

## Design Structure Matrix Methods And Applications Engineering Systems

A sleeker, more comprehensive approach to construction projects BIM and Construction Management, Second Edition is a complete integration guide, featuring practical advice, project tested methods and workflows, and tutorials for implementing Building Information Modeling and technology in construction. Updated to align with the latest software editions from Autodesk, Trimble and Bentley, this book provides a common sense approach to leveraging BIM to provide significant value throughout a project's life cycle. This book outlines a results-focused approach which shows you how to incorporate BIM and other technologies into all phases of construction management, such as: Project planning: Set up the BIM project to succeed right from the start by using the right contracts, the right processes and the right technology Marketing: How to exceed customer expectations and market your brand of BIM to win. Pre-construction: Take a practical approach to engineer out risks in your project by using the model early to virtually build and analyze your project, prior to physical construction. Construction: Leverage the model throughout construction to build safer and with better quality. Field work: Learn how mobile technologies have disrupted the way we work in the field to optimize efficiencies and access information faster. Closeout: Deliver a better product to your customer that goes beyond the physical structure and better prepares them for future operations. Additionally, the book provides a look at technology trends in construction and a thoughtful perspective into potential use cases going forward. BIM and Construction Management, Second Edition builds on what has changed in the construction landscape and highlights a new way of delivering BIM-enabled projects. Aligning to industry trends such as Lean, integrated delivery methods, mobile platforms and cloud-based collaboration this book illustrates how using BIM and technology efficiently can create value.

This book introduces state-of-the-art models and methods based on the matrix in the field of product design and change management. It develops several types of matrix models for a broad range of applications, with the goal of efficiently finding product design solutions and proactively analyzing design change propagation. The book offers readers an extensive introduction to design automation, highlighting fundamental and innovative concepts, as well as cutting-edge technologies. Further, it familiarizes them with the latest advances in design change propagation and prediction. Lastly, the book puts forward design change-oriented matrix models and includes a proactive analysis of change propagation. The book offers a valuable resource for graduate students, researchers and engineers in the fields of product design and methodology, design automation and related areas.

Provides the reader with a review of the latest discussion in the ongoing process of Product Structuring. Even though the meeting was of academic nature, the papers include many practical examples of industrial applications.

Dependency and Structure Modelling (DSM) techniques support the management of complexity by focusing attention on the elements of a complex system and how they are related to each other. The DSM perspective can assist in understanding, designing and optimising complex systems – including products, processes and organisations. This volume comprises peer-reviewed papers representing state-of-the-art in DSM

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research and applications. The papers were presented at the 14th International DSM Conference held in September 2012 in Kyoto.

A guide to systems engineering that highlights creativity and innovation in order to foster great ideas and carry them out Practical Creativity and Innovation in Systems Engineering exposes engineers to a broad set of creative methods they can adopt in their daily practices. In addition, this book guides engineers to become entrepreneurs within traditional engineering companies, promoting creative and innovative culture around them. The author describes basic systems engineering concepts and includes an abbreviated summary of Standard 15288 systems' life cycle processes. He then provides an extensive collection of practical creative methods which are linked to the various systems' life cycle processes. Next, the author discusses obstacles to innovation and, in particular, how engineers can push creative ideas through layers of reactionary bureaucracy within non-innovative organizations. Finally, the author provides a comprehensive description of an exemplary creative and innovative case study recently completed. The book is filled with illustrative examples and offers effective guidelines that can enhance individual engineers' creative prowess as well as be used to create an organizational culture where creativity and innovation flourishes. This important book: Offers typical systems engineering processes that can be accomplished in creative ways throughout the development and post-development portions of a system's lifetime. Includes a large collection of practical creative methods applicable to engineering and other technological domains Includes innovation advice needed to transform creative ideas into new products, services, businesses and marketing processes Contains references and notes for further reading in every section Written for systems engineering practitioners, graduate school students and faculty members of systems, electrical, aerospace, mechanical and industrial engineering schools, Practical Creativity and Innovation in Systems Engineering offers a useful guide for creating a culture that promotes innovation.

This book constitutes the refereed proceedings of the 10th IFIP WG 5.1 International Conference on Product Lifecycle Management, PLM 2013, held in Nantes, France, in July 2013. The 63 full papers presented together with 2 keynote talks were carefully reviewed and selected from 91 submissions. They are organized in the following topical sections: PLM for sustainability, traceability and performance; PLM infrastructure and implementation processes; capture and reuse of product and process information; PLM and knowledge management; enterprise system integration; PLM and influence of/from social networks; PLM maturity and improvement concepts; PLM and collaborative product development; PLM virtual and simulation environments; and building information modeling.

A thorough treatment of product and systems development interms of value to all stakeholders Product and Systems Development compiles more than twentyyears of research and practice from a value perspective, fromvision and marketing to design, manufacturing, delivery,operations, and maintenance. It defines stakeholder value andidentifies specific stakeholders in the product and systemdevelopment process; covers best practices in development; andexamines systems engineering, current industry views, and the lifecycle of a value stream. Featuring appendices written by professionals in the field ontopics such as Design Structure Matrices, Lean Enablers for systemsengineering, and MDAO and simulations, this indispensableguide: Explains

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why stakeholders' values can hold the key to fulfillment or defeat of the developer's vision Emphasizes the succession of value-contributing practices and tools that form a framework for development success Integrates the technical, productivity, and customer/end-user elements in product and system development Uses more than 100 tables and figures to illustrate the above processes, as well as corollary elements of risk, failure analysis, and fault-tolerant design Includes numerous case studies and links to online material Product and Systems Development is an excellent course book for senior and graduate students in aerospace, mechanical, civil, electrical, and material engineering, as well as management science and engineering. It is also a useful reference for practicing engineers in a variety of technology-based industries.

This book presents a new, multidisciplinary perspective on and paradigm for integrative experimental design research. It addresses various perspectives on methods, analysis and overall research approach, and how they can be synthesized to advance understanding of design. It explores the foundations of experimental approaches and their utility in this domain, and brings together analytical approaches to promote an integrated understanding. The book also investigates where these approaches lead to and how they link design research more fully with other disciplines (e.g. psychology, cognition, sociology, computer science, management). Above all, the book emphasizes the integrative nature of design research in terms of the methods, theories, and units of study—from the individual to the organizational level. Although this approach offers many advantages, it has inherently led to a situation in current research practice where methods are diverging and integration between individual, team and organizational understanding is becoming increasingly tenuous, calling for a multidisciplinary and transdisciplinary perspective. Experimental design research thus offers a powerful tool and platform for resolving these challenges. Providing an invaluable resource for the design research community, this book paves the way for the next generation of researchers in the field by bridging methods and methodology. As such, it will especially benefit postgraduate students and researchers in design research, as well as engineering designers.

The consumer goods industry is characterized by high volume, high-throughput production. A quality assessment phase must go through before a routine production starts. This phase is consisted of inspecting a set of quality attributes to meet predefined requirements. All attributes must pass the inspection before the quality assessment process completes. The inspection can be queued into a sequence to be processed by workers; however, a good arrangement of the sequence (to reduce the makespan of quality assessment phase) faces challenges due to the following issues: 1) Different inspection method. 2) Dependency and interdependency relation among attributes 3) The availability of resources 4) The changes of failure probability each round when conducting inspection CPM and PERT are proven techniques that can be used to manage a project, but the existence of interdependencies may cause iterations that would greatly reduce the effectiveness of CPM and PERT in planning an inspection project. The DSM (Design Structure Matrix) method can effectively model the dependency and interdependency relations, such that it can arrange the sequence in a way that minimizes task iterations. However, DSM cannot optimized the sequence of the attributes within a block, especially when a block is consists of many attributes; the sequence within a block can play a key role in determining the total makespan of an

inspection project. In this thesis, DSM is applied to the process of quality assessment, to reduce the makespan. A new sequence generation method is developed to optimize the sequence of attributes inspection within a block. A Resource Constrained Sequence is developed to deal with resource limitations. A simulation tool that can simulate the sequences is developed. A case study is conducted to compare the performance of the proposed methodology with other three techniques.

Engineering Asset Management 2010 represents state-of-the art trends and developments in the emerging field of engineering asset management as presented at the Fifth World Congress on Engineering Asset Management (WCEAM). The proceedings of the WCEAM 2010 is an excellent reference for practitioners, researchers and students in the multidisciplinary field of asset management, covering topics such as: Asset condition monitoring and intelligent maintenance Asset data warehousing, data mining and fusion Asset performance and level-of-service models Design and life-cycle integrity of physical assets Education and training in asset management Engineering standards in asset management Fault diagnosis and prognostics Financial analysis methods for physical assets Human dimensions in integrated asset management Information quality management Information systems and knowledge management Intelligent sensors and devices Maintenance strategies in asset management Optimisation decisions in asset management Risk management in asset management Strategic asset management Sustainability in asset management These proceedings summarize the best papers in each research area represented at the 2015 Annual Meeting of the German Gesellschaft für Arbeitswissenschaft, held at Karlsruhe Institute of Technology (KIT) from February 26-28. The meeting featured more than 160 presentations and 30 posters reflecting the diversity of subject matter in the field of human and industrial engineering.

The treatise supports understanding the phenomena of complexity in engineering, distinguishes complexity from other challenges and presents an overview of definitions and applied approaches. The historical background of complexity management is explained by highlighting the important epochs, their key actors and their discoveries, findings and developments. Knowing about the appearance of early system awareness in ancient Greece, the creation of mechanical philosophy in the 17th century and the discovery of classic physics enables the reader to better comprehend modern system sciences and management approaches. A classification of complexity management approaches by research fields indicates current focus areas and starting points for future discussions. In a comprehensive map, the classification points out mutual overlaps between engineering disciplines in terms of similar complexity management approaches. Finally, the treatise introduces a generic complexity management framework, which is based on structural management approaches.

This book presents the results of several years' research work on how to characterize complexity in engineering design with a specific regard to dependency modeling. The 52 complexity metrics that are presented show different facets of how complexity takes shape in design processes. The metrics are supported by a modeling method and a measurement framework to employ the metrics in a goal-oriented manner. The detailed description of all involved metrics and models makes it possible to apply the analysis approach to common process modeling methodologies. Three case studies from automotive process management illustrate the application to facilitate the transfer to

other cases in an industrial context. The comprehensive appendix supplies additional details and checklists for structural analysis to generate a complete overview of current means of structural analysis.

The present work provides a platform for leading Data designers whose vision and creativity help us to anticipate major changes occurring in the Data Design field, and pre-empt the future. Each of them strives to provide new answers to the question, "What challenges await Data Design?" To avoid falling into too narrow a mind-set, each works hard to elucidate the breadth of Data Design today and to demonstrate its widespread application across a variety of business sectors. With end users in mind, designer-contributors bring to light the myriad of purposes for which the field was originally intended, forging the bond even further between Data Design and the aims and intentions of those who contribute to it. The first seven parts of the book outline the scope of Data Design, and presents a line-up of "viewpoints" that highlight this discipline's main topics, and offers an in-depth look into practices boasting both foresight and imagination. The eighth and final part features a series of interviews with Data designers and artists whose methods embody originality and marked singularity. As a result, a number of enlightening concepts and bright ideas unfold within the confines of this book to help dispel the thick fog around this new and still relatively unknown discipline. A plethora of equally eye-opening and edifying new terms, words, and key expressions also unfurl. Informing, influencing, and inspiring are just a few of the buzz words belonging to an initiative that is, first and foremost, a creative one, not to mention the possibility to discern the ever-changing and naturally complex nature of today's datasphere. Providing an invaluable and cutting-edge resource for design researchers, this work is also intended for students, professionals and practitioners involved in Data Design, Interaction Design, Digital & Media Design, Data & Information Visualization, Computer Science and Engineering.

This thesis presents a new modeling framework and research methodology for the study of engineering systems. The thesis begins with a formal conceptualization of Engineering Systems based upon a synthesis of various literatures. Using this conceptualization, a new modeling framework is presented called the Engineering Systems Matrix (ESM). The ESM is an improvement to existing system-level modeling frameworks, such as the Design Structure Matrix (DSM), by providing a dynamic, end-to-end representation of an engineering system. In support of this contribution, a new research methodology is presented called Qualitative Knowledge Construction (QKC). QKC can be thought of as a Bayesian-type approach to grounded theory. The methodology integrates qualitative social science with quantitative methods by developing a procedure for translating textual reports of observations, interview transcripts, system documentation, and figures into coded data represented in the ESM. The thesis develops the ESM framework and the QKC methodology in the context of a real world engineering system, a US Air Force miniature uninhabited air vehicle (MAV) product development system.

Managing the Dynamics of New-Product Development Processes merges product-based planning, process modelling, process execution, probabilistic simulations, and simulation based decision-making into one framework called the Dynamic new-Product Development Process. It provides readers with a means of improving the management of product development through enhanced methods and tools that are specifically tailored to the characteristics and challenges of such processes. It calls for a new Product Lifecycle Management paradigm of utilizing the managed product data for management of the product's development process. Within the framework, the methods used are enhanced or modified to fit

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the new-product development process requirements. Each specific method is exhaustively analyzed, from the basic definition of terms through a description of the state of the art of that topic and its limitations. Then, the method enhancements are illustrated by many examples, and discussed while suggesting further research directions. Finally, the enhanced methods are integrated and demonstrated by a test case. The main two methods described are the design structure matrix (DSM) and Petri nets, which are merged into a novel concept entitled DSM nets. *Managing the Dynamics of New Product Development Processes* provides algorithms, proofs, and practical examples that can be used for general study of the issues concerned. The main concepts presented are applicable to systems engineering and can be used by practitioners of product development processes, such as designers, product managers, and process managers, as well as developers of process management tools for systems with dynamically changing process structures.

An introduction to a powerful and flexible network modeling tool for developing and understanding complex systems, with many examples from a range of industries. Design structure matrix (DSM) is a straightforward and flexible modeling technique that can be used for designing, developing, and managing complex systems. DSM offers network modeling tools that represent the elements of a system and their interactions, thereby highlighting the system's architecture (or designed structure). Its advantages include compact format, visual nature, intuitive representation, powerful analytical capacity, and flexibility. Used primarily so far in the area of engineering management, DSM is increasingly being applied to complex issues in health care management, financial systems, public policy, natural sciences, and social systems. This book offers a clear and concise explanation of DSM methods for practitioners and researchers.

This book is an essential guide or foundational toolkit for anyone who is involved in the process of developing, offering or selling any type of product or service. Based on how to surf on the waves of innovation and the principle of "form follows function" (System Architecture), it introduces and connects concepts like Market Understanding, Design Thinking, Design to Value, Modularization and Agility. It introduces readers to the essence of these main frameworks and provides a toolkit that explains both theoretically and practically when and how to utilize which one. The methods and processes described in this book have all been successfully tested in many industries. They apply in today's market context of high uncertainty, complexity and turbulence, where innovation and disruption are essential. Readers will find answers to two fundamental questions: How can we implement an innovation process and environment that are conducive to successful product design? And, if our products fail to appeal to customers, how can we achieve a major turn-around with regard to product development? A wealth of examples and case studies help readers to benefit from the authors' broad professional experience. Further, lessons learned and conceptual summaries provide valuable shortcuts to the methods and tools discussed. For today's CEOs, enabling innovation is one of THE most complex leadership tasks. But innovation is not about theory and nice buzzwords. It's about succeeding in the real world. This 'hands-on' book connects the dots and introduces the reader to some of the most relevant ideas and pragmatic concepts fitting today's business reality. Dr. Robert Neuhauser, Executive VP and Global Head People and Leadership Development, Siemens At the most fundamental level this book brings order to chaos. It sets different and highly relevant design approaches into a complementary picture, rather than presenting them as competing ways of solving the same problem. Product designers, managers, consultants, scholars and students will surely have this valuable book within reach on a daily basis. Olivier L. de Weck, Ph.D – MIT Professor of Aeronautics and Astronautics and Engineering Systems, Editor-in-Chief Systems Engineering

This book gathers papers from the International Conference on Advanced Intelligent Systems for Sustainable Development (AI2SD-2019), held on July 08–11, 2019 in Marrakech, Morocco,

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which address the environment, industry and economy, and the role of advanced intelligent systems and computing in connection with these three fields. The book includes a host of interesting studies and successful applications regarding the economy and industry, e.g. in Manufacturing, Digital Factories, Smart Supply Chain Management in Industry, Project Management in Industry, Digital Economy, Digital Business, M-commerce, Blockchain and Digital Currencies. In addition, the book highlights work that addresses the environmental aspect, covering topics such as Big Data Analysis & the Internet of Things for Environmental Management, Sensor Networks for Environmental Services, Network Interoperability in Environmental Ecosystems, Wireless Sensors and Cognitive Radio Networks, Environmental Management Computing Systems, Sustainable Mobility Solutions, Remote Sensing Applications, Geo-information & Geophysics. Addressing social, legislative and environmental aspects, the book is intended for all stakeholders in the industrial world. It will be of interest e.g. to customers, helping them improve their profits and economic profitability, and to professionals and fishermen working to evolve and optimize their supply chains, and to improve productivity, in the fiercely competitive I4.0 world. The authors of each chapter report on the state of the art and present the outcomes of their own research, laboratory experiments, and successful applications. The purpose of the book is to combine the idea of advanced intelligent systems with appropriate tools and techniques for modeling, management, and decision support in the fields of the environment, industry and economy.

With new technologies and advances in the medical field, much effort is spent on improving medical devices. One such assistive device is a wheelchair. Many of the existing wheelchairs do not address all the needs of disabled people. Developing a dynamic wheelchair that helps disabled people who have extensor thrust is a challenging problem. Because of strong competition between different mobility device manufacturing companies, developing a dynamic wheelchair using product development tools becomes an effective technique for reducing development time, which can be a competitive weapon. One development tool that can be used to manage and analyze product development activities is the Design Structure Matrix (DSM). The DSM is an information exchange model that can help to find the relationship between activities, parameters, or tasks in order to minimize product development time. The goal of this research is to develop an instrumented, active seating system for people with extensor thrust using the DSM method to provide an efficient execution sequence of the design tasks for three subsystems of the seat: the seat back, seat bottom, and footrest. Furthermore, some numerical evaluation methods are presented to provide the optimal ordering of groups of design activities, in the DSM so that the total design time is minimized. This thesis provides a detailed application of the use of the DSM in developing a dynamic wheelchair for people with extensor thrust.

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This book showcases over 60 cutting-edge research papers from the 5th International Conference on Research into Design – the largest in India in this area – written by eminent researchers from across the world on design process, technologies, methods and tools, and their impact on innovation, for supporting design across boundaries. The special features of the book are the variety of insights into the product and system innovation process, and the host of methods and tools from all major areas of design research for the enhancement of the innovation process. The main benefit of the book for researchers in various areas of design and innovation are access to the latest quality research in this area, with the largest collection of research from India. For practitioners and educators,

it is exposure to an empirically validated suite of theories, models, methods and tools that can be taught and practiced for design-led innovation.

*Advances in Product Family and Product Platform Design: Methods & Applications* highlights recent advances that have been made to support product family and product platform design along with successful applications in industry. This book provides not only motivation for product family and product platform design (i.e., address questions about “why and when should we platform”) but also methods and tools to support the design and development of families of products based on shared platforms (i.e. address the “how” and “what” questions about platforming). It begins with a general overview of product family design to introduce the general reader to the topic and then progress to more advanced topics and design theory to help designers, engineers, and project managers plan, architect, and implement platform-based product development strategies for their company. Finally, successful industry applications provide readers and practitioners with case studies and “talking points” to become platform advocates and leaders within their organization.

A groundbreaking text book that presents a collaborative approach to design methods that tap into a range of disciplines In recent years, the number of complex problems to be solved by engineers has multiplied exponentially. *Transdisciplinary Engineering Design Process* outlines a collaborative approach to the engineering design process that includes input from planners, economists, politicians, physicists, biologists, domain experts, and others that represent a wide variety of disciplines. As the author explains, by including other disciplines to have a voice, the process goes beyond traditional interdisciplinary design to a more productive and creative transdisciplinary process. The transdisciplinary approach to engineering outlined leads to greater innovation through a collaboration of transdisciplinary knowledge, reaching beyond the borders of their own subject area to conduct “useful” research that benefits society. The author—a noted expert in the field—argues that by adopting transdisciplinary research to solving complex, large-scale engineering problems it produces more innovative and improved results. This important guide: Takes a holistic approach to solving complex engineering design challenges Includes a wealth of topics such as modeling and simulation, optimization, reliability, statistical decisions, ethics and project management Contains a description of a complex transdisciplinary design process that is clear and logical Offers an overview of the key trends in modern design engineering Integrates transdisciplinary knowledge and tools to prepare students for the future of jobs Written for members of the academy as well as industry leaders, *Transdisciplinary Engineering Design Process* is an essential resource that offers a new perspective on the design process that invites in a wide variety of collaborative partners.

The proceedings includes the set of revised papers from the 23rd International Conference on Flexible Automation and Intelligent Manufacturing (FAIM 2013). This conference aims to provide an international forum for the exchange of

leading edge scientific knowledge and industrial experience regarding the development and integration of the various aspects of Flexible Automation and Intelligent Manufacturing Systems covering the complete life-cycle of a company's Products and Processes. Contents will include topics such as: Product, Process and Factory Integrated Design, Manufacturing Technology and Intelligent Systems, Manufacturing Operations Management and Optimization and Manufacturing Networks and MicroFactories.

Design structure matrix (DSM) is a straightforward and flexible modeling technique that can be used for designing, developing, and managing complex systems. DSM offers network modeling tools that represent the elements of a system and their interactions, thereby highlighting the system's architecture (or designed structure). Its advantages include compact format, visual nature, intuitive representation, powerful analytical capacity, and flexibility. Used primarily so far in the area of engineering management, DSM is increasingly being applied to complex issues in health care management, financial systems, public policy, natural sciences, and social systems. This book offers a clear and concise explanation of DSM methods for practitioners and researchers. The book's four sections correspond to the four primary types of DSM models, offering tools for representing product architectures, organization architectures, process architectures, and multidomain architectures (which combine different types of DSM models to represent multiple domains simultaneously). In each section, a chapter introducing the technique is followed by a chapter of examples showing a variety of applications of that DSM type. The forty-four applications represent a wide range of industries (including automotive, aerospace, electronics, building, and pharmaceutical), countries (among them Australia, Germany, Japan, Turkey, and the United States), and problems addressed (modularity, outsourcing, system integration, knowledge management, and others).

Dependency and Structure Modelling (DSM) techniques support the management of complexity by focusing attention on the elements of a complex system and how they are related to each other. The DSM perspective can assist in understanding, designing and optimising complex systems – including products, processes and organisations. This volume comprises peer-reviewed papers representing state-of-the-art in DSM research and applications. The papers were presented at the 17th International DSM Conference held in November 2015 in 2015 in Fort Worth (Texas, USA).

The Future of Design Methodology gives a holistic overview of perspectives for design methodology, addresses trends for developing a powerful methodical support for design practice and provides a starting point for future design research. The chapters are written by leading scientists from around the world, who have great expertise in design methodology, as well as the farsightedness needed to develop design methodology further. The Future of Design Methodology is a detailed contribution to consolidated design methodology and design research. Instead of articulating the views of one scientist, it provides a comprehensive collection of perspectives and visions. The editor

highlights the substantial deficiencies and problems of the current design methodology and summarizes the authors' findings to draw future-oriented conclusions. The comprehensive overview of the status of design methodology given in *The Future of Design Methodology* will help enhance the individual scientific development of junior researchers, while the authoritative perspectives on future design methodology will challenge the views of experts. It is suitable for readers working in a wide range of design fields, such as design methodology, engineering design and industrial design. This book explores the evolution of products from the beginning idea through mass-production. Rather than prescribing a one-size-fits-all process, the authors explain the theory behind product development and challenge readers to develop their own customized development process uniquely suited for their individual situation. In addition to theory, the book provides development case studies, exercises and self-evaluation criteria at the end of each chapter, and a product development reference that introduces a wide variety of design tools and methods. Class-tested for three consecutive years by hundreds of students in four different courses, the book is an ideal text for senior design classes in mechanical engineering and related disciplines as well as a reference for practicing engineers/product designers.

The complexities around building, testing, and flying aircraft span many different domains. Some of these domains include processes, people, and tools, of which affect the way work is performed on aircraft. In this thesis, communication tools and the organizations involved in troubleshooting and readying aircraft for flight at an aircraft manufacturer's flight line was analyzed using Design Structure Matrix (DSM) methods. Mapping the two DSMs together into a larger multi-domain matrix (MDM) provided insight to the ways information is transferred, and clarified ways to streamline available information to the various stakeholders, while reducing effort and increasing information quality. One recommendation to streamline flows was to design a system that leverages existing responsibilities of Manufacturing, Quality and Engineering and applying them in an electronic format by utilizing computers (a tool found at every level of employee) to capture live data in an organic fashion. The proposed solution would provide valuable information to other stakeholders at a reduced effort, translating to savings. Savings in the form of interaction reductions could range from 235 to 117, at a 50% reduction in interactions across all organizations. It would also provide a method by which to share information at faster speeds, ensuring all stakeholders are engaged with the latest information. Information quality and speed would further help reduce the risk of flight delays, and improve the customer experience. Overall, reductions in efforts from all organizations and an improved customer experience through rapid and accurate information dissemination, will ultimately reduce cost and promote business and growth.

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