

# Model-based Conceptual Design Working Group (MBCD WG) Charter

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## 1 Overview

### 1.1 Purpose

The purpose of this working group is to advance the body of knowledge and practice of systems engineering (SE) through the development and application of model-based systems engineering (MBSE) methodologies to the Exploratory Research and Concept stages of systems engineering.

### 1.2 Vision

Develop best practice for model-based conceptual design

### 1.3 Missions

- Enhance the practise of problem definition and identifying capability needs
- Develop modelling practise in support of Exploratory Research and Concept Stage

### 1.4 Scope

Activities cover current and future model-based conceptual design theory, practice and education. The working group's focus is on the Exploratory Research and Concept Stages of the generic life-cycle defined by INCOSE<sup>1</sup>. However, the working group will also consider how model-based conceptual design influences and is influenced by other life-cycle stages.

### 1.5 Model-based Conceptual Design

Model-based Conceptual Design (MBCD) is the application of MBSE to the Exploratory Research and Concept Stages of the generic life-cycle defined by INCOSE<sup>1</sup> and more specifically to the following activities:

- i. Identify stakeholders' needs
- ii. Explore ideas and technologies
- iii. Refine stakeholders' needs
- iv. Explore feasible concepts
- v. Propose viable solutions

The main MBCD outputs, listed below, summarise the generic products from the first two technical processes defined by INCOSE<sup>1</sup>. These technical processes are also depicted in Figure 1.

- i. Stakeholder needs
- ii. Concept documents, including the concept of operations and support.
- iii. Stakeholder requirements specification

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<sup>1</sup> Systems Engineering Handbook Working Group, INCOSE, Systems Engineering Handbook, INCOSE-TP-2003-002-03.2, January 2010

- iv. Measures of effectiveness
- v. System Functions and System Functional Interfaces
- vi. Key performance parameters
- vii. One or more System Conceptual Designs
- viii. System analysis including trade studies to identify preferred concepts
- ix. System requirements specification incorporating measures of performance
- x. Validation and verification Criteria

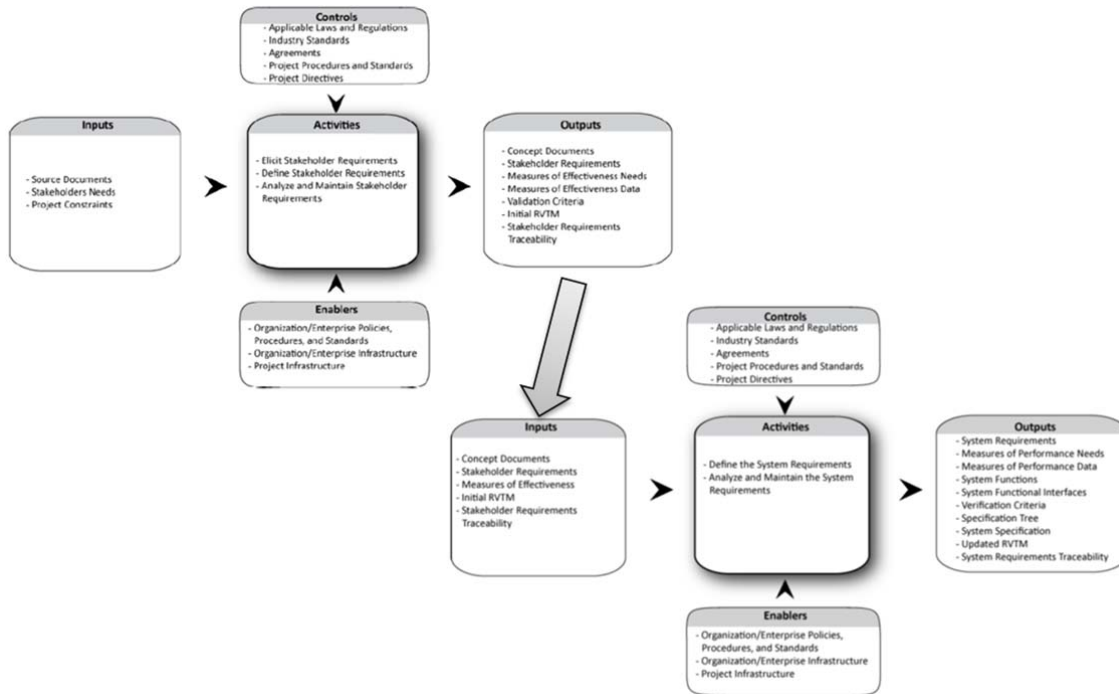


Figure 1: INCOSE<sup>1</sup> Systems Engineering – Initial Technical Process Steps

Following a recommendation by INCOSE’s Community Advisory Board<sup>2</sup>, the MBCD WG will, into the future, explore the application of the MBCD advances identified in the Exploratory Research and Concept Stages to the Validation Technical Process of the generic life-cycle defined by INCOSE<sup>1</sup>.

## 2 Structure

### 2.1 Member Skills and Expertise

Members should have a sound understanding of systems engineering, and expertise in model-based systems engineering, and a willingness to learn and advance the MBCD body of knowledge and practice. Researchers, practitioners and educators from the following domains, to the competency level of at least practitioner, act as examples of the expertise and skills required:

#### Systems Engineering Technical Skills

- i. Stakeholder needs and requirements elicitation and definition
- ii. Requirements analysis
- iii. Requirements verification and validation

<sup>2</sup> INCOSE CAB Meeting, International Workshop 2013

- iv. Model-based systems engineering

#### Systems Engineering Project Skills

- i. Project planning
- ii. Project assessment
- iii. Project control

#### Expertise

- i. Legal and policy
- ii. Business analysis
- iii. Soft systems analysis
- iv. Systems thinking
- v. Holistic lifecycle consideration

## 2.2 Membership, roles and responsibilities

The working group is structured with a steering group and activity teams.

The steering group consists of:

- i. Chair – Provide direction to, and be responsible for, the leadership of the MBCD WG
- ii. Co-chairs – Support the chair leading the MBCD WG and serve as chair in absence of the chair
- iii. Members – Support the activities of the MBCD WG steering group

Individual teams will be responsible for tackling specific challenges and issues. The teams consist of:

- i. Lead - Provide leadership of team tackling specific challenges and issues
- ii. Members - Support the team

## 2.3 Related working groups

It is desirable that the following INCOSE working groups should be engaged:

- i. Requirements working group
- ii. Systems of systems working group
- iii. MBSE Initiative – challenge teams and activity teams
- iv. Tools integration and interoperability working group

## 3 Working practice

### 3.1 Deliverables

The following are maintained on an ongoing basis by the steering group:

- i. Working Group Charter
- ii. Working Group strategy
- iii. Working Group membership
- iv. MBCD WG promotional material, including website and discussion forum
- v. MBCD WG progress summary

The following are to be delivered by the teams:

- i. Annual participation in the MBSE symposium, focusing on model-based conceptual design

- ii. Description of the challenges and issues the MBCD WG could address, along with proposed selections and approaches
- iii. MBCD WG activities roadmap
- iv. Establishment and maintenance of an MBCD discussion forum
- v. MBCD handbook (future)
- vi. Half-yearly progress reports

### 3.2 Approach

The steering group will meet at least quarterly.

The individual teams will meet regularly and report to the steering group half-yearly.

Communicate via electronic media, including website, discussion forums, email and telecom.

### 3.3 Measures of success

Measures of success include:

- i. Membership of activity teams
- ii. Deliverables from activity teams
- iii. Contributions to discussion forum
- iv. New and updated MBCD practice products
- v. Conference, symposiums and journal contributions
- vi. MBCD symposiums organised

## 4 Resources

### 4.1 Resources required

The MBCD WG will submit resources requirements as required. Resources required may include meeting facilities, teleconferencing, and publication costs.

### 4.2 Duration

This Charter will remain in effect until rescinded by the duly authorised INCOSE representative.

## 5 Signatures

<u>Position</u>	<u>Signature</u>	<u>Date</u>
Chair		
INCOSE Technical Director		
Chairman, INCOSE Board of Directors		

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## 6 Revisions

<u>Date</u>	<u>Revision</u>	<u>Description</u>	<u>Author</u>
23 <sup>rd</sup> May 2012	0.1	Initial early first draft – to start the discussion process.	Kevin Robinson
3 <sup>rd</sup> June 2012	0.2	Revised based on comments from the MBCD WG steering group meeting, 28 <sup>th</sup> May 2012.	Stephen Cook Kevin Robinson
4 <sup>th</sup> June 2012	0.3	Revised based on comments from the MBCD WG through email.	Kevin Robinson
7 <sup>th</sup> June 2012	0.4	Inclusion of example knowledge required.	Kevin Robinson
11 <sup>th</sup> June 2012	0.5	Inclusion of email review	Kevin Robinson
8 <sup>th</sup> July 2012	0.6	Review and editing	Quoc Do
6 <sup>th</sup> September 2012	0.7	Inclusion of review feedback from Robert Swarz, INCOSE Assistant Director Processes	Quoc Do
2 <sup>nd</sup> October 2012	0.8	Inclusion of final technical panel comments and minor typos	Kevin Robinson
2 <sup>nd</sup> October 2012	1.0	Release for publication	
27 <sup>th</sup> Jan 2013	1.1	Change WG name to MBCD and updated mission vision and mission statements	Quoc Do
5 <sup>th</sup> March 2013	1.2	Inclusion of INCOSE CAB recommendation	Kevin Robinson