

Design Structure Matrix Methods and Applications

Led by **Tyson Browning**

Friday, 26 October 2018, 8:00 a.m. – 4:30 p.m.

Workforce Training Center, Albuquerque, NM

Brought to you by the INCOSE Enchantment Chapter, Albuquerque NM

Tutorial: Design Structure Matrix Methods and Applications

The *design structure matrix* (DSM) is a powerful tool for visualizing, analyzing, innovating, and improving systems—including product designs, organizational structures, and process flows. The DSM is a square matrix showing relationships between system elements, which can be product components, software code packages, teams, activities, etc. By analyzing a DSM, one can prescribe a better (e.g., more modular) system architecture or organization. Adding a time-basis to the model enables one to prescribe a faster, lower-risk process. Because the DSM highlights process feedbacks, it helps identify iterations, cycles, and rework loops (key drivers of cost and schedule risk). The DSM is concise, visually appealing, and used in many organizations across diverse industries. Users have found it extremely useful for fostering architectural innovation and enabling the situation awareness and empowerment that motivates the people executing complex processes. This tutorial introduces DSM and applications for product developers, systems engineers, and project and program managers. Real-life examples are presented from the aerospace, automotive, semiconductor, and other industries. Participants will engage in hands-on exercises (building DSM models) and come away with a clearer understanding of the drivers of critical, emergent behaviors in systems. The methods can be applied immediately to systems for quick results and insights.

Topics include:

1. General Introduction
 - Why are interfaces and dependencies important?
 - Why are they often mismanaged?
2. Introduction to the DSM
 - A) How does it work?
 - B) History
 - C) Types of applications
3. **Application one: *Product Architecture DSM for systems architecting***
 - A) Motivation
 - B) Using the product DSM
 - C) A detailed example—engine architecture
 - D) Exercise
 - E) Analysis opportunities and challenges
 - F) Additional examples (Pratt & Whitney, etc.)
 - G) Tools
 - H) Discussion—strengths and weaknesses of the approach; when, where, and why to use it
4. **Application two: *Organization Architecture DSM for organization design and coordination***
 - A) Motivation—well-integrated organizations, multi-team coordination
 - B) Capturing organizational interactions
 - C) Using the organization DSM
 - D) A detailed example (General Motors)
 - E) Discussion—strengths and weaknesses of the approach; when, where, and why to use it
5. **Application three: *Process Architecture DSM for project management***
 - A) Problems with common process modeling methods
 - B) Activity coupling, interdependency, feedback, and iteration
 - C) Using the process DSM
 - D) A detailed example
 - E) Exercise
 - F) Additional examples (Boeing, Intel, Lockheed Martin, etc.)
 - G) Analysis opportunities and challenges
 - H) Tools
 - I) Discussion—strengths and weaknesses of the approach; when, where, and why to use it
6. Integrative topics
 - A) Relationships among the applications
 - B) Beyond DSM: Domain Mapping Matrices (DMMs) and Multidomain Matrices (MDMs)

THE PRESENTER



Dr. Tyson R. Browning is an internationally recognized researcher, educator, and consultant. He is a full Professor of Operations Management in the Neeley School of Business at Texas Christian University, where he conducts research on managing complex projects (integrating managerial and engineering perspectives) and teaches MBA courses on project management, operations management, risk management, and process improvement. He has trained and advised several organizations, including BNSF Railway, General Motors, Lockheed Martin, Northrop Grumman, Seagate, Siemens, Southern California Edison, and the U.S. Navy. He has also served as an expert witness in legal proceedings. Prior to joining TCU in 2003, he worked for Lockheed Martin, the Lean Aerospace Initiative at the Massachusetts Institute of Technology (MIT), Honeywell Space Systems, and Los Alamos National Laboratory. He earned a B.S. in Engineering Physics from Abilene Christian University before two Master's degrees and a Ph.D. from MIT. His research results appear in a variety of academic journals, including ten papers in *Systems Engineering*. He is also the co-author of a book on the Design Structure Matrix (DSM). He has given over 160 academic and industry presentations and workshops in 17 countries. Having previously served as a Department or Associate Editor for three journals, he is currently co-Editor-in-Chief of the *Journal of Operations Management*. He is a member of several professional societies: Academy of Management, Decision Sciences Institute, Institute for Operations Research and the Management Sciences, International Council on Systems Engineering, Production and Operations Management Society, and Project Management Institute.

MEETING DETAILS

Time: Check in is 7:30 – 8:00 a.m.;
Tutorial is 8:00 a.m. – 5:00 p.m.

Date: Friday, October 26, 2018

Place: Room 207, Workforce Training Center (WTC),
5600 Eagle Rock Ave. NE Albuquerque, NM 87113,
<http://www.cnm.edu/depts/wtc/index.html>.

Directions: From Junction of I-40 and I-25 in
Albuquerque take I-25 North to exit 233, Alameda
Boulevard. Take a left and cross the freeway. See
map to left.

Package: The tutorial cost includes **soft-copy
downloadable** tutorial notes, lunches and snacks.

Registration & Payment: Register via EventBrite
[here](#): INCOSE members: \$150; non-members: \$200;
students: \$0. You will receive an email receipt from
EventBrite, which will act as your confirmation. If you
do not receive a confirmation, have trouble
registering or paying, or to register and pay by check,
contact Mary Compton at mlcompt@sandia.gov.

Contact: Other questions? Contact Ann Hodges at
alhodge@sandia.gov

