



Model-Based Conceptual Design Working Group

Australian Systems Engineering Workshop 2016





ASEW2016 AUSTRALIAN SYSTEMS
ENGINEERING WORKSHOP
CANBERRA A.C.T. AUSTRALIA | 21-22 NOVEMBER 2016

Tutorial

Writing case studies

Mon 10:30am to 12:15pm



Writing a case study

- What is a case study?
- Key concepts
- Examples
 - SoSE
 - Transport
 - INCOSE handbook
- Discussion

What is a case study?

- “Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the *subject* of the inquiry will be an instance of a class of phenomena that provides an analytical frame — an *object* — within which the study is conducted and which the case illuminates and explicates.” Thomas (2011)
- In simple terms a **case study** is an in depth **study** of a particular situation

Where are case studies used?

(Friedman & Sage, 2004)

- Case studies have has a long history in many disciplines, notably, sociology, psychology, medicine, history and political science, and business.

Case Studies on Systems Engineering

(Friedman & Sage, 2004)

- For our purposes (Yin, 2003a), a case study is empirical inquiry that:
 - Investigates a contemporary phenomenon within its real-life context, especially when
 - Boundaries between phenomenon and context are not clearly evident, and in which
 - Multiple sources of evidence are generally used.

Why use Case Study Research?

(Friedman & Sage, 2004)

- In particular, it is often insufficient to know that X can cause Y. We also need to know the **how** and the **why** X causes Y, and for **what** specific X and Y. Case study research can potentially answer these interrogatives and thereby help us become more contextually aware.
- Case studies support a holistic understanding and interpretation of the systems of action, or interrelated activities engaged in by the participants or actors in the case situation subject to study.

The Qualities of a Good Case Study

- **Internal Validity** – Were the findings actually justified by the research, or were there problems of *researcher bias*? Has the case study researcher demonstrated a causal relationship between actors by showing that other plausible factors could not equally well or perhaps better explain the observed relationships?
- **External Validity** – Could the research findings be generalized?
- **Construct Validity** – Do the measures used in the case study make the concepts involved operational? In other words have we used multiple evidence sources, have we sufficiently established chains of evidence and have those providing evidence to the case study been allowed to review the case report before finalizing it.
- **Reliability** – To what extent would other researchers who are studying the same case in exactly the same way arrive at equivalent conclusions?

Meta Case Study Research

- Case study research can also include the evaluation of multiple case studies to surface additional insights
- Therefore it is helpful if all of the case studies to be used share a similar way of recording their findings through a shared list of headings and analysis approaches

Types of Case Study

- Analysis of a case in progress, e.g. a project
- Analysis of a completed or historical activity
- University case studies usually involve students as the researchers analysing the cases as a minimally involved party
- Industry case studies are often conducted by the participants to gain or disseminate knowledge

What should be included in a case study?

- Group exercise – Pair up, discuss and be prepared to share!

Example case studies

- System of Systems Engineering
- Transport interest group
- INCOSE Systems Engineering Handbook (see section 3.6 for introduction)
 - Five case studies used to illustrate the systems engineering process in the handbook
 - Domains including medical, civil, transport and cyber

Analysis of structure

	Study		
	System of Systems WG <i>Case Studies in System of Systems, Enterprise Systems, and Complex Systems Engineering</i>	Transportation WG <i>Systems Engineering in Transportation Projects – A Library of Case Studies</i>	INCOSE <i>INCOSE Systems Engineering Handbook</i>
Sections	Keywords	Keywords	
	Abstract		
	Glossary		
	Background	Background	Background
	Purpose		
	System (and context)		
	Challenges	Description of Challenges Faced	
	Development		
	Results		
	Analysis		
		Descriptions of SE Performed	Approach
		Outcome	
	Summary		
	Conclusion	Conclusion	Conclusions
	References		

Proposed MBCD case study structure

- Case Study Title and keywords
- Author Details
- Abstract
- Introduction
- Background
 - Context
 - Information on the project and system of interest
- Approach / Methodology (MBCD performed, development)
 - Tools, methods, techniques
 - Match methodology to framework of ideas (for example Checkland - is analysis appropriate)
 - Degree to which ideal conceptual design is covered in approach
- Project Outcome (including results and analysis)
 - What was the outcome and why did the methodology help / hinder / influence?
- Conclusion
 - Findings / Lessons Learned
 - Client perspective, or external review of outcomes
 - Value proposition
 - ❖ Value of MBCD to project
 - ❖ Degree to which value has been demonstrated
- References

Other case study details

- How should they look:
 - Structure as proposed
 - Similar to an INCOSE INSIGHT article (see instructions to authors)
 - ❖ 4 to 5 pages, style and references as per guide
- Managing and reviewing
 - Kevin Robinson and David Harvey to lead
- Indicative schedule
 - First drafts by start of Feb 2017
 - Final versions by mid Mar 2017
 - Released online through INCOSE channels for Jul 2017 – INCOSE IS in Adelaide



Case study workshop

Model-Based Conceptual Design

Mon 1:15pm to 3:00pm



Workshop plan

➤ Objectives

- Apply knowledge gained from the “*How to write a case study*” tutorial
- Gather dot-point level information for several case studies in Model-Based Conceptual Design

➤ Who has a case study to share?

➤ Process

- Break into teams of interviewee(s) and interviewer(s)
- Populate the case study structure with dot-point level information
- Share results of each team with the overall group
- Identify and discuss any common themes



Committee meeting

Model-Based Conceptual Design Working Group (MBCD WG)

Tue 10:30am to 11:30am



Agenda

- 1. Activity team updates and planning**
 - MBCD Case study collection progress
- 2. Planning for upcoming events**
 - INCOSE IS 2017 (17-20 Jul 2017)
- 3. Outreach**
 - Focus is on connections to other WGs
 - US satellite group and future plans
- 4. Focus discussion**
 - Committee leadership
- 5. Any Other Business**
- 6. Next meeting**
 - Wed 07 Dec 2016 – Teleconference



Back-brief

Model-Based Conceptual Design activities

Tue 3:30pm to 3:55pm



Model-Based Conceptual Design activities

➤ Tutorial

- *How to write a case study*

➤ Workshop

- Case studies gathered by teaming up people with a story to tell with interviewers
- Case studies identified
 - ❖ X
 - ❖ Y
 - ❖ Z
- **Thematics identified**

Model-Based Conceptual Design activities

- Working Group committee meeting
 - Key activities
 - ❖ Case study collection, collation and analysis, publication
 - ❖ Development of “good practice guide”
 - Change of leadership with a widening focus
 - Improving global connections – particularly through interaction with other working groups