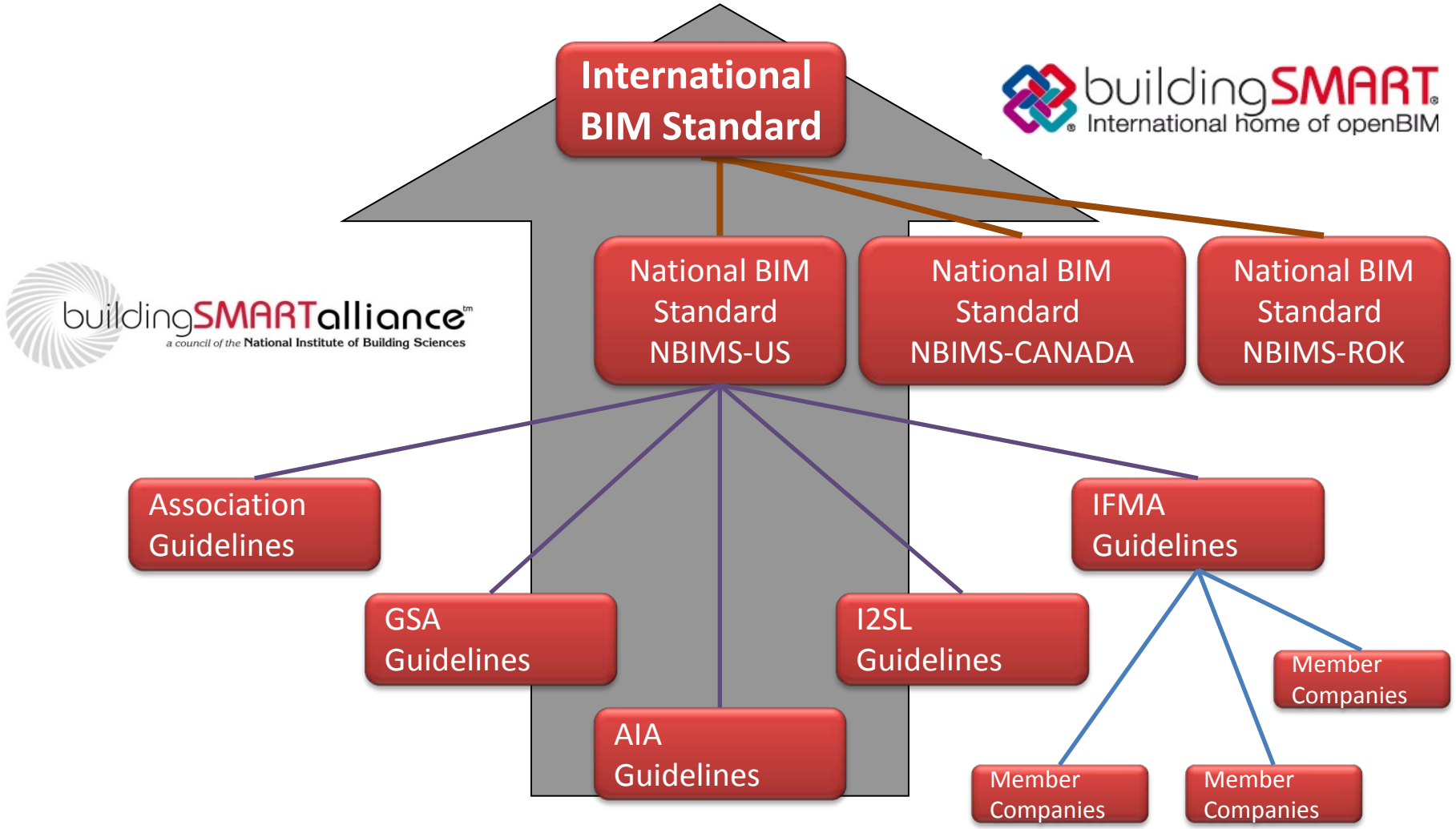
B. Information Exchange Standards

- B.1. Information Exchanges
- B.2. Reference Processes
- B.3. Reference Specifications
- B.4. Reference Examples

C. Guidelines and Applications

- C.1. Contract Specifications
- C.2. Best Practice Guides
- C.3. Open Standards based Applications

2. Standards Development / Voting Process



2. Standards Development / Voting Process

buildingSMART
International home of openBIM

International BIM Standard

Assigned Room
Work together on final ISO version

This is an ISO WG

Approves NWI

ISO

Technical Committee (TC)
Sub-Committee (SC)

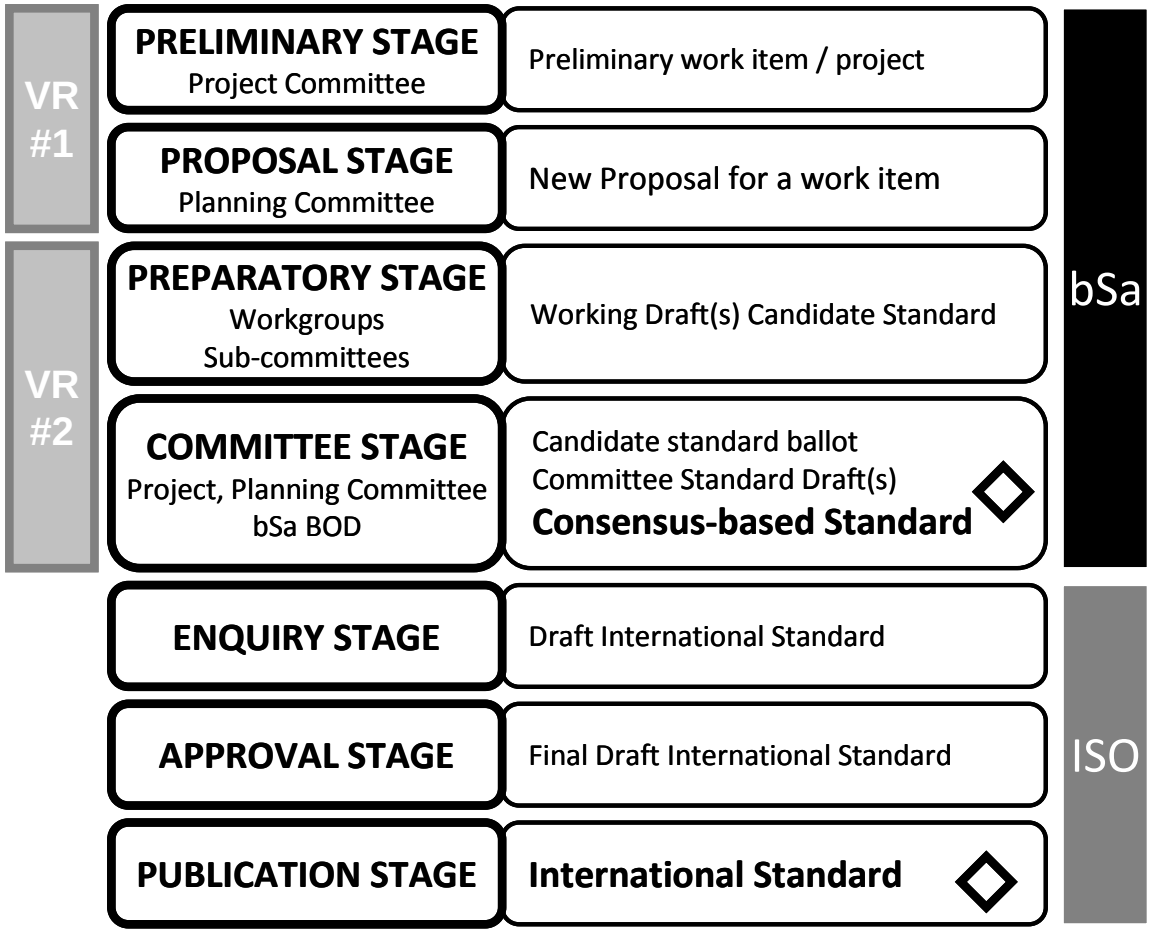
National BIM Standard NBIMS-US

National BIM Standard NBIMS-CANADA

National BIM Standard NBIMS-ROK

National BIM Standard NBIMS-Others

2. Standards Development / Voting Process



3. The Progressive Client

ERDC SR-12-2

Engineer Research and Development Center

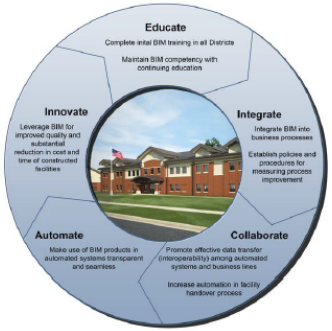
US Army Corps of Engineers®
Engineer Research and Development Center

ERDC
INNOVATIVE SOLUTIONS for a safer, better world

The US Army Corps of Engineers Roadmap for Life-Cycle Building Information Modeling (BIM)

US Army Corps of Engineers — November 2012

Directorate of Civil Works
Engineering and Construction Branch
Washington, DC 20314-1000



Approved for public release; distribution is unlimited.

BIM USE WORKSHEET

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
3D Coordination (Design)	High	Architect	High	3	3	3	BIM Model and Analysis Programs to Help Determine Potetential Clashes Between Disciplines	Coordinating and modelling took place at the same time. Creating the BIM model took longer than originally anticipated due to the tasks happening simultaneously.	YES
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		BIM Engineer	High	3	3	3			
		Plumbing	High	3	3	3			
Design Authoring	High	Architect	High	3	3	3	Design plans and 3D modeling software to create overall BIM Model. Requires close collaboration between BIM users	Teamwork and experience allowed decisions to be made that were best for the project team and	YES
		BIM Engineer	High	3	3	3			
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		Plumbing	High	3	3	3			
3D Coordination (Construction)	High	Architect	High	3	3	3	BIM Engineer to lead meetings throughout design and construction. Members are to meet on site weekly in order to complete different building areas in their entirety.	Coordinating and modelling took place at the same time. There were a lot of coordination issues which slowed this process much more than expected.	YES
		BIM Engineer	High	3	3	3			
		Structural	High	3	2	2			
		Mechanical	High	3	2	1			
		Electrical	High	3	2	2			
		Plumbing	High	3	3	3			
Generate Shop Drawings	High	Architect	High	3	2	2	3D Model Manipulation Tools. Ability to effectively communicate between design, construction, and facilities management teams	Changes are made to models during weekly meetings and noted in order to make changes to subcontractor models and produce up-to-date drawings.	YES
		Structural	High	3	2	1			
		Mechanical	High	3	3	1			
		Electrical	High	3	3	3			
		Plumbing	High	3	2	2			
Record Modeling	Low	Mechanical	Low	1	1	1	Ability to understand typical equipment operation and maintenance practices	General Contractor is not legally required to give model to owner, but will hand over once complete.	YES
		Lighting	Low	1	1	1			
		Structural	Low	1	1	1			
Virtual Mockup	Medium	BIM Engineer	Low	3	3	3	Drawings and Specs for specific systems to be constructed virtually	Originally a BIM Goal to construct virtual mockups, however this goal was never achieved	NO
		Architect	Low	3	3	3			
		Structural	Low	3	2	2			

* Additional BIM Uses as well as Information on each Use can be found at http://www.engr.psu.edu/ae/cic/bimex/

4. Challenges: Interface with US Legal System / Construction Laws

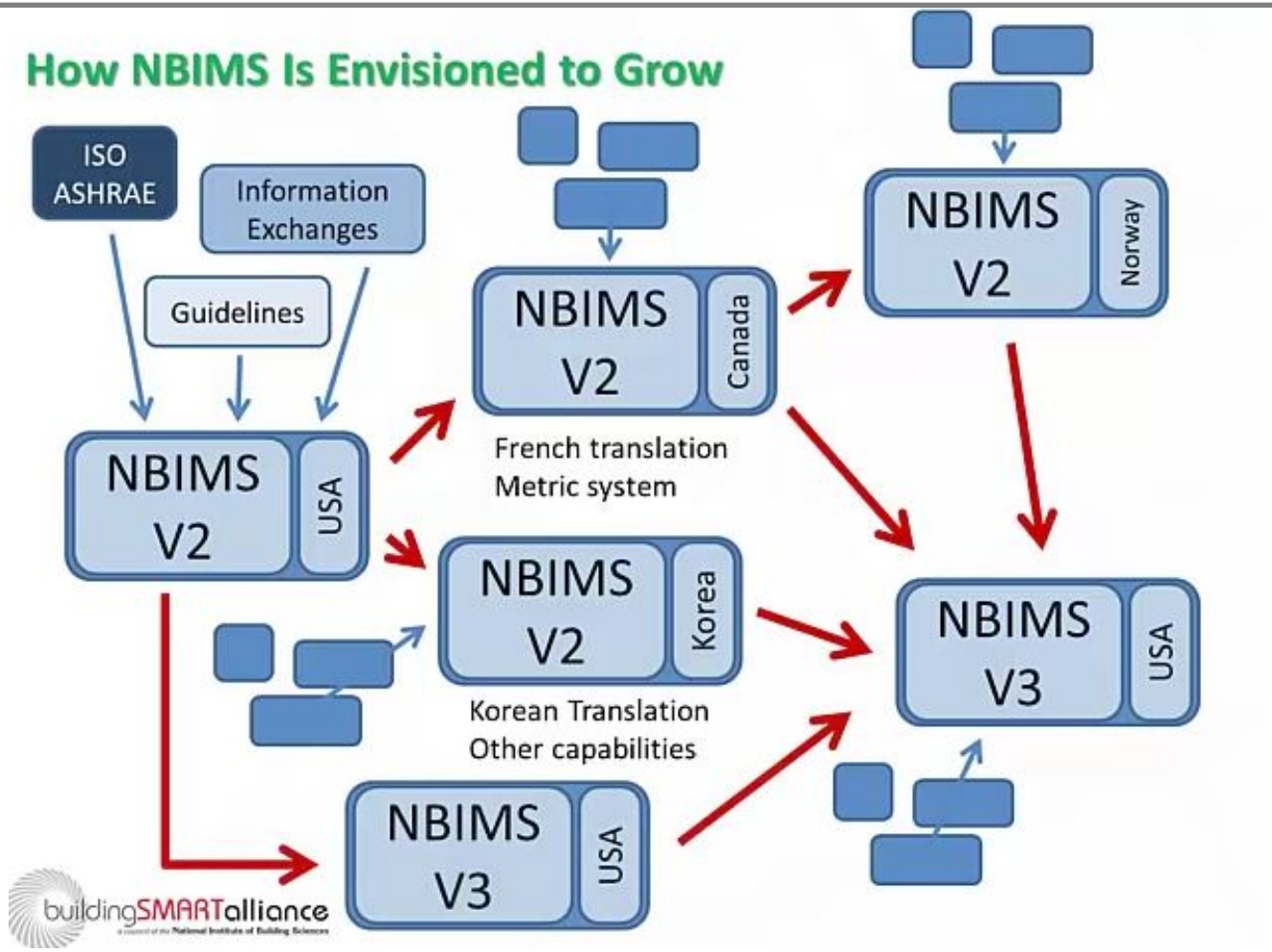
Current:

- All participants affected by suit

Future With Metadata

- Only person responsible will be affected
- Metadata identifies who, what, and when
- Helps identify incompetent practitioners

5a. Vision of the NBIMS: the Trajectory



5b. Lessons Learned & Recommendations

1. BIM is an enabler – not the final product
2. Promote open standards for BIM
3. Start with the end in mind
4. Build the facility virtually as a model then build from the model
5. Think holistically – Full lifecycle
6. Enter data one time and re-purpose
7. Data entry and maintenance are part of business process
8. Detail information can be summarized
9. Seek to move to International Standards
10. We have just begun

6. Conclusion

I Propose to establish an MOU with the German Chapter to collaborate on standards development

If we all work together we will achieve better and faster results to the benefit of all of us - so let's just do it, we can start today."

For additional information please contact:

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Thank You