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I.   Introduction

BIM Excellence is a unique *research-based* approach to digital innovation in the construction industry. It provides an integrated methodology and a modular language for performance assessment, learning and process optimisation. The **BIMe Initiative** is *not-for-profit effort* based on the BIM Excellence approach and is guided by a set of Principles. The Initiative is undertaken by volunteer researchers and is supported by in-kind contributions, commercial services, and institutional/corporate sponsorship.

This document must be read in conjunction with **101in BIMe Initiative Explainer**, **102in BIMe Knowledge Structures**, *and* **103in BIMe Initiative Projects** (refer to list of publications)*. The BIM Excellence approach and the BIMe Initiative are based on the* published research of Dr. Bilal Succar *and a growing cohort of esteemed international collaborators.*

II.   How to use this document

The Competency Table can be used to *organise* Competency Items – whether developed by the BIMe Initiative or by others - and to *provide a structure* for:

→ Developing **assessment modules** for evaluating and comparing the abilities of individuals, groups and whole organisations;
→ Developing *competency-based* **certification regimes** and **accreditation programmes**;
→ Developing learning units and *competency-based* **educational programmes**; and
→ Identifying **competency profiles** of varied roles across markets and disciplines.
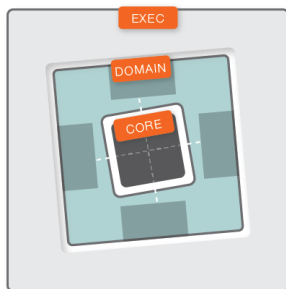
The Competency Table is structured according to the published **Competency Hierarchy** which includes 3 **Competency Tiers**: Core Tier, Domain Tier and Execution Tier. This document focuses on the Domain Tier [1] and its 8 Competency Sets and 55 *standard* Competency Topics. Each of the *standard* [2] topics includes 10s or 100s of Competency Items, a **Competency Item** is a 'phrase/sentence' representing an *ability*, *activity* or *outcome* that can be *assessed*, *learned* or *applied*. Each Competency Item belongs to a specific Competency Topic (e.g. Collaboration) within a specific Competency Set (e.g. Functional Set). Below are three sample Competency Items:

→ prepare a 3D model for Construction Scheduling
→ facilitate Model-based Collaboration between a team of structural engineers on a bridge project
→ maintain BIModels generated using standardised Protocols

Competency Items are applicable at specific Organizational Scales and Granularity Levels [3], and are used to populate *assessment modules* and *training lessons*. They can also be collated into *checklist/task list templates* and *modular project workflows* (see example).

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[1] Refer to the Competency Tiers model on the BIM Framework blog: http://bit.ly/Competency-Tiers.
[2] Standard competency topics apply within the BIM domain and vary across other domains (e.g. PLM or GIS). The taxonomy allows for non-standard topics provided these do not overlap or contradict with Standard Topics.
[3] Refer to OScales and GLevels within Paper A3: *Building Information Modelling Maturity Matrix* (Succar, 2010 - http://bit.ly/BIMPaperA3) or directly through the BIM Framework blog: http://bit.ly/Org-Hierarchy.

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III.   Competency Item

A **Competency Item** is a 'phrase/sentence' representing an *ability*, *activity* or *outcome* that can be *assessed*, *learned*, or *applied*. Each Competency Item belongs to a specific Competency Topic (e.g. Collaboration) within a specific Competency Set (e.g. Functional Set). Below are a few sample Competency Items:
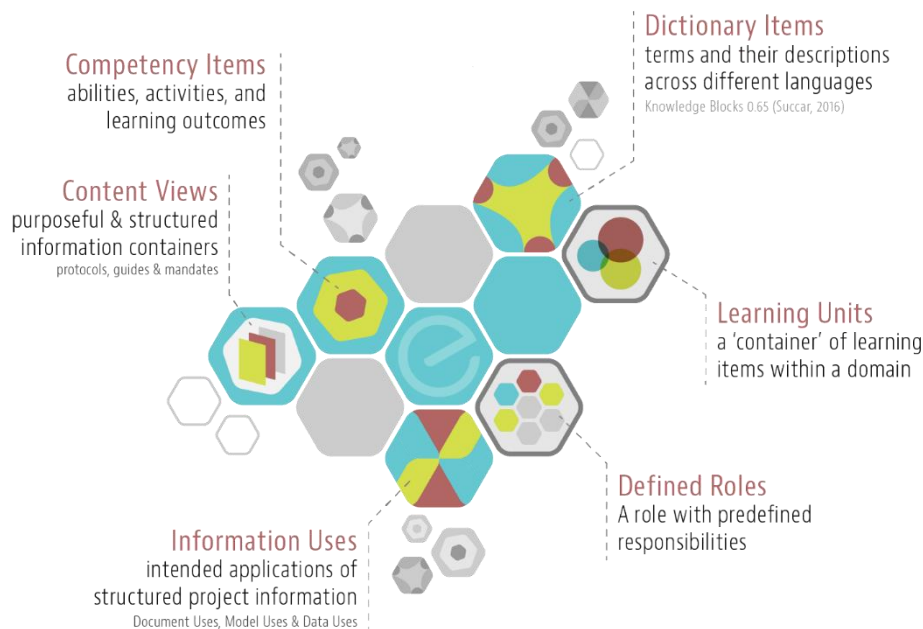
Syntax - *do you have the ability to:*

→   prepare a 3D model for Construction Scheduling
→   facilitate Model-based Collaboration between a team of structural engineers on a bridge project
→   maintain BIMModels generated using standardised Protocols
→   use a Federated Model to conduct Egress and Ingress simulations
→   use BIMModels to monitor Building Performance and control its systems and equipment

Competency Items are used to populate *assessment modules* and *training lessons*. They can also be collated into *checklist/task list templates* and *modular project workflows* (see example).

Competency Items are a type of Knowledge Block used to build larger knowledge structures. As a *mid-sized* block, a Competency Item can host *smaller* blocks (e.g. Dictionary Items - as shown in the sample items above) and get collated into *larger* blocks, similar to Defined Roles, and Information Uses.

Dictionary Items
terms and their descriptions across different languages
Knowledge Blocks 0.65 (Succar, 2016)

Competency Items
abilities, activities, and learning outcomes

Content Views
purposeful & structured information containers
protocols, guides & mandates

Learning Units
a 'container' of learning items within a domain

Defined Roles
A role with predefined responsibilities

Information Uses
intended applications of structured project information
Document Uses, Model Uses & Data Uses

Knowledge Blocks are interconnected through a common BIM Ontology and a semantic web engine. Formulated as simple/small knowledge structures, they collectively form a *modular language* for defining project *requirements* (input), measuring project *deliverables* (output) and clarifying project *processes*.

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IV. Competency Sets and Topics

Competency Items are identified using a specialized **Competency Flow Diagram**[4], collated into an expanding **Competency Inventory**[5], and organised under four *primary* competency sets - Managerial, Functional, Technical, and Supportive - and four *secondary* competency sets – Administration, Operation, Implementation, and Research & Development. All these competency sets, and the majority of their topics are *applicable across multiple domains* (e.g. construction, geospatial and manufacturing) and their respective *information systems* (e.g. BIM, GIS and PLM).

The tables below provide a summary of the 8 Competency Sets and 56 Competency Topics. The short descriptions are derived from the BIM Dictionary[6]:

Managerial Set

Summary: the decision-making abilities which drive the selection/adoption of long-term strategies and initiatives. Managerial competencies include leadership, strategic planning, and organizational management.

CODE	COMPETENCY TOPIC	DESCRIPTION
M01	General Management	Defining and communicating overall managerial goals from adopting new systems and workflows
M02	Leadership	Leading and guiding others throughout the process of implementing new systems and workflows
M03	Strategic Planning	Identifying strategic objectives and developing implementation strategies
M04	Organizational Management	Identifying the organizational changes necessary for instigating, monitoring, and improving BIM Adoption
M05	Business Development and Client Management	Maximizing the value achieved by the organization and its clients from BIM tools and workflows
M06	Partnership and Alliancing	Initiating partnerships and alliances with other organizations based on BIM Deliverables and workflows

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[4] Refer to "Competency flow: from identification to multiple use", Figure 5 within Succar, B., Sher, W., & Williams, A. (2013). *An integrated approach to BIM competency acquisition, assessment and application. Automation in Construction*. http://bit.ly/BIMPaperA6

[5] The BIM Excellence platform (http://BIMexcellence.com) collates thousands of competency items across all sets and topics. These are used to conduct corporate assessments and not-for-profit, international benchmarking activities.

[6] The naming of competency sets/topics is based on published research and have been calibrated through hundreds of assessments and user feedback. However, topics descriptions are not static but are continuously updated to reflect new research and additional user feedback. Unless a very recent version of this document is available (check Change Log), please refer to the online BIM Dictionary for all descriptions (e.g. M03 Strategic Planning > http://BIMdictionary.com/strategic-planning)

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Administration Set

Summary: the day-to-day organizational activities required to meet and maintain strategic objectives. Administration competencies include tendering and procurement, contract management, and human resource management.

CODE	COMPETENCY TOPIC	DESCRIPTION
A01	Administration, Policies and Procedures	Developing managerial initiatives into policies and procedures to facilitate the adoption of BIM tools and workflows
A02	Finance, Accounting and Budgeting	Planning, allocating and monitoring the costs associated with BIM Adoption
A03	Performance Management	Assessing organizational BIM capability/maturity, Individual Competency and project performance using standardized metrics
A04	Human Resource Management	Planning, developing, and managing human resources as to align staff competencies to organizational BIM goals
A05	Marketing	Promoting an organization's BIM Capability to its clients and business partners
A06	Tendering and Procurement	Developing the necessary specifications and documents to pre-qualify, recommend, or procure BIM products and services
A07	Contract Management	Administering the contractual documentation underlying Collaborative BIM Projects and workflows
A08	Risk Management	Managing the risks associated with using BIM tools and collaborative workflows
A09	Quality Management	Establishing, managing and controlling the quality of models, documentation and other Project Deliverables

Functional Set

Summary: the non-technical, overall abilities required to initiate, manage and deliver projects. Functional competencies include collaboration, facilitation and project management.

CODE	COMPETENCY TOPIC	DESCRIPTION
F01	Functional Basics	Identifying the basic requirements and main deliverables expected from using BIM tools and workflows
F02	Collaboration	Preparing the documentation necessary to enable Model-based Collaboration between Project Participants
F03	Facilitation	Facilitating the process of BIM collaboration between Project Participants
F04	Project Management	Managing projects where BIM Workflows are used, and BIM deliverables are specified
F05	Team and Workflow Management	Managing teams involved in the delivery of BIM Projects

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Operation Set

Summary: the daily, hands-on individual efforts required to deliver a project or part/aspect of a project. Operational competencies include designing, simulating, and quantifying.

CODE	COMPETENCY TOPIC	DESCRIPTION
o001	General Modelling	Using software tools to model project requirements and generate Model-based Deliverables across industries, information systems and knowledge domains
o002	Capturing and Representing	Using software tools and specialized equipment to capture and represent physical spaces and environments
o003	Planning and Designing	Using software tools for conceptualization, planning and design
o004	Simulating and Quantifying	Using software tools to conduct various types of model-based simulations and estimations
o005	Constructing and Fabricating	Using BIModels for the specific purposes of construction and fabrication
o006	Operating and Maintaining	Using models to operate, manage and maintain a Facility
o007	Monitoring and Controlling	Using models to monitor Building Performance or control its spaces, systems and equipment
o008	Linking and Extending	Linking BIModels and their components to other databases
o009	Custom Modelling	Using software tools to deliver a custom combination of Model-based Deliverables reflecting a variety of Model Uses

Technical Set

Summary: the abilities required to generate Project Deliverables across disciplines and specialties. Technical competencies include modelling, drafting and model management.

CODE	COMPETENCY TOPIC	DESCRIPTION
T01	General IT	Designing, installing, managing, maintaining, and ensuring the security of Information and Communication Technology (ICT) infrastructure including databases, servers, and networks
T02	Software Systems	Selecting, deploying, and maintaining software systems in a multi-user environment
. T03	Hardware and Equipment	Specifying, recommending, or procuring computer hardware and equipment
T04	Modelling	Generating BIModels based on pre-defined Modelling Standards and protocols
T05	Documentation	Generating drawings and construction documents using standardized details and workflows
T06	Presentation and Animation	Generating professional-quality renderings or 3D animations using Specialized Software Tools
T07	Model Management	Managing and maintaining BIModels generated using standardized processes, protocols, and specifications

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CODE	COMPETENCY TOPIC	DESCRIPTION
T08	Document Management	Using Document Management Systems or similar to store, manage and share files and BIModels
T09	Data Management	Managing data flows – speed, volume, quality, and security - across project, asset, and information lifecycles

Implementation Set

Summary: the activities required to introduce BIM concepts, tools and workflows into an organization. Implementation competencies include component development, standardization, and technical training.

CODE	COMPETENCY TOPIC	DESCRIPTION
I01	Implementation Fundamentals	Identifying and managing issues associated with BIM implementation
I02	Component Development	Implementing a structured approach for developing or customizing Model Components using documented Modelling Standards
I03	Library Management	Developing or managing component libraries as required for the standardized delivery of BIM Projects
I04	Standardization and Templates	Generating standardized templates, item lists and workflows for initiating, checking or delivering BIM Projects
I05	Technical Training	Developing a BIM Training Plan or maintaining a Skill Register to track staff training and their acquired skills
I06	System and Process Testing	Assessing the capability/compatibility of systems and the suitability of workflows and procedures
I07	Guides and Manuals	Developing guides, manuals or educational material covering Model-based Workflows

Supportive Set

Summary: the abilities needed to maintain information technology and communication systems. Supportive competencies include data and network support, equipment support and software troubleshooting.

CODE	COMPETENCY TOPIC	DESCRIPTION
S01	General IT Support	Troubleshooting software issues and supporting staff in resolving technical problems
S02	Data and Network Support	Managing and maintaining the storage of data, documents, 2D Drawings and BIModels
S03	Equipment Support	Developing specifications for BIM Hardware and BIM Hardware Deployment Programmes
S04	Software Support	Addressing issues related to BIM Software Tools, fulfilling relevant Support Tasks and managing the relationship with software vendors/resellers
S05	Software and Web Development	Developing extensions for BIM Software Tools, productivity software or web portals to improve BIM Deliverables

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Research and Development

Summary: the abilities required to evaluate existing processes, investigate new solutions and facilitate their adoption - within the organization or by the larger industry. R&D competencies include change management, knowledge engineering and industry engagement.

CODE	COMPETENCY TOPIC	DESCRIPTION
R01	General Research and Development	Conducting general or BIM-specific research and development activities
R02	Strategy Development and Planning	Developing a BIM Implementation Strategy or a BIM Implementation Plan to guide BIM Adoption
R03	Teaching and Coaching	Developing BIM training material to educate staff and facilitate the BIM Adoption process
R04	Knowledge Management and Engineering	Developing a Knowledge Management Strategy and capturing/representing the BIM-specific knowledge of staff
R05	Change Management	Developing a Change Management strategy that accompanies/supports the BIM Implementation process
R06	Research and Analysis	Participating in and/or publishing academic research focused on BIM innovation or collaboration
R07	Industry Engagement and Knowledge Sharing	Sharing BIM knowledge and experience with the wider industry through formal/informal workshops, seminars, and presentations

V. Change Log

VERSION	DATE	DESCRIPTION
0.1-0.9	Jan 2013 - July 2014	Test Distribution as part of beta testing and research validation
1.0-1.3	Aug 2014 – May 2016	Limited Direct Distribution through private channels
1.4	May 23, 2016	First Public Release through social media
2.0	Dec 13, 2016	Text simplification – removal of discussion covering Knowledge Blocks
2.1	Jan 27, 2019	Added new Technical Topic (T09 Data Management) – modified text for T01

VI. License to Use

VII. Contact Info

If you found this document beneficial and would like to contribute to the **BIMe Initiative**, please contact us. You can also follow the BIMe Initiative's on Twitter (@bimexcellence) and LinkedIn; thank you.

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