

Systems Architecting and Program Management with the Design Structure Matrix (DSM)

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Abstract. The design structure matrix (DSM) is a powerful tool for visualizing, analyzing, innovating, and improving system architectures, including those of products, processes, and organizations. The DSM helps to confront and manage system complexities and their implications. Akin to a traditional N2 chart and the System-System matrix in the DoD Architecture Framework (DoDAF), the DSM is a square matrix showing relationships between system elements. These elements can be components, teams, activities, or others. By analyzing the DSM, one can prescribe a better (e.g., more modular) system architecture. Adding a time-basis enables one to prescribe a faster, lower-risk process. Because the DSM highlights process feedbacks, it helps identify iterations and rework loops—key drivers of cost and schedule risk. The DSM is concise and visually appealing and is used in many organizations across diverse industries. Users have found the tool extremely useful for fostering architectural innovation and enabling the situation awareness and empowerment that motivates people executing complex processes. This tutorial introduces the DSM and three distinctive applications useful to product developers, system architects and 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 and how to identify these using a DSM. Participants will receive a copy of the presentation materials and access to free tools that can be applied immediately to systems for quick results and insights.

Biography

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Dr. Tyson R. Browning (www.TysonBrowning.com) is an internationally recognized expert in the design structure matrix (DSM). He is Associate Professor of Operations Management at the Neeley School of Business at TCU in Fort Worth, Texas, where he teaches MBA courses on Operations and Program Management and Six Sigma and conducts research on managing complex programs and processes. He has previous work experience with Lockheed Martin, Lean Aerospace Initiative, Honeywell Space Systems, and Los Alamos National Laboratory, and he has consulted for organizations such as BNSF Railways, General Motors, Lockheed Martin, Northrop Grumman, Seagate, Southern California Edison, U.S. Navy, and two European research consortia on complex systems. Dr. Browning earned a B.S. in Engineering Physics from Abilene Christian University and two Master's degrees and a Ph.D. from MIT. He has authored numerous papers for conferences and journals, including IEEE Transactions on Engineering Management, Journal of Mechanical Design, Journal of Operations Management, Project Management Journal, and others, as well as 9 papers for Systems Engineering. He has been an INCOSE member since 1995 and serves on the Editorial Boards for Systems Engineering and IEEE-TEM. He is co-author of the new book Design Structure Matrix Methods and Applications.