

developing open information exchange standards

E. William East, PE, PhD
buildingSMART Alliance Project Coordinator

Dana Smith, AIA
buildingSMART Alliance Executive Director

what is interoperability?

“a property referring to the ability of diverse systems and organizations to work together .”

ref: Wikipedia, <http://en.wikipedia.org/wiki/Interoperability> (cited 30-June-08)

what is interoperability?

“The ability of software and hardware on multiple machines from multiple vendors to communicate.”

ref: *DLI Glossary*, Grainger Engineering Library, University of Illinois at Urbana-Champaign,
<http://dli.grainger.uiuc.edu/glossary.htm> (cited 30-June-08)

what is interoperability?

“The ability of different types of computers, networks, operating systems, and applications to work together effectively, ***without prior communication***”

ref: *Information Services Metadata*, University of Melbourne, <http://www.infodiv.unimelb.edu.au/metadata/glossary.html> cited 30-June-2008

what is interoperability?

“to work with other systems or products
without special effort on the part of the customer.”

ref: *Digital Television Glossary*, University of Michigan, www.michigandtv.com/glossary cited 30-June-08

what is interoperability?

The ability to ...

“implement and manage collaborative relationships among members of cross-disciplinary teams”

“manage and communicate electronic product and project data among collaborating firms”

ref: *Interoperability in the Construction Industry*, SmartMarket Report, McGraw-Hill, 2007

how is it defined?

Please, tell us what you want...

...can't you tell us what we want?



Unfortunately....

User's inability to clearly define detailed requirements requires software companies to make assumptions that may not work for a wider audience.

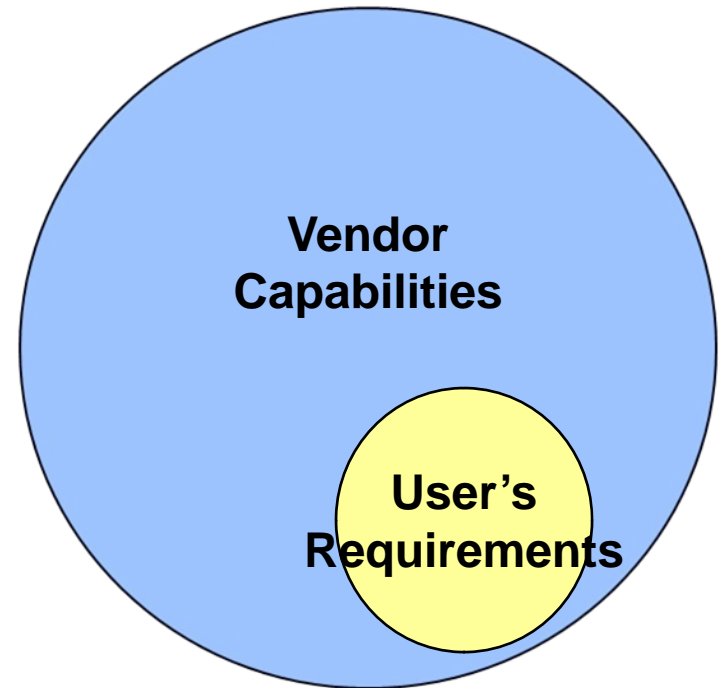
tightly coupled interoperability

Pro's

inexpensive to define limited requirements
rapid implementation in vendor software

Con's

resulting capability limited
directly linked to vendor-specific solutions
custom software development
expensive to maintain
may be “owned” by one or more participants



provides rapid, expensive, short-lived solutions

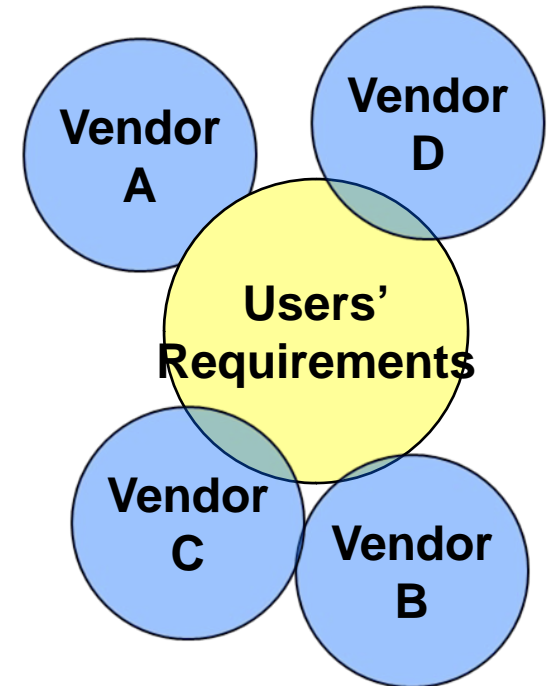
loosely coupled interoperability

Pro's

- inexpensive evaluation of cursory requirements
- rapid demonstrations

Con's

- resulting capability does not solve the problem
- resulting capability based on custom platforms
- directly linked to vendor-specific solutions



provides rapid, state-of-practice descriptions

interoperability is overrated!

- vagueness in process allows sloppiness in result
 - “special” configuration settings
 - tech support not aware of “special” settings
 - not repeatable without specific software stack
 - not enforceable by contract
- vagueness of results in misplaced expectations
 - frustration
 - proprietary specifications

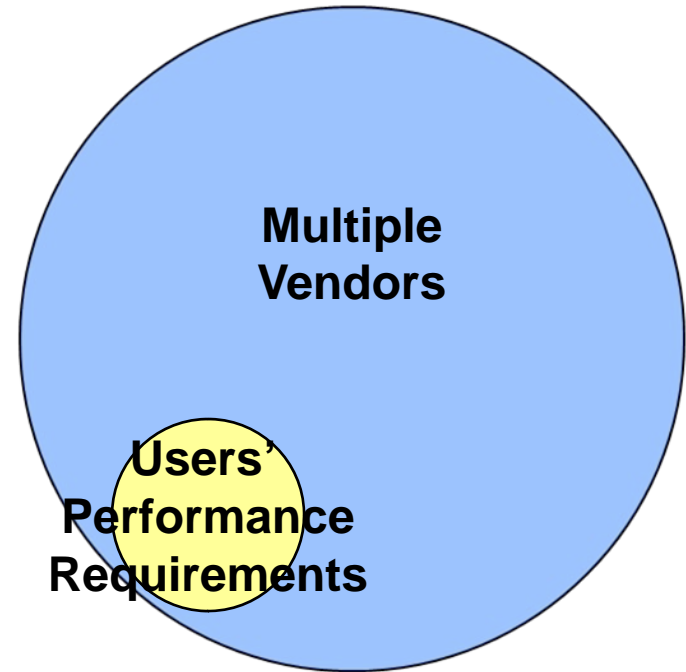
performance-driven interoperability

Pro's

- requirements owned by stakeholders
- provides open-solution to defined problem
- path from current to future requirements
- platform/version neutral solutions
- empowers market innovation

Con's

- buy-in from major stakeholder (reps.)
- buy-in from major professional/trade assns.
- meetings & coordination required
- management of expectations
- requires preparation of contract specifications



provides long-term solutions at least total cost

contracted information exchanges

- in contracts today
- in paper or e-paper formats
- examples in owner-based contracts include:
 - design deliverables
 - quality certifications
 - construction submittals
 - handover documents

contracted information exchanges

specifications define:

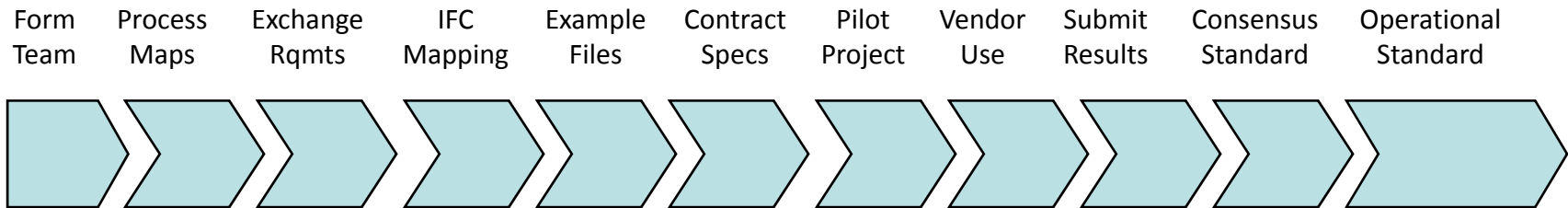
- information content
 - based on national consensus
 - Likely to be international variation
- deliverable timing
- format of data exchange
 - non-proprietary international standard
 - widely used by vast majority of stakeholders

contracted information exchanges

from e-paper to useful information

- an open process to update these specs
- software to import/export the data
- parties must use the specs
- outreach to community
 - demos with full disclosure of settings
 - repeatable at local end-user offices

information exchange roadmap



process designed to have questions answered up-front

subject matter experts, not consultants, drive the process

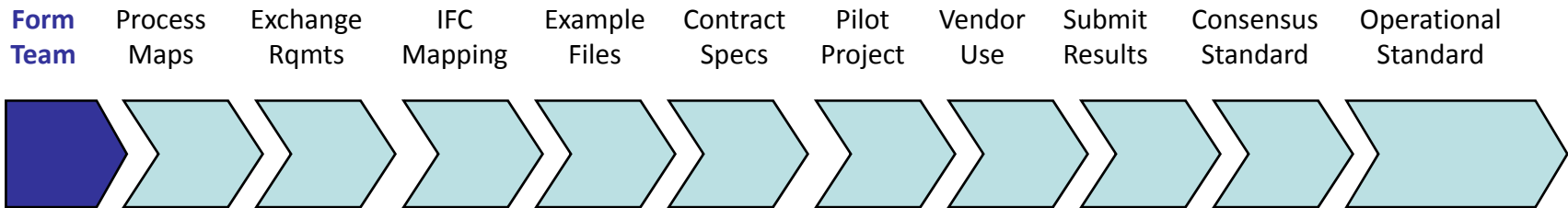
it is a “problem solving” not a “technology tinkering” process

technical work and pilots can be done in 12-24 months

goal is to meet 80% solution, don't let perfection get in the way of progress

industry-wide adoption, well, we'll all work on that one!

1. form team



teams are formed by subject matter experts to solve specific problems

teams need to have appropriate stakeholder representation

the Alliance supports teams with websites, listserve

if team are Bronze or better, Alliance will hire 'guide' through process

a concise statement about specific exchanges causing problem

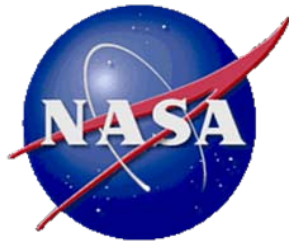
lessons learned – don't start with IFC, start with clear problem statement

1. form team (cobie)

- today, handover information is created and lost ***several*** times
- designer creates space and equipment layouts
- construction contractor post-construction survey
- surveys “stored” in boiler rooms
- *(maintenance contractor paid to survey building)*
- hand load data into maintenance system

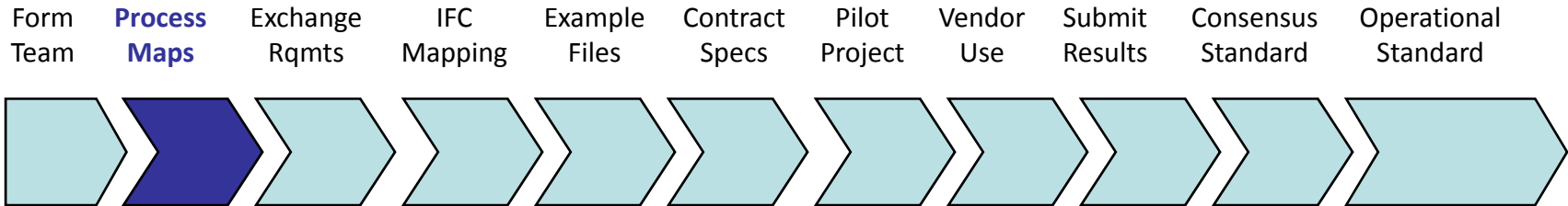


1. form team (cobie)



owners, designers, builders, operators, 3rd party providers
i.e. all parties who contribute/produce/use handover data

2. process maps



who needs what information when

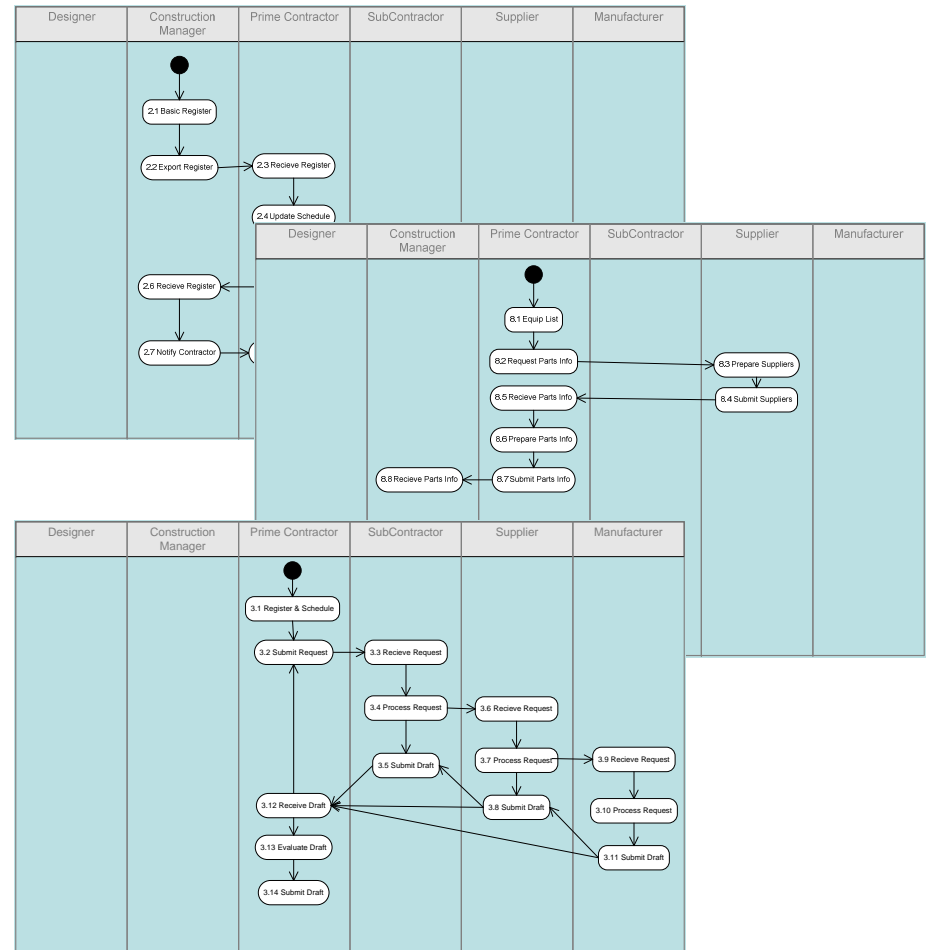
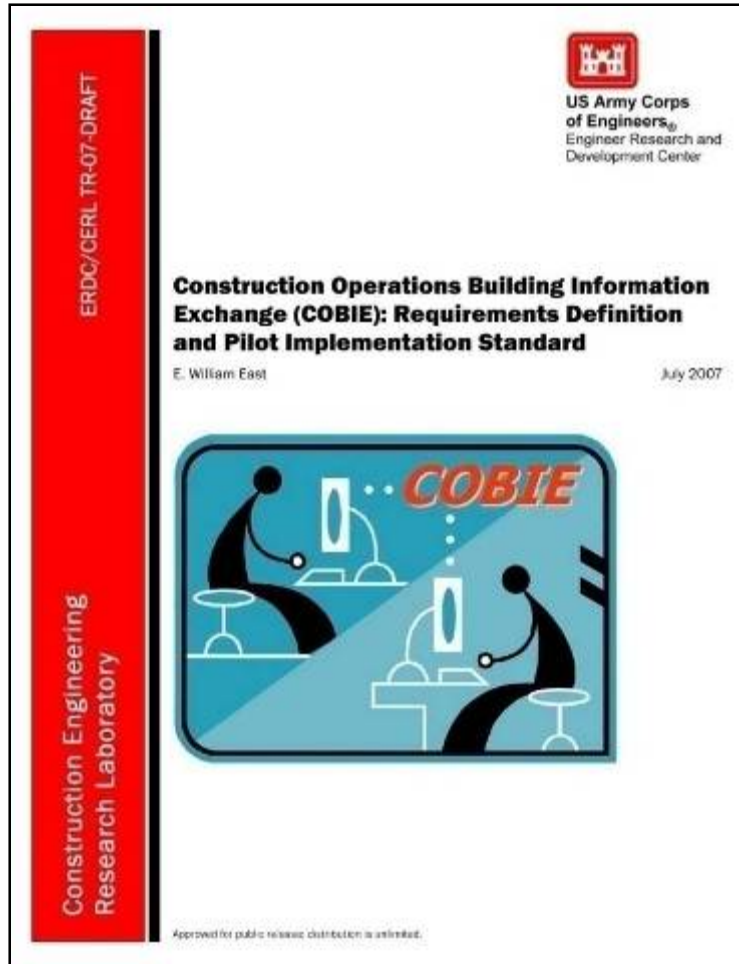
uses Business Process Modeling Notation (www.bpmn.org)

creates “swim lane” diagrams

identifies what information is given to whom, when

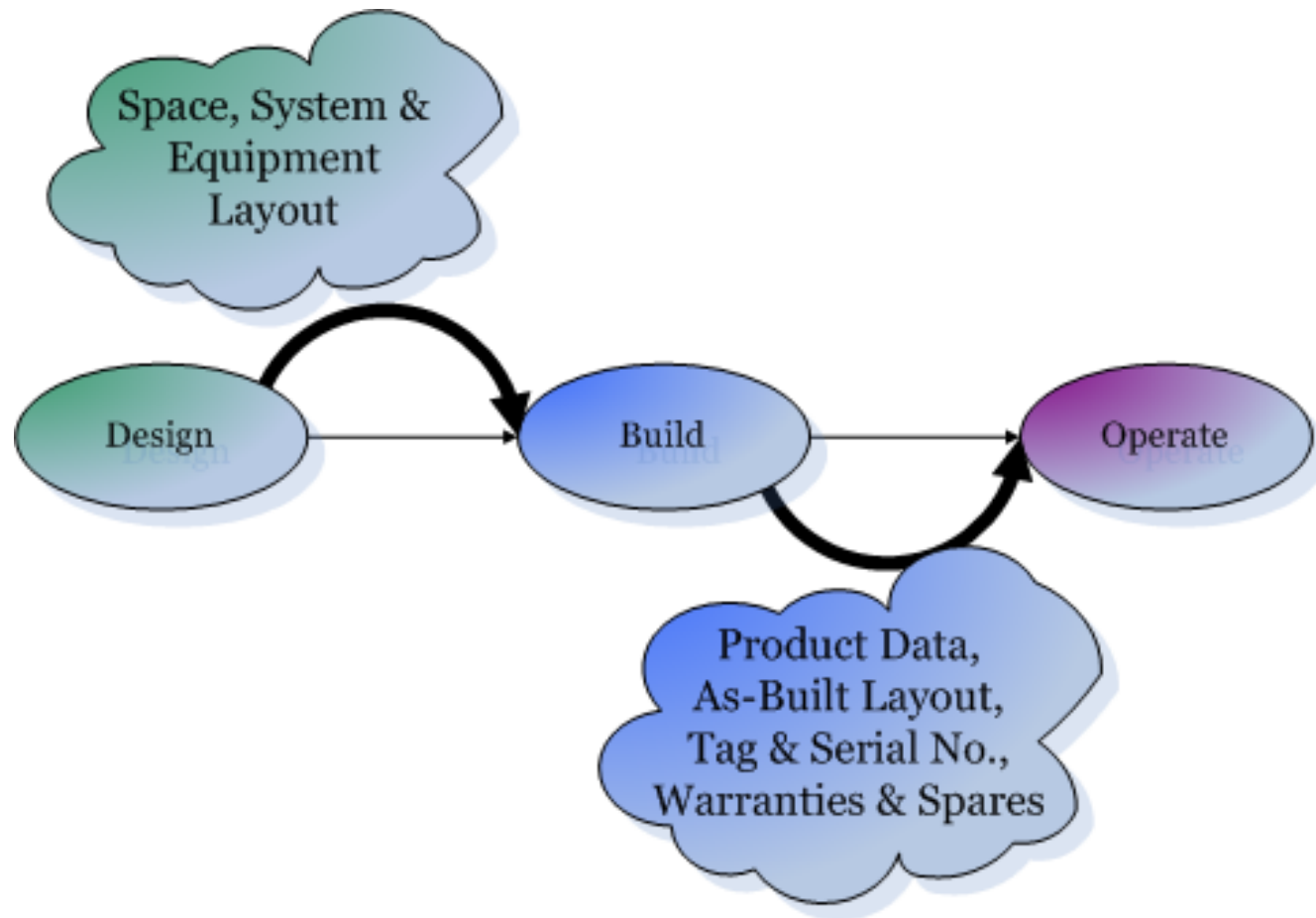
clearly defines the exchanges that, if resolved, would solve the problem

2. process maps (cobie)



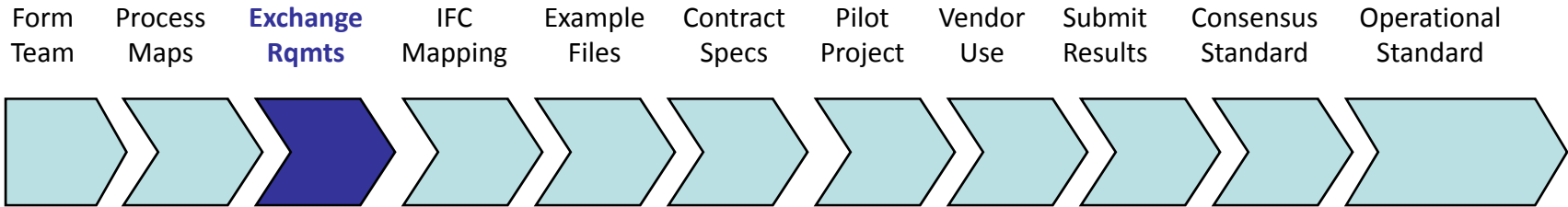
ref: http://www.wbdg.org/pdfs/erdc_cerl_tr0730.pdf

2. process maps (cobie)



ref: <http://www.wbdg.org/resources/cobie.php>

3. exchange requirements



based on “swim lane” diagram

define what information is exchanged, during context of process

compare to existing sources of data for this exchange

find out where the gaps are between today and what’s needed

a concise statement about specific data on “swim lane” arrows

3. exchange requirements (cobie)

Overview

COBIE contains information describing the operations, maintenance, and assets in capital facilities. The authoritative sources for the information include designers, builders, installers, and manufacturers. On the design side of the exchange, BIM-based design tools may be used to capture COBIE data. From construction, information about approved submittals are included in COBIE exchanges. Builders identify products to be installed. Manufacturers provide operating and maintenance information. Installers provide serial and tag numbers. Quality Control/Assurance staff provide test and certification reports. All these parties can capture building handover data through the COBIE standard tying their diverse set of software together for the purpose of providing a consistent data set of operations, maintenance, and asset management to building staff.

This exchange requirement defines interior and exterior spaces at the level needed for construction-operation information handover. An example scenario for this stage is shown in the table below:

Task	Scenario
Space Name	Provide the name and floor for each space.
Space Function	Identify the primary function of the space using the OmniClass or locally specified spatial function classification scheme.
Space Volume (Coordinates)	Identify the space X and Y coordinate. Floor height and elevation define the Z coordinate needed to form the bounding box. Coordinates are provided using an internal frame of reference only.
Space Area (Asset)	Provide one or more values required to manage the space asset. These values are defined by ANSI/ASTM or other authoritative source that is explicitly identified in the exchange.
Space Nesting	Identify one or more super-spaces may contain the space. The name of these spaces will typically refer to various conceptual zones within the building that have a similar or grouped pattern of use. For example, zones may refer to mechanical heating zones, alarm systems zones, or groups of spaces to be used for specific clients.

The information provided through this information exchange should be a subset of information that already exists in the design building information model, as appended/changed during construction. Information related to the facility that may be exchanged include:

- All spaces must link to a single floor. If the space spans multiple floors, such as an atrium, the space is defined by the bottom most elevation for that space.
- Spaces may be organized into "super spaces."
- There may be multiple "super spaces" that refer to the same space.
- Asset management information may be included, based on specific contract requirements.
- Spatial layout information may be included, based on specific contract requirements.

The following information auditing is also required for all COBIE file exchanges that occur in a batch file transfer mode. Software that mediates that transmission of COBIE data may capture this data automatically based on process model implementations:

- The party who created the data provided. This is required for individual record.
- The full history of all changes to the data must be included in the data file.

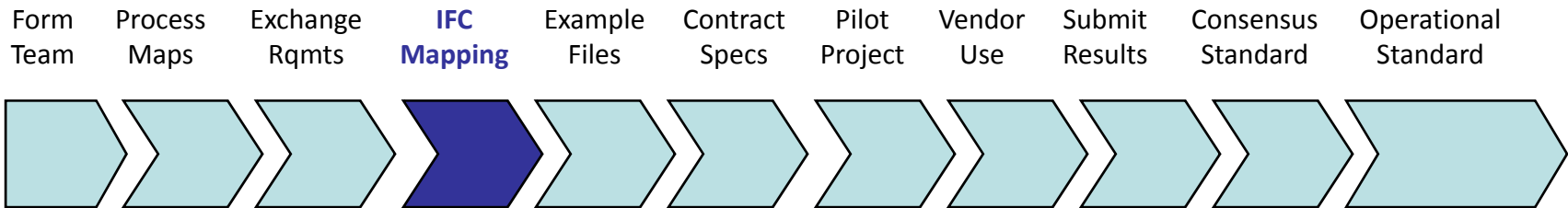
The authoritative source for this information is the design building information model. Ideally the information in this project wrapper will have been created during early design and "passed down" with the project as work progressed from design through to construction.

Subject matter experts document what data is needed when...

Project Stage		
Stage	Name	Valid
0	Portfolio requirements	
1	Conception of need	
2	Outline feasibility	
3	Substantive feasibility	
4	Outline conceptual design	
5	Full conceptual design	
6	Coordinated design and procurement	
7	Production information	
8	Construction	✓
9	Operation and maintenance	✓
10	Disposal	

ref: <http://idm.buildingsmart.no/confluence/display/IDM/COBIE+Project>

4. ifc mapping



first step to consider actual ifc model

ifc modeler support recommended for this step

“model view definition” is coordinated with international IAI

identify if existing IAI activities have/are working on this

implementation formats developed in “human usable” format also

4. ifc mapping (cobie)

Information Requirements					
Context	Information Needed	MAN	REC	OPT	Actor Supplying
Preursor:	The provisions of the exchange requirement COBIE-6B-01 must be provided as a wrapper that identifies the facility to which these floors and spaces belong.	✓			Designer or Constructor
Preursor:	Site (General) information must be provided to identify the site upon which the facility is placed.	✓			Designer or Constructor
Preursor:	Facility (General) information must be provided to identify the facilities in which floors and spaces may be found.	✓			Designer or Constructor
Preursor:	Provide the name of each conceptual/physical vertical level of each of the facilities identified in the project wrapper.	✓			Designer or Constructor
Space Name:	Provide the name and floor for each space.	✓			Designer or Constructor
Space Function:	Identify the primary function of the space using the OpenClass or locally specified spatial facilities classification scheme.	✓			Designer or Constructor
Space Volume (Coordinates):	Identify the space X and Y coordinate, floor height and elevation define the Z coordinates needed to form the bounding box. Coordinates are provided using an internal frame of reference only.	✓			Designer or Constructor
Space Area (Area):	Provide one or more values required to manage the space asset. These values are defined by AREA/STAIR or other authoritative source that is explicitly identified in the exchange.		✓		Designer or Constructor
Space Heating:	Identify one or more super-spaces that contain the space. The name of these spaces will typically refer to various conceptual zones within the building that have a similar or grouped pattern of use. For example, zones may refer to mechanical heating zones, alarm systems zones, or groups of spaces to be used for specific clients.		✓		Designer or Constructor
Authoritative Source:	The user responsible for creating the project wrapper data set.	✓			Designer or Constructor
History:	All versions of information captured during the project will be provided in the file. Superseding data is explicitly identified.	✓			Designer or Constructor



IFC Entities Required

- IfcElement
- IfcObject
- IfcProduct
- IfcRoot
- IfcSpace
- IfcSpatialStructureElement

IFC Datatypes Required

- IfcElementCompositionEnum
- IfcGloballyUniqueId
- IfcInternalOrExternalEnum
- IfcLabel
- IfcLengthMeasure
- IfcText

IFC Functions Required

- .

IFC Property Sets

- Pset_SpaceCommon

IDM Functional Packages

- fp_address
- fp_aggregates
- fp_apply_owner_history
- fp_apply_quantity
- fp_contains_in_spatial_struct
- fp_define_by_properties
- fp_place_object

EXPRESS Schema

```

SCHEMA FP_MODEL_SPACE;

  TYPE IfcGloballyUniqueId = STRING (22) FIXED;
  END_TYPE;

  TYPE IfcLabel = STRING;
  END_TYPE;

  TYPE IfcLengthMeasure = REAL;
  END_TYPE;

  TYPE IfcText = STRING;
  END_TYPE;

  TYPE IfcElementCompositionEnum = ENUMERATION OF
    (COMPLEX,
     ELEMENT,
     PARTIAL);
  END_TYPE;

  TYPE IfcInternalOrExternalEnum = ENUMERATION OF
    (INTERNAL,
     EXTERNAL,
     NOTDEFINED);
  END_TYPE;

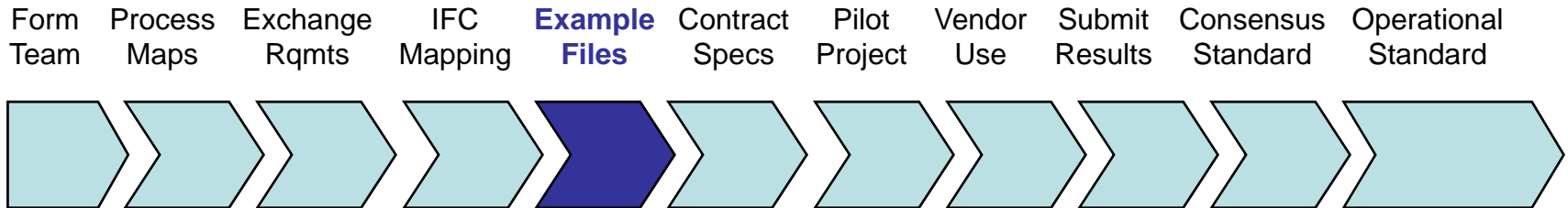
  ENTITY IfcProduct
  ABSTRACT SUPERTYPE
  SUBTYPE OF (IfcObject);
    ObjectPlacement : OPTIONAL fp_place_object;
    Representation : OPTIONAL fp_represent_product;
  WHERE
    WR1 : (EXISTS(Representation) AND EXISTS(ObjectPlacement))
    OR (EXISTS(Representation) AND
    (NOT ('IFC2X2_FINAL.IFCPRODUCTDEFINITIONSHAPE' IN TYPE
    OR (NOT (EXISTS(Representation))));
  
```

ref: <http://idm.buildingsmart.no/confluence/display/IDM/COBIE+Project>

Ref: <http://idm.buildingsmart.no/confluence/display/IDM/Model+Space+%28FP%29>

cobie-specific ifc model: http://www.wbdg.org/zips/cobie_working_2008_html.zip

5. example files



“a picture is worth a thousand words”

examples from real, but “sanitized” projects for public release

examples should exercise several exchange parts

examples should demonstrate who provides what data

examples help exercise problem statement and prior steps

5. example files (cobie)

multiple mappings to formal ifc definitions may be required

ifcXML file of ifcSpace object

```
</RelativePlacement>
</IfcLocalPlacement>
<!-- Representation of COBIE worksheet 04-Space key 1 -->
- <IfcSpace id="*_04_sp_HE000000000000_1">
  <GlobalId>*_04_sp_HE000000000000_1</GlobalId>
  <OwnerHistory>
    <IfcOwnerHistory xsi:nil="true" ref="*_01_oh_HE000000000000_2" />
  </OwnerHistory>
  <Name>B1.001</Name>
  <Description>Baggage collation</Description>
  <ObjectType>13-15 21 11 27 Material Handling Area</ObjectType>
  <ObjectPlacement>
    <IfcLocalPlacement xsi:nil="true" ref="lp_04_1" />
  </ObjectPlacement>
  <Representation>
    <IfcProductDefinitionShape>
      <Representations>
        <IfcShapeRepresentation>
          <ContextOfItems>
            <IfcGeometricRepresentationContext xsi:nil="true" ref="qrc1" />
          </ContextOfItems>
          <RepresentationIdentifier />
          <RepresentationType>BoundingBox</RepresentationType>
          <Items>
            <IfcBoundedBox>
              <Corner>
                <IfcCartesianPoint xsi:nil="true" ref="origin" />
              </Corner>
              <Dim>3000</Dim>
              <YDim>3000</YDim>
              <ZDim>3000</ZDim>
            </IfcBoundedBox>
          </Items>
        </IfcShapeRepresentation>
      </Representations>
    </IfcProductDefinitionShape>
  </Representation>
  <LongName>Baggage collation</LongName>
  <CompositionType>element</CompositionType>

```

spreadsheet format (for us humans!) can also be used!

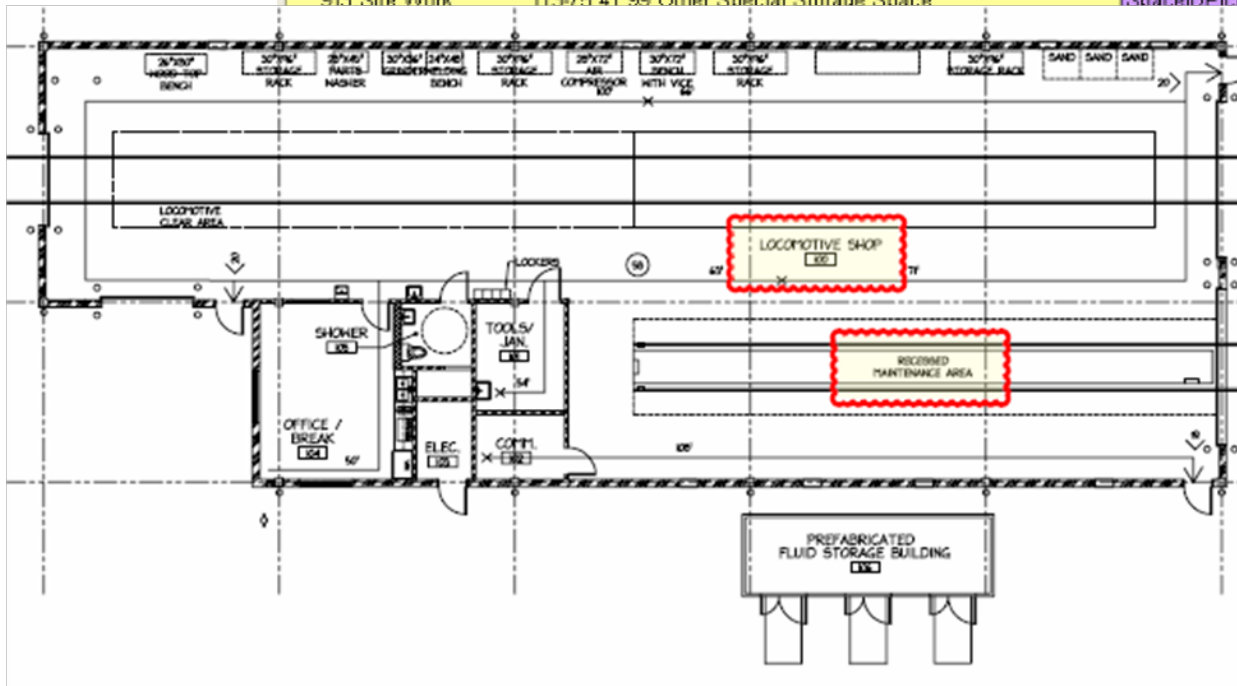
	A	B	C	D	E	F	G	H
	SpaceID	FloorID	SpaceFunction	SpaceReferenceID	SpaceNumber	SpaceName	SpaceDescription	SpaceUsableHeight
1								
2	1	1	15 36 10 Material Handling space	SpaceID	B1.001	Baggage collation	Baggage collation	
3	2	1	15 36 10 Material Handling space	SpaceID	B1.002	baggage dispatch	baggage dispatch	
4	3	2	15 36 10 Material Handling space	SpaceID	B2.002	baggage reception	baggage reception	
5	4	2	15 36 10 Material Handling space	SpaceID	B2.001	baggage holding	baggage holding	
6	5	4	10 10 00 Gathering	SpaceID	DE.001	departure lounge	departure lounge	
7	6	4	10 00 00 Interacting	SpaceID	DE.002	departure gate	departure gate	
8	7	3	10 10 00 Gathering	SpaceID	AR.001	arrival corridor	arrival corridor	
9	8	3	10 00 00 Interacting	SpaceID	AR.002	passport control	passport control	
10	9	5	15 11 10 Office space	SpaceID	OF.001	administration	administration	
11	10	5	10 72 10 Conference Room	SpaceID	OF.002	conference room	conference room	

cobie format translator available to vendors

cobie spreadsheet examples available through WBDG

5. example files (cobie)

SpaceID	FloorID	SpaceFu	SpaceRef	ExternalS	ExternalN	SpaceNu	SpaceNa	SpaceDe
1	1, First Floor	13-15 21 17 Maintenance Spaces	SpaceDPick			100	Maintenance Bay	
2	1, First Floor	13-15 21 17 Maintenance Spaces	1,100			1004	Locomotive Shop	
3	1, First Floor	13-15 21 17 Maintenance Spaces	1,100			1006	Recessed Maintenance Area	
4	1, First Floor	13-75 00 00 Storage Spaces	SpaceDPick			101	Tools/Janitor	
5	1, First Floor	13-81 21 24 Telecommunications Room	SpaceDPick			102	Communication room	
6	1, First Floor	13-81 21 21 Electrical Room	SpaceDPick			103	Electrical Room	
7	1, First Floor	13-15 11 34 11 Office	SpaceDPick			104	Office/ Break	
8	1, First Floor	13-41 11 14 14 Shower	SpaceDPick			105	Shower	
9	3 Site Work	13-75 41 99 Other Special Storage Space	SpaceDPick			106	Prefab Fluid Storage Bldg.	
						0	Roof	
						0	Exterior Pavement	



5. example files (cobie)

The image shows a screenshot of a web browser displaying the Whole Building Design Guide (WBDG) website. The website has a blue header with the WBDG logo and navigation links. A sidebar on the left lists various resource pages. The main content area is titled 'Construction Operations Building Information Exchange (COBIE)' and includes an introduction and a diagram illustrating the COBIE process. The diagram shows a flow from 'Design' to 'Build' to 'Operate', with 'Product Data' and 'Space, Systems & Equipment Layout' as inputs to the 'Build' phase.

WBDG
Whole Building Design Guide

The Gateway to Up-to-Date Information on Integrated Whole Building Design Techniques and Technologies

Home / About / Contact / Site Map / Search

Design Guidance / Project Management / Operations & Maintenance / Documents & Resources

RESOURCE PAGES

- ACH - LEED - ASHRAE - BREEAM
- Achieving Sustainable Site Design through Life Impact Development Practices
- Acoustic Control
- Aesthetic Challenges
- Aesthetic Opportunities
- Air Duct Systems in Buildings
- Air Decontamination
- Archaeological Site Considerations
- Assessment Tools for Accessibility
- Balancing Security/Safety & Sustainability Objectives
- Blind Safety of the Building Envelope
- Building Information Modeling (BIM)
- Building Integrated Photovoltaics (BIPV)
- Changing Nature of Organizations, Work, and Workplace
- Chemical/Biological/Radiation (CBR) Safety in the Building Envelope
- Construction Operations

Home / Construction Operations Building Information Exchange (COBIE)

Construction Operations Building Information Exchange (COBIE)

by J. Miller East, P.E., F.O.
Engineer, Research and Development Center, U.S. Army, Corps of Engineers
Last updated: 08/06/2003

Introduction

Today, most contracts require the handover of project documents, drawings, product data sheets, warranties, spare part lists, preventive maintenance information, and other information. This information is essential to support the operation and the management of the facilities assets by the owner and/or operator.

Gathering this information at the end of the job, today's standard procedure, is a monumental task. The amount of information has to be increased from information to simplify the work required to capture and record project handover data.

The COBIE approach is to enter the data as it is created during design/construction, see Figure 1. Designers provide floor, space, and equipment data. Contractors provide make, model, and serial numbers of installed equipment. Data provided by contractors comes directly from product manufacturer participants in COBIE. Please see [Project Delivery Terms](#) for more information.

Figure 1: COBIE Approach

Design → Build → Operate

Inputs: Space, Systems & Equipment Layout, Product Data

2007-09-07-COBIEGuide-v2(2003).pdf - Adobe Reader

File Edit View Document Tools Windows Help

COORDINATING DRAFT 8-Sep-07

A STEP-BY-STEP GUIDE TO THE CONSTRUCTION OPERATIONS BUILDING INFORMATION EXCHANGE (COBIE) SPREADSHEET

This document provides a step-by-step guide to manually enter data directly into the COBIE spreadsheet. This document, as well as information about the specific specification for COBIE or the way COBIE was developed may be found on the Whole Building Design Guide (www.wbdg.org) under the COBIE "resource page."

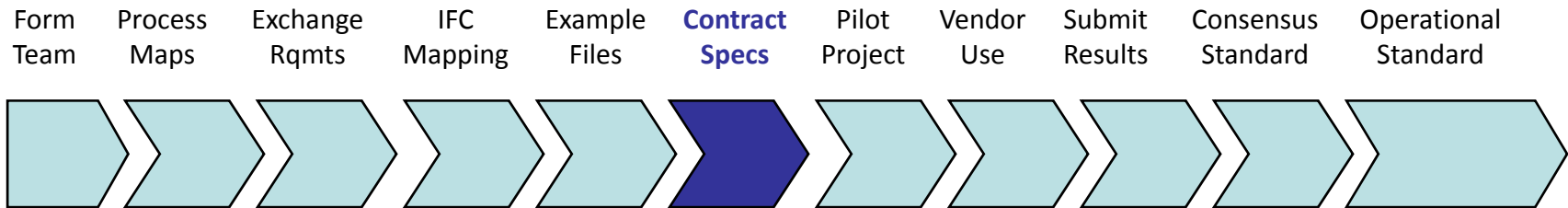
WHO SHOULD USE THIS GUIDE

This guide is intended for those who will be entering COBIE data directly into the template spreadsheet named "2007-09-08-COBIE-Spreadsheet.xls." The "2007-09-08-COBIE-Spreadsheet.xls" includes some additional formatting that will simplify the use of the revised COBIE July 2007 spreadsheet. The COBIE July 2007 spreadsheet superseded the initial COBIE spreadsheet specification published in December 2006 as Appendix B of the National Building Information Model Standard.

READ THEN DISCUSS WITH PROJECT MANAGER

Read this whole document prior to loading any data into the spreadsheet to identify what data needs to be entered. You will need to discuss these requirements with your project manager. Document this discussion as a COBIE "kick-off" meeting where the impact of these decisions can be clearly discussed and resolved prior to entering any data.

6. contract specs



if it is not in a contract, it won't be used

find current information exchanges on which project is based

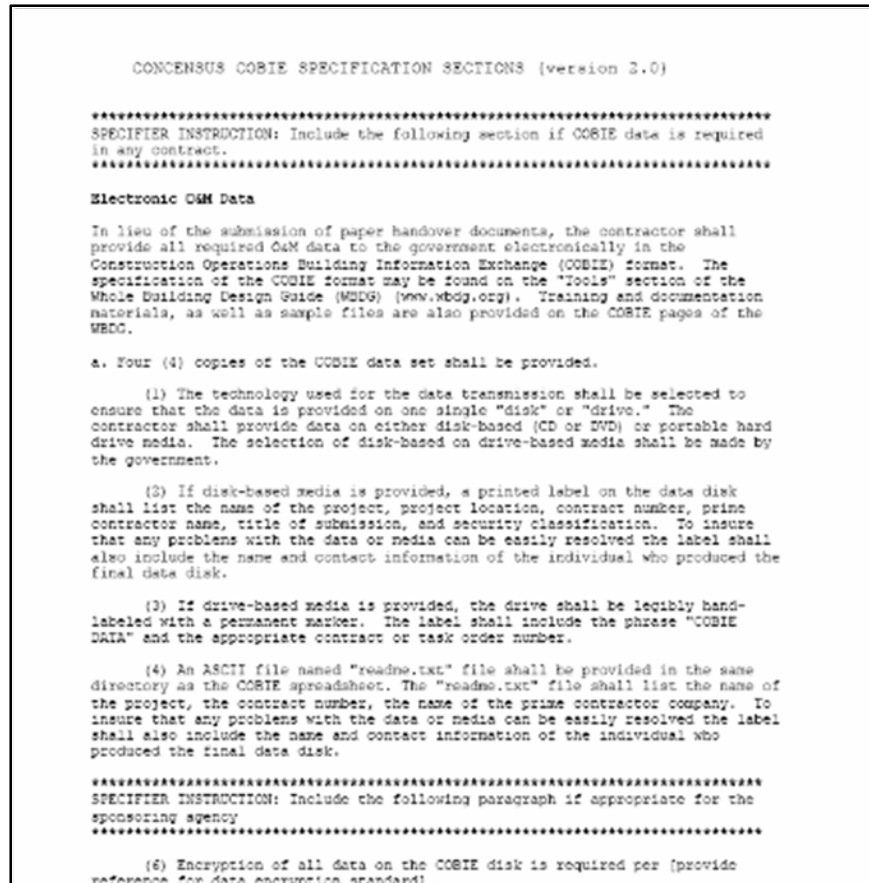
modify those examples to change “format” and “content” of deliverable

specification states who provides what data, when

specification must include true cost of information exchange failure

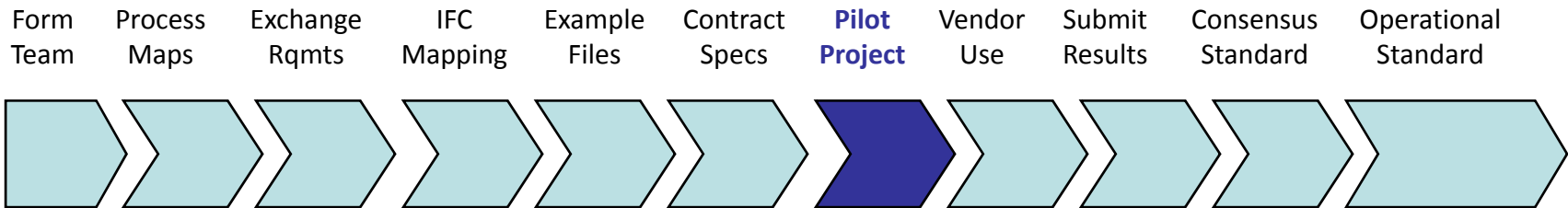
6. contract specs (cobie)

- replaces paper-based specifications
- designer submits space and equipment layouts with plans and specs
- construction contractor loads mfg, serial, and tag no's
- commissioning agent provides job plans
- final deliverable eliminates paper reproduction



ref: http://www.wbdg.org/pdfs/cobie_specification_sections.pdf

7. pilot project



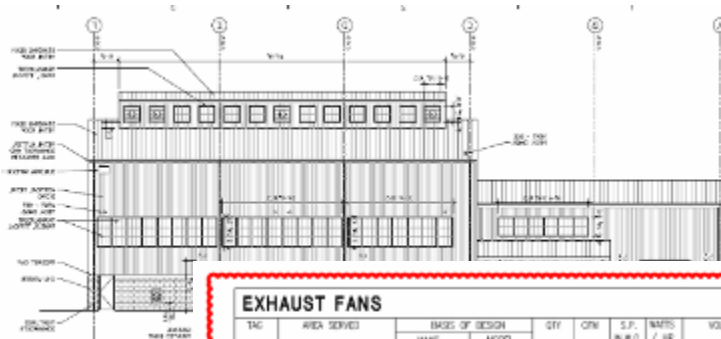
ensure release of “sanitized” data is possible

use real project and pay for the data by-hand if needed

results verify format and specifications

results validate scope of problem statement and value of information

7. pilot projects (cobie)



TAG	AREA SERVED	BASIS OF DESIGN		QTY	CFM	S.P. IN. WG.	WAFS / HP	VOLTAGE	NOISE LBS	
		MAKE	MODEL							
EF-1	HIGH DRY	GREENWICK	SB-2L30-7	1	8000	0.125	3/4 HP	208/2/50*	125	2.5.5
EF-2	HIGH DRY	GREENWICK	SB-2L30-7	1	8000	0.125	3/4 HP	208/2/50*	125	2.5.5
EF-3	ELECTRICAL ROOM	GREENWICK	CSP-4510	1	350	0.25	217 W	115/1/60	56	5
EF-4	RECESSED MANT AREA	GREENWICK	CSP-4710	1	250	0.625	325 W	115/1/60	56	2
EF-5	PARTS WASHER	MESERIAN	NHS	1	500	3.75	1/2 HP	115/1/60	XX	1
EF-6	WELDING BOOTH	MESERIAN	NHS	1	500	3.75	1/2 HP	115/1/60	XX	1
EF-7	TOILET VAN ROOM	GREENWICK	CSP-4710	1	210	0.625	325 W	115/1/60	56	

	A	B	C	D	E	F	G	H	I
Sample	Year	Age	Sex	Weight	Color	Condition	Location	Notes	Remarks
25	1971	10	M	1.2	Black	Good	Forest	1.2	Forest
26	1972	11	M	1.3	Black	Good	Forest	1.3	Forest
27	1973	12	M	1.4	Black	Good	Forest	1.4	Forest
28	1974	13	M	1.5	Black	Good	Forest	1.5	Forest
29	1975	14	M	1.6	Black	Good	Forest	1.6	Forest
30	1976	15	M	1.7	Black	Good	Forest	1.7	Forest
31	1977	16	M	1.8	Black	Good	Forest	1.8	Forest
32	1978	17	M	1.9	Black	Good	Forest	1.9	Forest
33	1979	18	M	2.0	Black	Good	Forest	2.0	Forest
34	1980	19	M	2.1	Black	Good	Forest	2.1	Forest
35	1981	20	M	2.2	Black	Good	Forest	2.2	Forest
36	1982	21	M	2.3	Black	Good	Forest	2.3	Forest
37	1983	22	M	2.4	Black	Good	Forest	2.4	Forest
38	1984	23	M	2.5	Black	Good	Forest	2.5	Forest
39	1985	24	M	2.6	Black	Good	Forest	2.6	Forest
40	1986	25	M	2.7	Black	Good	Forest	2.7	Forest
41	1987	26	M	2.8	Black	Good	Forest	2.8	Forest
42	1988	27	M	2.9	Black	Good	Forest	2.9	Forest
43	1989	28	M	3.0	Black	Good	Forest	3.0	Forest
44	1990	29	M	3.1	Black	Good	Forest	3.1	Forest
45	1991	30	M	3.2	Black	Good	Forest	3.2	Forest
46	1992	31	M	3.3	Black	Good	Forest	3.3	Forest
47	1993	32	M	3.4	Black	Good	Forest	3.4	Forest
48	1994	33	M	3.5	Black	Good	Forest	3.5	Forest
49	1995	34	M	3.6	Black	Good	Forest	3.6	Forest
50	1996	35	M	3.7	Black	Good	Forest	3.7	Forest
51	1997	36	M	3.8	Black	Good	Forest	3.8	Forest
52	1998	37	M	3.9	Black	Good	Forest	3.9	Forest
53	1999	38	M	4.0	Black	Good	Forest	4.0	Forest
54	2000	39	M	4.1	Black	Good	Forest	4.1	Forest
55	2001	40	M	4.2	Black	Good	Forest	4.2	Forest
56	2002	41	M	4.3	Black	Good	Forest	4.3	Forest
57	2003	42	M	4.4	Black	Good	Forest	4.4	Forest
58	2004	43	M	4.5	Black	Good	Forest	4.5	Forest
59	2005	44	M	4.6	Black	Good	Forest	4.6	Forest
60	2006	45	M	4.7	Black	Good	Forest	4.7	Forest
61	2007	46	M	4.8	Black	Good	Forest	4.8	Forest
62	2008	47	M	4.9	Black	Good	Forest	4.9	Forest
63	2009	48	M	5.0	Black	Good	Forest	5.0	Forest
64	2010	49	M	5.1	Black	Good	Forest	5.1	Forest
65	2011	50	M	5.2	Black	Good	Forest	5.2	Forest
66	2012	51	M	5.3	Black	Good	Forest	5.3	Forest
67	2013	52	M	5.4	Black	Good	Forest	5.4	Forest
68	2014	53	M	5.5	Black	Good	Forest	5.5	Forest
69	2015	54	M	5.6	Black	Good	Forest	5.6	Forest
70	2016	55	M	5.7	Black	Good	Forest	5.7	Forest
71	2017	56	M	5.8	Black	Good	Forest	5.8	Forest
72	2018	57	M	5.9	Black	Good	Forest	5.9	Forest
73	2019	58	M	6.0	Black	Good	Forest	6.0	Forest
74	2020	59	M	6.1	Black	Good	Forest	6.1	Forest
75	2021	60	M	6.2	Black	Good	Forest	6.2	Forest
76	2022	61	M	6.3	Black	Good	Forest	6.3	Forest
77	2023	62	M	6.4	Black	Good	Forest	6.4	Forest
78	2024	63	M	6.5	Black	Good	Forest	6.5	Forest
79	2025	64	M	6.6	Black	Good	Forest	6.6	Forest
80	2026	65	M	6.7	Black	Good	Forest	6.7	Forest
81	2027	66	M	6.8	Black	Good	Forest	6.8	Forest
82	2028	67	M	6.9	Black	Good	Forest	6.9	Forest
83	2029	68	M	7.0	Black	Good	Forest	7.0	Forest
84	2030	69	M	7.1	Black	Good	Forest	7.1	Forest
85	2031	70	M	7.2	Black	Good	Forest	7.2	Forest
86	2032	71	M	7.3	Black	Good	Forest	7.3	Forest
87	2033	72	M	7.4	Black	Good	Forest	7.4	Forest
88	2034	73	M	7.5	Black	Good	Forest	7.5	Forest
89	2035	74	M	7.6	Black	Good	Forest	7.6	Forest
90	2036	75	M	7.7	Black	Good	Forest	7.7	Forest
91	2037	76	M	7.8	Black	Good	Forest	7.8	Forest
92	2038	77	M	7.9	Black	Good	Forest	7.9	Forest
93	2039	78	M	8.0	Black	Good	Forest	8.0	Forest
94	2040	79	M	8.1	Black	Good	Forest	8.1	Forest
95	2041	80	M	8.2	Black	Good	Forest	8.2	Forest
96	2042	81	M	8.3	Black	Good	Forest	8.3	Forest
97	2043	82	M	8.4	Black	Good	Forest	8.4	Forest
98	2044	83	M	8.5	Black	Good	Forest	8.5	Forest
99	2045	84	M	8.6	Black	Good	Forest	8.6	Forest
100	2046	85	M	8.7	Black	Good	Forest	8.7	Forest
101	2047	86	M	8.8	Black	Good	Forest	8.8	Forest
102	2048	87	M	8.9	Black	Good	Forest	8.9	Forest
103	2049	88	M	9.0	Black	Good	Forest	9.0	Forest
104	2050	89	M	9.1	Black	Good	Forest	9.1	Forest
105	2051	90	M	9.2	Black	Good	Forest	9.2	Forest
106	2052	91	M	9.3	Black	Good	Forest	9.3	Forest
107	2053	92	M	9.4	Black	Good	Forest	9.4	Forest
108	2054	93	M	9.5	Black	Good	Forest	9.5	Forest
109	2055	94	M	9.6	Black	Good	Forest	9.6	Forest
110	2056	95	M	9.7	Black	Good	Forest	9.7	Forest
111	2057	96	M	9.8	Black	Good	Forest	9.8	Forest
112	2058	97	M	9.9	Black	Good	Forest	9.9	Forest
113	2059	98	M	10.0	Black	Good	Forest	10.0	Forest
114	2060	99	M	10.1	Black	Good	Forest	10.1	Forest
115	2061	100	M	10.2	Black	Good	Forest	10.2	Forest
116	2062	101	M	10.3	Black	Good	Forest	10.3	Forest
117	2063	102	M	10.4	Black	Good	Forest	10.4	Forest
118	2064	103	M	10.5	Black	Good	Forest	10.5	Forest
119	2065	104	M	10.6	Black	Good	Forest	10.6	Forest
120	2066	105	M	10.7	Black	Good	Forest	10.7	Forest
121	2067	106	M	10.8	Black	Good	Forest	10.8	Forest
122	2068	107	M	10.9	Black	Good	Forest	10.9	Forest
123	2069	108	M	11.0	Black	Good	Forest	11.0	Forest
124	2070	109	M	11.1	Black	Good	Forest	11.1	Forest
125	2071	110	M	11.2	Black	Good	Forest	11.2	Forest
126	2072	111	M	11.3	Black	Good	Forest	11.3	Forest
127	2073	112	M	11.4	Black	Good	Forest	11.4	Forest
128	2074	113	M	11.5	Black	Good	Forest	11.5	Forest
129	2075	114	M	11.6	Black	Good	Forest	11.6	Forest
130	2076	115	M	11.7	Black	Good	Forest	11.7	Forest
131	2077	116	M	11.8	Black	Good	Forest	11.8	Forest
132	2078	117	M	11.9	Black	Good	Forest	11.9	Forest
133	2079	118	M	12.0	Black	Good	Forest	12.0	Forest
134	2080	119	M	12.1	Black	Good	Forest	12.1	Forest
135	2081	120	M	12.2	Black	Good	Forest	12.2	Forest
136	2082	121	M	12.3	Black	Good	Forest	12.3	Forest
137	2083	122	M	12.4	Black	Good	Forest	12.4	Forest
138	2084	123	M	12.5	Black	Good	Forest	12.5	Forest
139	2085	124	M	12.6	Black	Good	Forest	12.6	Forest
140	2086	125	M	12.7	Black	Good	Forest	12.7	Forest
141	2087	126	M	12.8	Black	Good	Forest	12.8	Forest
142	2088	127	M	12.9	Black	Good	Forest	12.9	Forest
143	2089	128	M	13.0	Black	Good	Forest	13.0	Forest
144	2090	129	M	13.1	Black	Good	Forest	13.1	Forest
145	2091	130	M	13.2	Black	Good	Forest	13.2	Forest
146	2092	131	M	13.3	Black	Good	Forest	13.3	Forest
147	2093	132	M	13.4	Black	Good	Forest	13.4	Forest
148	2094	133	M	13.5	Black	Good	Forest	13.5	Forest
149	2095	134	M	13.6	Black	Good	Forest	13.6	Forest
150	2096	135	M	13.7	Black	Good	Forest	13.7	Forest
151	2097	136	M	13.8	Black	Good	Forest	13.8	Forest
152	2098	137	M	13.9	Black	Good	Forest	13.9	Forest
153	2099	138	M	14.0	Black	Good	Forest	14.0	Forest
154	2100	139	M	14.1	Black	Good	Forest	14.1	Forest
155	2101	140	M	14.2	Black	Good	Forest	14.2	Forest
156	2102	141	M	14.3	Black	Good	Forest	14.3	Forest
157	2103	142	M	14.4	Black	Good	Forest	14.4	Forest
158	2104	143	M	14.5	Black	Good	Forest	14.5	Forest
159	2105	144	M	14.6	Black	Good	Forest	14.6	Forest
160	2106	145	M	14.7	Black	Good	Forest	14.7	Forest
161	2107	146	M	14.8	Black	Good	Forest	14.8	Forest
162	2108	147	M	14.9	Black	Good	Forest	14.9	Forest
163	2109	148	M	15.0	Black	Good	Forest	15.0	Forest
164	2110	149	M	15.1	Black	Good	Forest	15.1	Forest
165	2111	150	M	15.2	Black	Good	Forest	15.2	Forest
166	2112	151	M	15.3	Black	Good	Forest	15.3	Forest
167	2113	152	M	15.4	Black	Good	Forest	15.4	Forest
168	2114	153	M	15.5	Black	Good	Forest	15.5	Forest
169	2115	154	M	15.6	Black	Good	Forest	15.6	Forest
170	2116	155	M	15.7	Black	Good	Forest	15.7	Forest
171	2117	156	M	15.8	Black	Good	Forest	15.8	Forest
172	2118	157	M	15.9	Black	Good	Forest	15.9	Forest
173	2119	158	M	16.0	Black	Good	Forest	16.0	Forest
174	2120	159	M	16.1	Black	Good	Forest	16.1	Forest
175	2121	160	M	16.2	Black	Good	Forest	16.2	Forest
176	2122	161	M	16.3	Black	Good	Forest	16.3	Forest
177	2123	162	M	16.4	Black	Good	Forest	16.4	Forest
178	2124	163	M	16.5	Black	Good	Forest	16.5	Forest
179	2125	164	M	16.6	Black	Good	Forest	16.6	Forest
180	2126	165	M	16.7	Black	Good	Forest	16.7	Forest
181	2127	166	M	16.8	Black	Good	Forest	16.8	Forest
182	2128	167	M	16.9	Black	Good	Forest	16.9	Forest
183	2129	168	M	17.0	Black	Good	Forest	17.0	Forest
184	2130	169	M	17.1	Black	Good	Forest	17.1	Forest
185	2131	170	M	17.2	Black	Good	Forest	17.2	Forest
186	2132	171	M	17.3	Black	Good	Forest	17.3	Forest
187	2133	172	M	17.4	Black	Good	Forest	17.4	Forest
188	2134	173	M	17.5	Black	Good	Forest	17.5	Forest
189	2135	174	M	17.6	Black	Good	Forest	17.6	Forest
190	2136	175	M	17.7	Black	Good	Forest	17.7</	

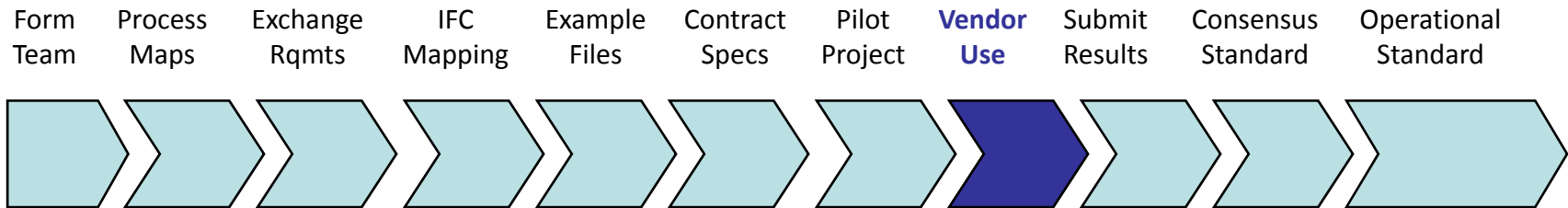
spreadsheet deliverables

- Overseas Buildings Operations (OBO), U.S. Dept of State
- NAVFAC
- Corps of Engineers

new electronic submittal process

- OBO
- NASA

8. vendor use



by-hand (or partially by-hand) has value now but has limited application

ultimately these exchanges should be transparent to users

consider the example of the ASCII format

vendors demonstrate compliance with information exchange specification

results of demonstrations made public to allow replication of results

8. vendor use (cobie)



[OVERVIEW](#) | [MEMBERS / JOIN](#) | [PROGRAMS](#) | [PROJECTS](#) | [NEWS / EVENTS](#) | [LINKS](#) | [FAQ](#) | [CONTACT US](#) | [HOME](#)

Latest News

OGC® and buildingSMART alliance™ Release RFQ/CFP for AECO0 Testbed
(May 2, 2008)

VA to Adopt BIM Starting in FY 2009
(April 15, 2008)

Fiatech CETI Awards
(April 10, 2008)

BuildingSmartAlliance now co-sponsoring BIM Storm LAX.



Demonstration of Building Information Modeling (BIM) Information Exchange

Background

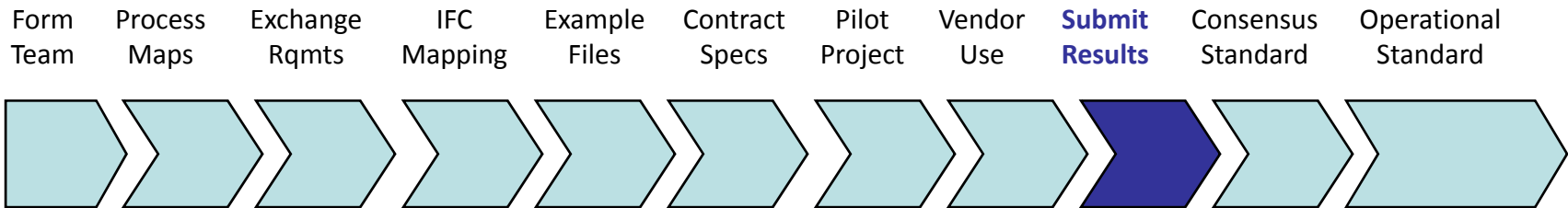
Today's dynamic project organizations often suffer from the incompatibilities between data content and format created by different project stakeholders. Such incompatibilities are not limited to the exchange of information between multiple software tools. Incompatibilities also arise when different versions of the same software or users have different configurations of the same software versions.

One of the objectives of the buildingSMART Alliance is to create performance-based information exchange specifications. These specifications help project team members to clearly identify the expected content of a given information exchange. To ensure that the data does not have to be retyped from one system to another, the Alliance requires that its information exchange products be based on open-standard formats. To use these definitions of data content and format, contract specifications are being developed to augment or replace the current requirements for paper-based information exchange.

Introduction

The buildingSMART alliance is deeply involved in establishing new approaches to move products and specification forward to the industry as quickly as possible and then to turn those efforts ultimately into consensus standards via NBIMS. We currently have multiple approaches underway to accomplish our goals. One such effort is buildingSMART alliance Project 08 ♦ COBIE. The effort described below is a work in progress and a test format for future projects that will eventually follow in a similar path. We request your input as to not only this project but also our approach. You comments should be sent to the Projects Coordinator, Bill East. For this project, Bill is wearing two hats, as he is also the COBIE project manager.

9. submit results



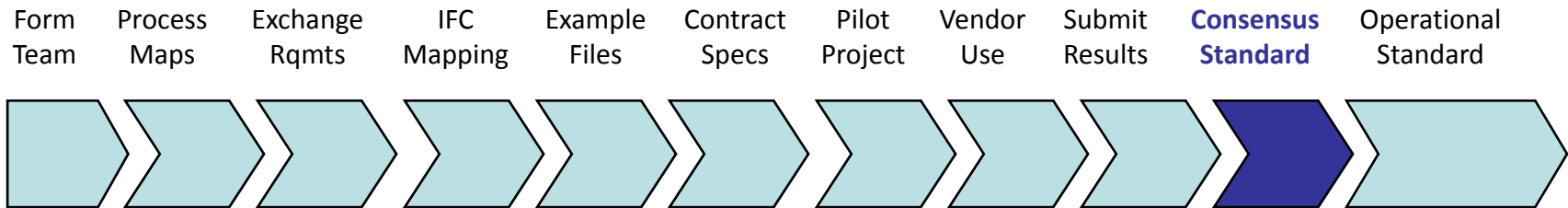
re-package information per NBIMS guidelines

key 1. demonstrate wide stakeholder participation

key 2. non-proprietary, performance-based specification

key 3. no follow-on “harmonization” with “competing standards”

10. consensus standard



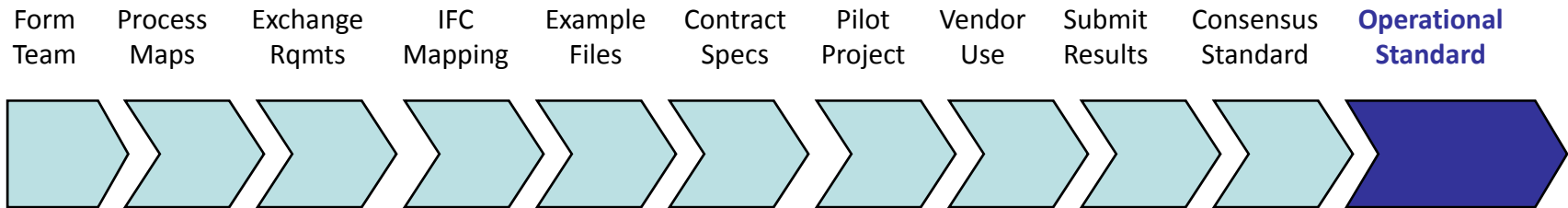
NBIMS voting process allows members to make suggestions

key 1. if you left out a group up-front, they may participate now

key 2. non-proprietary, performance-based specification

key 3. reduce follow-on “harmonization” with “competing standards”

11. operational standards



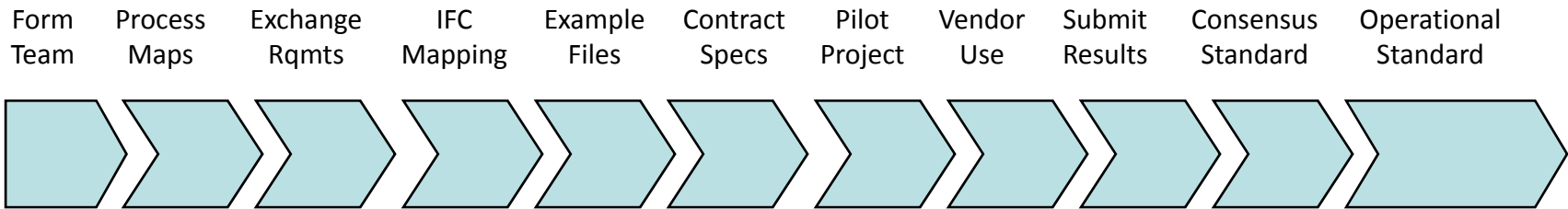
NBIMS will develop process for updating standards over time

key 1. requirements not technology driven

key 2. changes based on problem statement scope and definition

key 3. integration with wider international efforts following use

process summary



subject matter experts, not consultants, drive the process

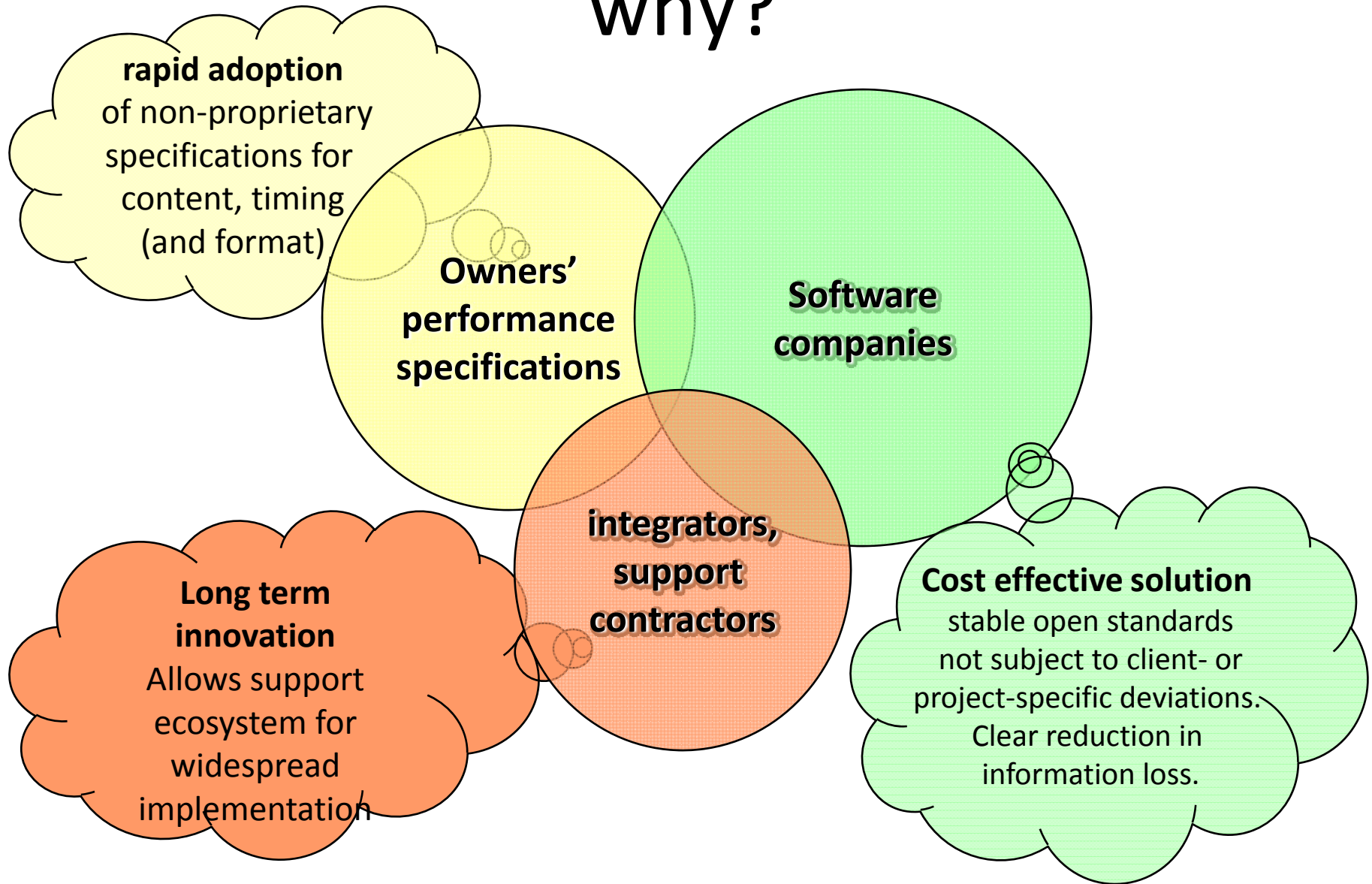
the problem drives the technology, not the other way around

technical work including contracts and pilots in as little as 12 months

phasing allows rapid, measured progress on complex topics

early adoption reduces client-driven requirements/customizations

why?



developing open information exchange standards

E. William East, PE, PhD
buildingSMART Alliance Project Coordinator

Dana Smith, AIA
buildingSMART Alliance Executive Director