PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

Lory Antonucci
Michael Fornasiero
Rebekah Kowalski

*Welcome to the **Success Profile** content from **Partners in Connection,** the report out of the public-private effort to define digital manufacturing workforce frameworks. These **Success Profiles** describe a portion of the Roles that make up the 'omni-facturing' workforce, a talent pool that has augmented the manual origins of its legacy name with many digital and digitally enabled capabilities. For today and tomorrow, we see a highly connected and cross-discipline digitally enabling and digitally opportunistic community of work roles that bring together many disciplines. Newer and legacy work capabilities- design, engineering, production, supply network and more – empower the innovation of America's global manufacturing base. Manpower Global/Right Management and the Digital Manufacturing and Design Innovation Institute led member and non-member subject matter experts, reviewers and contributors to define and develop these digitally oriented workforce frameworks. The project was completed under the Department of Defense Cooperative Agreement No. W31P4Q-14-2-0001 Control No. 15-09-01 between March 2016 and June 2017. The DM&D Taxonomy of Technical Domains and Roles, the Success Profiles and the Call to Action, along with inclusion of some of Manpower's general considerations for the Digital Manufacturing Organization and Digital Leader all serve as platform for Change in manufacturing for the many stakeholders. Awareness of the workforce changes needed to empower manufacturing as technologies continue to advance and become interconnected is shared here. With the Taxonomy's adoption, all stakeholders should see the acceleration of digital manufacturing and design's potential for those who choose to embrace digital innovations.*

Contents

Acknowledgements

The approved technical domains, roles taxonomy, and role profiles have been peer reviewed by various combinations of the listed contributors. The views expressed for the broader narrative are those of the authors and their respective organizations.

Authors	Lory Antonucci – Right Management - ManpowerGroup	Rebekah Kowalski - Right Management - ManpowerGroup
	Michael Fornasiero – UI LABS	
Executive Sponsors	Caralynn Nowinski Collens, MD - UI LABS	Chris Layden - Experis
	Tom McDermott - DMDII	Rebekah Kowalski - Right Management - ManpowerGroup
Champion Contributors	Nathan Hartman, PhD - Purdue University	Gail Norris - Siemens Industry
Gold Team Reviewers & Approvers	Brench Boden - DMDII / Air Force Research Lab	Paul Huang - Office of Naval Research
	Magdi Azer, PhD - Illinois Applied Research Institute	Greg Harris - Auburn University
	Caralynn Nowinski Collens, MD - UI LABS	Rebekah Kowalski, Right Management – ManpowerGroup
Champion Sites	Rolls-Royce | John Deere | Siemens | University at Buffalo	
Reviewers	Stephan Biller - GE Global Research	Shruti Batra - GE Global Research
	Jason Rutt - Siemens Industry	Brian Hamilton - Siemens Industry
	Timur Yaprak - Siemens Industry	Larry Maggiano - Mitutoyo America Corporation
	Dan Hartman - Rolls-Royce	Joseph Krok - Rolls-Royce
	John Matlik - Rolls-Royce	Kong Ma - Rolls-Royce
	Brooke Fireston - Rolls-Royce	Michael Hess - Rolls-Royce
	Robert Moriarty - Rolls-Royce	Jason Kielb - Rolls-Royce
	Dan Rozinski - Dow Chemical Company	David Ottavianelli - John Deere
	Curtis Burnett - John Deere	Steven Klabunde - John Deere
	Daryl Higdon - John Deere	Jared Morrison - John Deere
	Brandon Paine - John Deere	Dalton Meyer - John Deere
	Joseph Meany - John Deere	Craig Sutton - John Deere
	Joseph Sendra - Johnson & Johnson	Kelly Zelesnik - Lorain County Community College
	Ronald Zitek - Lorain County Community College	Duncan Estep - Lorain County Community College
	Alex Acket - Faurecia	Gregoire Ferre - Faurecia
Supplemental Reviewers	Anurag Garg - DATTUS	Chad Richardson - DATTUS
	Ryan Metzing - Conexus Indiana	Mimi Hsu - Lockheed Martin
	Steven Betza - Lockheed Martin	Sheila Noriega - Lockheed Martin
	Marilyn Gaska, PhD - Lockheed Martin	Jeff Daniels, PhD - Lockheed Martin
	James Reddish - CAEL	Houston Slatton - Bush Consulting Group
	Jeannine Kunz - Tooling U-SME	John Hindman - Tooling U-SME
	Timothy Leyh - University at Buffalo	Shambhu Upadhyaya, PhD - University at Buffalo
	Kemper Lewis, PhD - University at Buffalo	Kenneth English, PhD - University at Buffalo
	Sri Vilayanoor - Accu-Solve Group	Thomas Kaczmarek, PhD - Marquette University
	Phillip Ruotolo - Proctor & Gamble	Mike Miller - Proctor & Gamble
	Dharmesh Ved - Stanley Black & Decker	Gregg Chamberlain - Stanley Black & Decker
	Ayla Kiser, PhD	Jeremy Rickli, PhD - Wayne State University
	Dayna Baumeister, PhD - Biomimicry 3.8	Kirste Webb - Visionary Center for Sustainable Communities
	Susan McClure – Right Management	
Project Teams	Haley Stevens - UI LABS (emeritus)	Mike Cama – Right Management
	Colette Buscemi - UI LABS	Lea Carey – Right Management
	Katie Mulligan - UI LABS	Michelle Daly – Right Management
	Alyssa Sullivan - UI LABS	Irene Gaspar – Right Management
	Bryan Audia - UI LABS	Lynn Murphy – Right Management
	Song Zhao - UI LABS	Jake O'Neill – Right Management
	Alex Maties - UI LABS	Jennie Parr – Right Management
	Regis Masuke - UI LABS	Wendy Kava - Experis
	Joe Nesmith - ManpowerGroup Public Sector	Raleen Gagnon - ManpowerGroup Solutions
	Erika Nobel-Henzel - ManpowerGroup Public Sector	

Additional copies of the report and the profiles is available for download from:
UI LABS at www.uilabs.org/taxonomy

The suggested citation is:
Partners in Connection: MPG/UI LABS Digital Manufacturing and Design Job Roles Taxonomy and Success Profiles, Antonucci, L., Fornasiero, M., Kowalski, R. Manpower and Digital Manufacturing and Design Innovation Institute/UI LABS (2017).

We welcome a conversation! All comments and questions on this report can be directed to:

- Lory Antonucci, ManpowerGroup/Right Management lory.antonucci@right.com
- Michael Fornasiero, DMDII/UI Labs michael.fornasiero@uilabs.org
- Rebekah Kowalski, ManpowerGroup/Right Management rebekah.kowalski@right.com

And share or join in! **#GetDigitalRight**

ManpowerGroup / Right Management

@ManpowerGroup / @RightUpdates
www.manpowergroup.com
www.right.com
Digital@Right.com

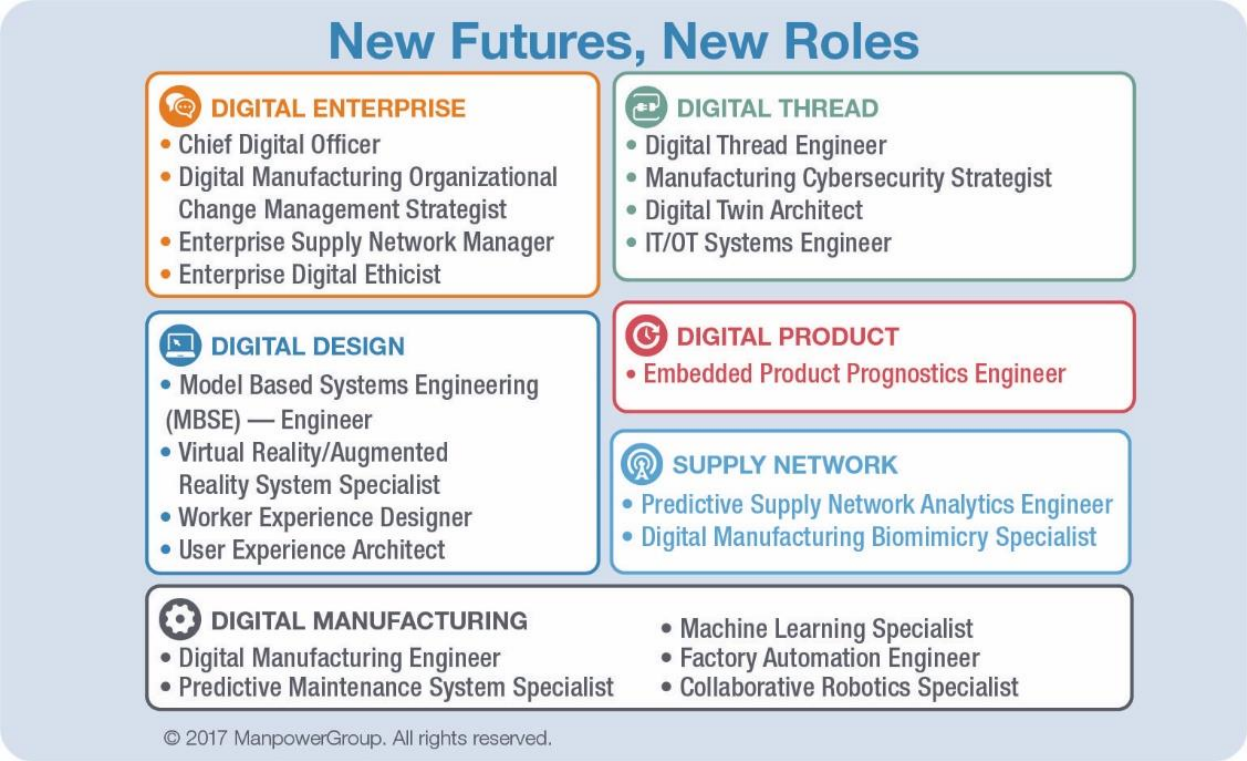
UI LABS

@UILABS_
@uilabs_
www.uilabs.org
info@labs.org

Success Profile Overview

Initial Roles Selected for Success Profiles

With 165 roles to choose from, which would be highlighted with an initial success profiling effort? Several of our most senior representatives from business, education and government worked with recommendations and selected the targeted list of DM&D profiles.



These profiles are representative of the kinds of changes the workforce is experiencing in DM&D. The 20 roles are not to be seen as the most critical or highest value or where to start. Those decisions need to be made by individual companies or within supply networks and depend on DM&D maturity, business needs and current talent supply and demand factors.

Yet these 20 profiles pave the way for deep understanding of the opportunities for manufacturers and the workforce alike, and represent targets for educators and workforce development programs.

The Success Profiles are an enhanced “job” or “role” description:

Success Profile Contents

The profiles have the following elements for each identified role:

Section 1: Job Role Identification Section	
This section identifies the role and provides an overview as well as its impact, generation and business case. Sidebar roles – digital roles closely associated with the role being profiled – may be introduced	
Summary Scope	The summary scope is used to capture the overall scope and contributions of a successful employee in this role. The summary captures the role’s focus in work efforts, the environment of work, its importance, and the current/future influence the role will have on digital manufacturing enterprise.
Role Title	Title of job role
Role Impact	Indicates the impact of the role within an organization within our classification of Pioneer, Keystone and Producer. Role impacts may progress over time such as a Pioneer becoming a Keystone or Producer; or a Producer becoming Keystone as more staff begin to work in various areas and the business environments mature.
	Producer – The majority of roles (over 60%) are known as producer roles. These essential functions occur at all levels and where some are more specialized and others more generalized, are responsible for much of the continuous work output within an organization. They convert key resources into outcomes for the business and produce the lion’s share of the overall work effort.
	Pioneer – The early emerging roles that establish new primary digital capabilities and play a broader initial role are referred to as pioneer roles. These roles often lead to more specialized roles as an organization’s capabilities grow. Approximately one quarter of the roles in the community map are pioneers.
	Keystone roles are less common than their pioneer and producer counterparts (~15% of the defined roles), yet they exert a high impact on the growth and performance of DM&D technologies within an organization. They support the other types of roles and facilitate output often positioning themselves as a central hub of workflow and direction within an organization.

Generational Profile	The generational profile helps develop understanding around the historic and future business and technical requirements for this role. This segment captures the current generational work focus of the role assuming interaction with existing commercial technologies and technologies entering industry in the next 5 years. A more in-depth description of Technical Generations can be found in the support materials.
Business Case Contribution	The business case contribution captures the "elevator pitch" for the job role, an efficient pitch for the value of the job role within an organization. The business case contribution offers the job role value to the business including contributions towards company objectives, and how the role differentiates an organization.
Domain Profile	The domain profile provides the primary and secondary work domains or bodies of knowledge required for this role. (Digital Enterprise, Digital Thread, Digital Design, Digital Manufacturing & Processing, Digital Product, Supply Network, and Omni).
Outcomes	The outcomes list focuses on foundation items or tangible outputs and outcomes of a successful employee in this role; these are inputs to Key Performance Indicators (KPIs) and performance measures that serve as an indicator of the value an organization receives from the job role.
Sidebar Roles	This section may be used to summarize roles that work in a similar technology area, have shared skills, outputs, duties, or values. A sidebar role shares similar technical and skill backgrounds but will have some differentiating work responsibilities or scope.
Progression Roles	This section may be used to summarize roles that work in a similar technology and skills progression. They have skills, outputs, duties, or values that contribute to common goals within an organization and follow a progression of skill and depth of expertise. Progression roles may capture the lineage of roles between technician, specialist, analyst, engineer, architect, etc.

Section 2: Key Responsibilities	
Key Responsibilities is the section that provides the behavioral and mental task profile that the role is accountable for achieving.	
Activities	A list of the key duties of successful workers in this role. A focus is placed on behaviors/tasks/actions, and outputs from the role. The listing works to capture a full range of work including the activities that set this role apart from others.
Accountabilities & Decisions	A list of the accountabilities and decisions made within a role. These are listed as a set of questions for an employee to ask themselves to check their performance within the role and help guide decisions or actions.
Interactions	A list of the stakeholder groups who the role interacts with while performing activities.
Success: Mastering Situational Factors	Identifies the key drivers of change and influence on the job role. Bold indicates an applicable driver.

Section 3. Role Positioning	
Role Positioning is used to help identify where the role fits within the broad workforce community, the overall job framework, and how the role interacts with other aspects of an organization's structure. Ratings range from; More (high impact, strong influence), Hybrid (mixed input, some feedback and influence), and Less (minimal input and minimal influence).	
Line Of Sight	Lists the connection between the role and the business strategy ranging from creation of vision through delivery of tasks contributing to vision. It also addresses levels of customer interaction.
Peer Context	Lists the ways a role may interact with others on their team or across their organization.
Life Cycle | Business Process	Lists the connections of the role to the processes and value chain of the organization, team, or product where the work is delivered.

Section 4: Competencies

The DM&D Technical Domain Map shows certain technology, tool, skill, or work areas that are the required areas of expertise for those who are most successful in the performance of a DM&D role. (By design, not all generic technology, skill or work areas for a role are described in the Digital Manufacturing & Design Domain Diagram; our focus is on those – generic and digitally direct areas – that are seen as most essential at this time for digital transformation and success). Three levels can be indicated.

◆ = Deep comprehension and/or comprehension of interactions (Level 1)
✚ = Practiced engagement and/or application (Level 2)
★ = Direction setting and/or expert application (Level 3)

While many areas may be *'nice to have'*, or some initial knowledge of many areas is '*preferred'*, the focus here is on those areas seen as *"need to have"* at Level 1 or above, as well as those that *differentiate* between "average" and "great" performance.

Section 5: Experience and Education	
Role Cluster	Identifies the cluster of roles within the community map that work adjacently to one another
Associated Roles	Lists the roles that are associated in the same general organizational or progression role cluster to the role defined in the success profile.
Overview of Progression	Describes the potential progression between/across roles or job clusters. Identifies potential paths of mobility, progression, and skill adjacency. Some progressions may capture the addition of next generation technologies or practices into an existing role. Some progressions may result from advancing skill/knowledge/practice within the same technology area.
Considered as a Transitional Role	Identifies if the role may provide an opportunity for a "connected role" (a manufacturing producer level role in an adjacent area) to transition with (estimated) 2 years of additional reskilling and development. In a manufacturing environment, an experienced production worker may be likely to transition to this role with 2 years of additional new training and development.

The 20 Success Profiles are available on the following pages.

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#01 | Chief Digital Officer

Section 1: Job Role Identifier Section

Role Title: Chief Digital Officer

Role Impact: Keystone

Summary Scope

Who is often charged with leading the strategy and matrixed-effort for digital manufacturing and design, and, in fact, charged with the digital transformation overall? Who has the job of making digital in all its forms – product, process, culture, etc. – part of the DNA of the organization and bring it into full expression? The Chief Digital Officer (CDO) marshals innovation and opportunities for digital integration and ultimately accelerates how soon digital becomes the new natural, understood as an imperative yet moved on to where it becomes part of the standard operating mode for the business as well as the common environment of the business ecosystem. As the executive advocate for the growth and profitability of digital strategies and business opportunities, the CDO orchestrates the collective pace of digital consideration and integration in both the customer experience and the company operations and cultural orientation.

Outcomes

- Creation of strategic direction on the basis of digital data analytics, from market, operational, and customer data
- Aligned content, experiences, product, and operations around a digital core
- Revenue from digitally enabled products and services
- Savings and efficiencies from digital operations
- Quantifiable benefits and increases in capabilities to lines of business
- Agile portfolios, roadmaps, investment plans, and organizations
- Lower resource and climate footprints and impacts and increases in conscious brand capital as a result of digital strategies replacing or augmenting conventional strategies

Domain Profile

1. Digital Enterprise
2. Omni

Generation Knowledge Range

G0G1G2G3

Generation Work Focus

G1G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The Chief Digital Officer accelerates the organizational capabilities and customer opportunities across the enterprise, and they create the digital vision and roadmap, championing the best strategies, pace, and investments for digital growth and optimization. A courageous challenger, smart selector of initiatives, and with a bias for informed action, the CDO aligns the leadership team and broader enterprise to the portfolio of DM&D technologies, strategies, and product opportunities.

Sidebar Roles

Digital Manufacturing Chief Technology Officer

The Digital Manufacturing Chief Technology Officer (CTO) leads the digitization, automation, and connectivity of manufacturing systems within an enterprise, from systems that engage areas of design, manufacturing, and their supply chain, to systems that support field service of their products. In this role, they work very closely with the Chief Digital Officer to envision and implement digital technologies and transformations. The Digital Manufacturing CTO contributes to the vision and roadmap for technology adoption with the CDO that directly impacts their organization's enterprise capabilities and the quality of their products and services that they offer, driving execution of the digital vision. The choices they make take into account both the current and future technology needs of the organization across the manufacturing segment of the product lifecycle, the future vision of data connectivity through the digital thread, and the impacts on their workforce and supply chain.

Section 2: Key Responsibilities

Activities

1. Actively sponsors and leads the digital change transformation
2. Works across the organization at the senior level to create the business strategy and model for digital integration to both internal operations and customer facing
3. Quantifies the ROI (including a broader capture of value and worth) of digital opportunities and investments
4. Develops and manages the strategic aspects of the digital portfolio and the digital innovation roadmap
5. Courageously identifies bold initiatives (new businesses, new products, new partnerships)
6. Continuously drives and enables the constant, deep Omni channel connections to customers and their changing habits and preference
7. Creates a high performance digital culture, including the space for a learning focus and an environment that values 'failing fast'
8. Expands networks of innovative ideas, people, technologies, and partners that can deliver on them, including acquisition targets

Accountabilities & Decisions

1. **Digital Trend Spotting:** What are the digitally related social, product, and experience trends that will positively impact our customer experiences and/or our internal culture and capabilities?
2. **Impact Identification:** Where is digital innovation most important for a smart payoff? Where should the company invest in "digital" technologies, products, people, and systems?
3. **Customer Centrism:** How can the customer experience best benefit from digital?
4. **Organization Design:** What flexible structures and arrangements will capture and accelerate digital optimization?
5. **Entrepreneurial Thinking:** Have I set an expectation for an entrepreneurial and innovative community internal to the organization and across our supply network?
6. **Stakeholder Engagement:** Have I successfully built relationships across stakeholders and brought core organizational functions into the digital transformation as key assets? Am I routinely communicating widely where we are as an organization on our digital journey and engaging others on how to improve our progress?
7. **Measures that Matter:** Have I gone beyond the conventional cost savings play into other high-value impact measures for digital?

Interactions

1. **Entire Organization:** The CDO is the current 'it' executive (the go-to digitization guru) and should be a widely known and accessible leader to all functions
2. **Other Executives:** Works closely with other key executives, especially Purchasing, Supply Chain Management, Manufacturing Engineering, IT, Operations, and Finance
3. **Innovation Ecosystems:** Executive liaison with think tanks, research organizations, and other business intelligence sources of new digital technologies, strategies, and talent

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
	Data Compliance, Management, Privacy & Security
✓	**Automation**
	Biomimicry & Sustainability
	Advanced Analysis
	Engaging Digital Twins
✓	**Customer Centrism**
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
✓	**Culture & Leadership**
	Ties to Digital Thread
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates	■		
	Drives Organization to Vision	■		
	Aligns/Influences/Localizes Vision		■	
	Develops Plans	■		
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans			■
	Direct Customer Contact	■		
	Indirect Customer Contact			■
Peer Context	Leadership/Management	■		
	Individual Body of Work/Specific Context			■
	Functional Work Team Member			■
	Project Work Team Member			■
	Implementer		■	
	Delivery Expert			■
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach		■	
	Evaluator		■	
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation	■		
	Business Planning & Forecasting	■		
	Product Development & Research		■	
	Product Life Management		■	
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain		■	
	Product/Service Delivery & Support		■	
	Customer Experience	■		
	Org. Management & Optimization	■		
	Talent Management & Optimization	■		
	Tech Management & Optimization	■		
	Employee Engagement		■	
	Network Engagement	■		
	Product Quality Improvement		■	
	Process Quality Improvement	■		
	Financial Management		■	

Section 4: Competencies

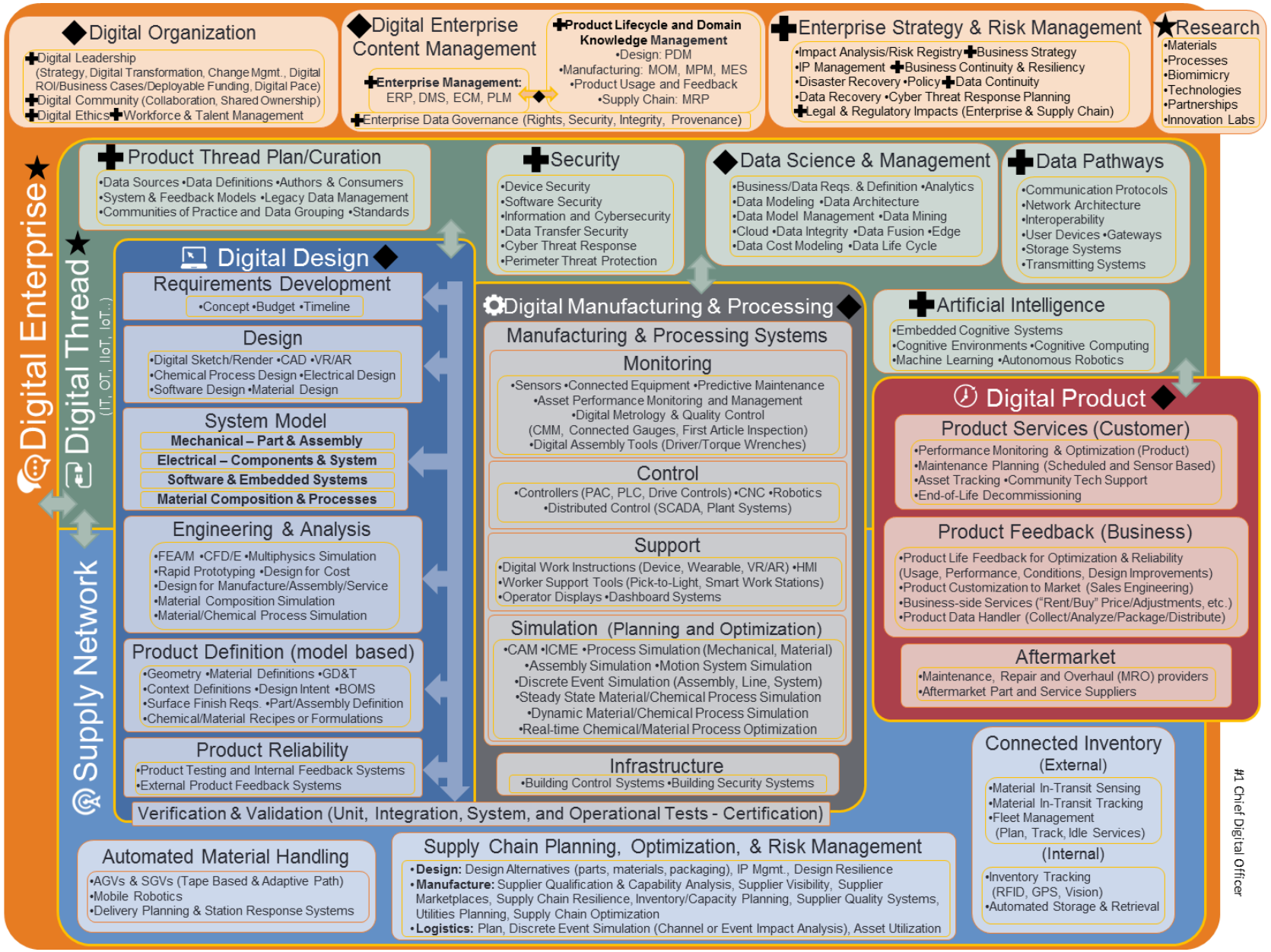
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



#1 Chief Digital Officer

ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Bachelor's degree in Engineering, Business, Marketing, Technical, or other related discipline based on manufacturer background
- MBA or Master's degree in related area preferred

Experience Profile

- 12 or more years of work experience, 5 of which have been in a senior-level marketing, technology, or digital/social/mobile leadership position
- Demonstrated executive-level strategic and tactical mindset
- Demonstrated process/systems thinking around technology, customer experience, manufacturing processes, workforce skillsets
- Experience with digital transformation; in a related industry setting is preferred
- Experience in strategic planning and execution of digital initiatives
- Experience in leading contracting, negotiating, and third-party or partner/channel management
- Knowledge of cloud computing, information management, systems, and software and the ability to manage the entire spectrum of information technology operations
- Experience with managing of business-driven information technology integrations in a large division/company
- Familiarity of Manufacturing Engineering and Manufacturing Operations roles, experience preferred
- Experience developing and managing a large budget
- Leadership in digital-related marketing, sales, and business development
- Strategy and brand management
- Digital technology
- Experience with digital and social platforms, technologies, providing communities
- High affinity for customer journeys and digital enablement

Section 6: Potential Progression

Role Cluster

2 Business and Program Leadership

Associated DM&D Community Roles

- Digital Manufacturing Chief Technology Officer
- Digital Manufacturing Executive Leader – Business
- Digital Manufacturing Executive Leader – Omni
- Digital Manufacturing Program Manager
- Digital Manufacturing Project Manager
- Digital Manufacturing Senior Manager – Business
- Progressive Strategist – Enterprise Direction

Overview of Progression

The CDO, Chief Marketing Officer, Chief Information Officer, and Chief Technology Officer often share contributing experiences and knowledge areas.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#02 | Model Based Systems Engineering (MBSE) - Engineer

Section 1: Job Role Identifier Section

Role Title: Model Based Systems Engineering (MBSE) – Engineer

Role Impact: Producer

Summary Scope

Who breaks down complex product concepts into “bite sized chunks” for design and development? Who supports the development of our next generation of products, enabling the integration of new systems and improving their operation? A Model Based Systems Engineer develops analytical models of products and their subsystems that support the requirements development, design, analysis, validation, operation, and sustainment of a product (or system). Their work includes the development and integration of models that breakdown a product’s performance and behavior from requirements development through functional decomposition and derivation of underlying meta-models. Central to a MBSE Engineer’s work is the use of formalized system modeling tools and a clear understanding of a product’s measures of performance (MOPs), measures of effectiveness (MOEs), key performance parameters (KPPs), and key system attributes (KSAs).

Outcomes

- Decrease errors and increase common calibration to model architectures and frameworks supported from the component to operational level, resulting in a reduction of product development and manufacturing schedule time
- More efficient analysis and design via graphical, mathematical, or physical behavioral models of mechanical, electrical, materials, chemical, or data systems representing a product in software and analytics modes, resulting in lower development and manufacturing cost
- Efficiencies, risk management, and opportunities identified via “what-if” scenarios played out to analyze component and product performance throughout the lifecycle by leveraging models with historic or real-time data
- Aids to decision making, development, and design of systems through the structured understanding of product functions and their interactions
- Increase access, source integrity, and translatable digital product record authority away from documents and into digital models that represent product geometries, mechanical, electrical, material, chemical, and even data systems interactions and performance
- Captures critical system elements in model-based form to be consumed by functional domain areas in accordance with design intent and mission parameters
- Provides a system of models that capture product functions from design through sustainability

Domain Profile

1. Digital Design
2. Digital Thread
3. Digital Manufacturing
4. Supply Network

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

A Model Based Systems Engineer supports the design and development of products or systems with ever increasing levels of complexity. MBSE approaches reduce risk in product development, deployment, and sustainment by accurately depicting and simulating intended systems behavior, and can lead to higher levels of product quality and performance throughout a product's lifecycle. Through a product's systems framework and models, product defects can be caught earlier in development cycles, reducing costly redesigns and delays. A Model Based Systems Engineering approach provides a clearer view of design change impacts, design intent, system needs, and system capabilities leading to improvements in the performance of both internal engineering teams and external suppliers.

Sidebar Roles

Digital Design Engineer
The Digital Design Engineer focuses on applying design and simulation software solutions to the engineering aspects of product design. Unlike an MBSE Engineer, their focus is less on the connectivity of part and assembly models, and more at the component or sub-assembly engineering level. In this role, the engineer may leverage software tools such as Finite Element Analysis / Methods, Computational Fluid Dynamics, Integrated Computational Materials Engineering, Design for Affordability, Design for Manufacturing, and Topology Optimization. These software packages allow an engineer to analyze and optimize part and product designs to improve stresses, heat transfer, magnetic field interactions, fluid flow interactions, material properties, cost, manufacturability, material usage, and additional properties. In their role, they need to be experienced in both design and simulation in order to advance a product's design in response to results encountered from simulation.

Product Digital Design Specialist
The Product Digital Definition Specialist works on building out the Model Based Definition of a part or product. They drive the creation of a complete 3D digital product definition or formulation that can be passed through the product lifecycle and across supply chains to guide manufacturing, supply chain, and service actions. In their work, they may have to follow data package or definition standards dictated by their product or customers that influences the information that must be brought together. In regards to physical products they often collect the component or assembly geometry, requirements, product manufacturing information (PMI), geometric dimensioning and tolerancing (GD&T), design intent, bill of materials (BOMs), context definitions, and material properties. If they work in the chemicals or process industry, as part of a digital product definition, they may collect product requirements and properties, chemical or material recipes or formulations, feedstock properties, process information, and raw material properties.

Section 2: Key Responsibilities

Activities

1. Develop and contribute to model architectures and frameworks, ranging from the component to operational level
2. Develop and contribute to the graphical, mathematical, or physical behavioral models of mechanical, electrical, materials, chemical, or data systems that represent a product through software and analytics tools
3. Analyze component and product performance throughout lifecycle by leveraging models with historic or real-time data and application of “what if” scenarios
4. Contribute to a structured understanding of product functions to aid in design decision making and development of systems
5. Work to move product record authority away from documents and into digital models that represent product geometries, mechanical, electrical, material, chemical, and even data systems interactions and performance

Accountabilities & Decisions

1. **Product Architecture:** How do we plan and manage the definition and modeling process of systems?
2. **Subsystem Validation and Verification:** How can a model’s results and performance be independently tested and integrated into the broader product model architecture? Has development and testing been performed with segregated data sources?
3. **Model Integrity:** Have model and simulation results been properly questioned? Does the system represent a highly valid model-based definition?
4. **Key Factors:** Have all critical inputs and outputs for system models been identified?
5. **Impacting the Enterprise:** Are design, engineering, manufacturing, and business teams engaged in the technical reviews of models and systems? How is sustainment, modification, and upgrade support planning considered as part of the model and product’s lifecycle?
6. **Constraints:** Do models acknowledge technical, cost, and time constraints? Have system integration risks been identified and addressed through program risk management practices?

Interactions

1. **Management:** Work with management teams to determine product development costs, timelines, and limitations, leveraging product frameworks and system models
2. **Product and Systems Architects:** Operationalize and deliver on product- and system-level architectures
3. **Designers:** Work with design teams to understand the effects design has on product- and system level-performance. Includes design for sustainment and the collection of operational product feedback considerations
4. **Engineers:** Apply an MBSE approach to help engineers breakdown product challenges and find model-based solutions
5. **Manufacturing:** Work with manufacturing personnel to understand the impact of manufacturing quality and material variability on the performance of a system or full product
6. **Supply Chain:** Work with supply chain personnel to determine critical subsystem and component-level risks for material availability, longevity, and disruption

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
	Automation
	Biomimicry & Sustainability
	Advanced Analysis
✓	**Engaging Digital Twins**
	Customer Centrism
	New Data Connectivity
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
✓	**Bridge Building**
	New Capabilities & Frontiers
	Visibility & Innovations

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			■
	Drives Organization to Vision			■
	Aligns/Influences/Localizes Vision		■	
	Develops Plans		■	
	Operationalizes/Details/Direct Plans	■		
	Delivers Tasks Within Plans	■		
	Direct Customer Contact			■
	Indirect Customer Contact	■		
Peer Context	Leadership/Management			■
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member		■	
	Project Work Team Member	■		
	Implementer		■	
	Delivery Expert	■		
	Program Leader (Formal/Informal)			■
	Integrator/Coordinator	■		
	Coach			■
	Evaluator			■
	Influencer			■
	Networker		■	
	Thought Leader			■
Life Cycle | Business Process	Strategy & Innovation			■
	Business Planning & Forecasting			■
	Product Development & Research	■		
	Product Life Management	■		
	Product Design	■		
	Product Engineering	■		
	Production		■	
	Connected Product		■	
	Supply Chain			■
	Product/Service Delivery & Support		■	
	Customer Experience		■	
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization	■		
	Employee Engagement	■		
	Network Engagement		■	
	Product Quality Improvement		■	
	Process Quality Improvement			■
	Financial Management			■

Section 4: Competencies

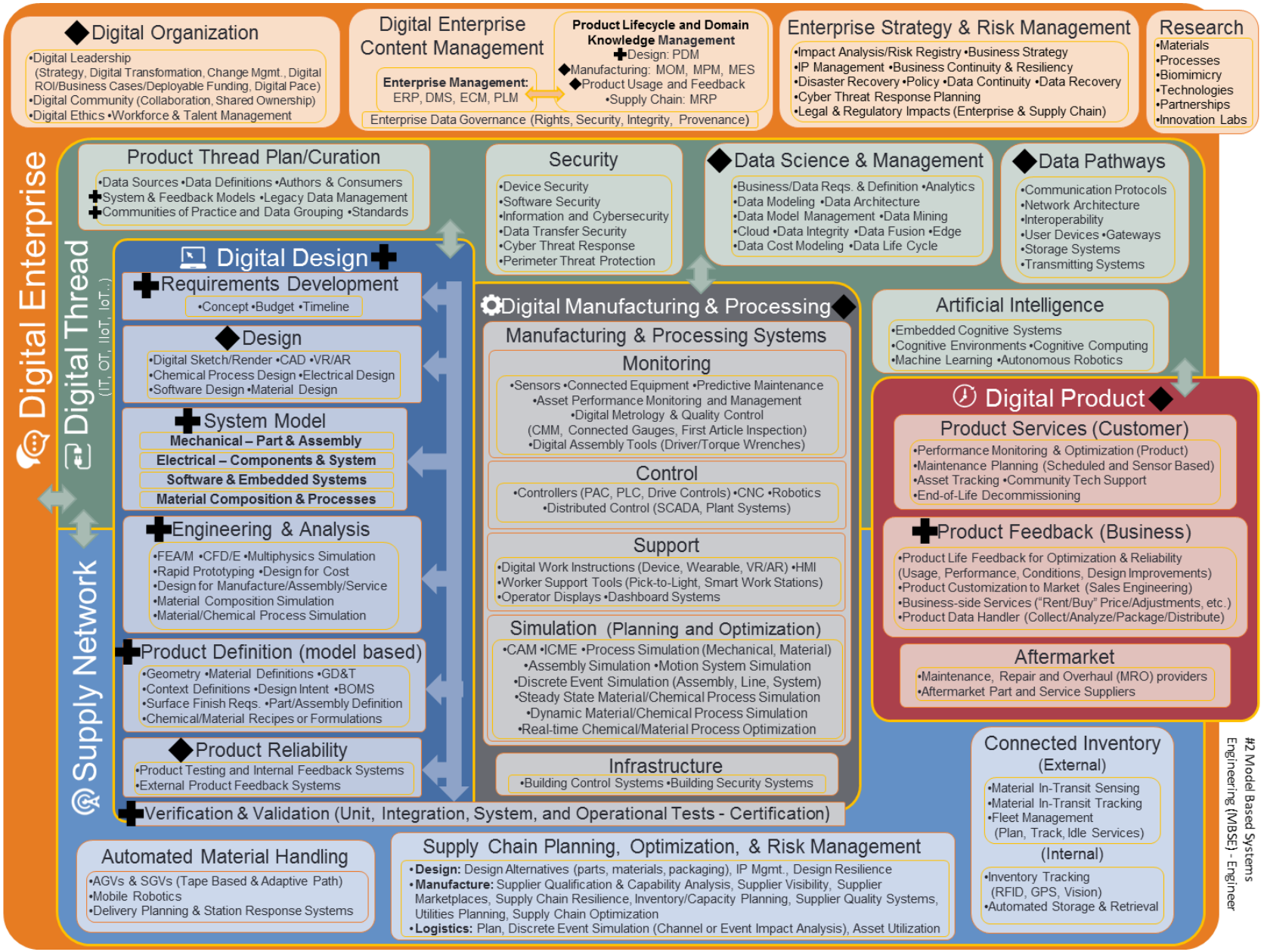
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- B.S. or higher in a STEM field:
  - Mechanical, Electrical, Chemical, Computer, Industrial, or Aerospace Engineering
  - Mathematics
  - Physics

Certifications

- Project Management Professional (PMP)
- Six Sigma Green Belt, Black Belt preferred

Experience Profile

- Experience with systems modeling and implementation tools, such as:
  - SysML
  - DOORS
  - MagicDraw
  - Rhapsody, etc.
- Understanding of MBSE architectures, interfaces, and data
- Ability to break down complex products into subsystems and meta-models
- Project management experience
- Ability to manage complex system relationships

Section 6: Potential Progression

Role Cluster

7 Integrated Data Management

Associated DM&D Community Roles

- Data Management Analyst
- Data Management Manager
- Digital Data Tester
- Digital Knowledge Community Curator
- Digital Thread Engineer
- Life Cycle Digital Twin Analyst
- Life Cycle Digital Twin Architect
- Life Cycle Digital Twin Manager
- Product Life Cycle Data Engineer
- Product Life Cycle Quality Data Analyst
- Product Life Cycle Quality Data Manager
- Product Life Cycle Quality Data Specialist
- Supply Network Quality Data Analyst
- Supply Network Quality Data Manager
- Supply Network Quality Data Specialist

Progression Roles

Model Based Systems Design Specialist

The Model Based Systems Design Specialist works closely with a Model Based Systems Engineering – Engineer to adjust model designs in response to results from simulation, verification, and validation. In their role they may be required to interpret results from part or product simulations to make appropriate design adjustments before resubmission, taking into account how the design changes may impact other product performance areas. Revision control of models and designs is critical as adjustments are made in response to requested changes. In this role, they may be responsible for the 3D design of components and assemblies, including electrical, hydraulic, and pneumatic systems.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#03 | Digital Manufacturing Engineer

Section 1: Job Role Identifier Section

Role Title: Digital Manufacturing Engineer

Role Impact: Pioneer

Summary Scope

A digital manufacturing engineer designs and improves manufacturing systems at the mechanical, electrical, and software levels. Their focus is not just on physical manufacturing systems; it includes the enablement (sensing and acquisition) and use of data (analytics) around manufacturing systems to drive increases in productivity, product quality, and business feedback. Their work helps plan, direct, and coordinate manufacturing processes within an organization in a data driven manner. They may work with staff throughout an organization to refine a product's design, plan and develop new manufacturing systems, and support other roles in their pursuit of actionable data in the manufacturing environment.

Outcomes

- Efficiency and effectiveness improvements via the design and plan of integrated and upgraded manufacturing operations, processes, and systems
- Improved monitoring and earlier problem identification and resolution of manufacturing operations, processes, and systems through connected data sources to identify and address problem areas
- Integrations and innovations in systems and data that support the instrumentation, control, connectivity, and analytic solutions around manufacturing equipment and operational assets
- Reduction in production errors
- Increase efficiency and productivity of manufacturing operations, processes, and systems, while maintaining or improving product quality
- Minimize equipment downtime and failures
- Better implementations and savings in deployment costs via development, integration, testing, and validation of factory and process level models or simulations
- Improved manufacturing data availability and insights for the organization

Domain Profile

1. Digital Manufacturing
2. Digital Design

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The Digital Manufacturing Engineer supports innovations and brings improved efficiencies and decreased costs as a result of manufacturing systems designs and improvements that leverage data connectivity across production and manufacturing value streams. Through their process development and refinement efforts, Digital Manufacturing Engineers work to improve manufacturing productivity, efficiency, and quality while driving down maintenance, rework, and inventory costs. This role provides feedback and insights to product designers, shopfloor workers, and business leaders on manufacturing capacity and capability. The data they work to generate and refine can be consumed by others to develop stronger cross-organization understanding of manufacturing operations performance and production capabilities. Their work directly impacts the planning, implementation, and operation of manufacturing/processing systems that transform and organization's materials into finished products.

Section 2: Key Responsibilities

Activities

1. Design and plan manufacturing operations, processes, and systems
2. Support the instrumentation, control, connectivity, and analytic solutions around manufacturing equipment and operational assets
3. Oversee efforts and initiatives to reduce production errors and improve product quality across manufacturing systems
4. Increase efficiency and productivity of manufacturing operations, processes, and systems
5. Minimize equipment downtime and failures by analyzing production system and production quality data to determine indicators of impending system failure modes
6. Identify opportunities for process and equipment improvement through enhancements or modifications
7. Support the evaluation and management of software applications and functionality available across manufacturing systems
8. Implement tools, such as Technical Publication Authoring Systems (Digital Work Instructions), Computer Aided Process Planning, Operator Displays, Performance/Status Dashboards, and other connected worker support tools

Accountabilities & Decisions

1. **Problem Identification:** Am I monitoring manufacturing operations, processes, and systems through connected data sources to identify and address problem areas?
2. **Process Management:** Am I developing and sustaining uniform manufacturing processes?
3. **Full-Scale Data Analysis:** Am I analyzing both historic and real-time manufacturing data to optimize manufacturing system and process performance? Am I comparing historic and real-time manufacturing data to identify new insights or changes that are occurring?
4. **Data Impact:** Are my data sources giving me the insight I need? Am I collecting effective and efficient system and process data?
5. **Model Validation:** Have I fully developed, integrated, tested, and validated factory and process-level models or simulations?
6. **Product Validation:** Have I developed appropriate product test processes and systems to be used throughout a manufacturing process?
7. **Process Improvement:** How can I improve manufacturing productivity, efficiency, and quality while driving down maintenance, rework, and inventory costs?
8. **Quality as a Team:** Am I inspecting parts and working with production staff to identify and resolve manufacturing problems as a team?

Interactions

1. **Production:** Collaborate with operations, IT/OT, and manufacturing staff to understand and solve technical issues in and across the manufacturing environment.
2. **Product Design and Production Leadership:** Provide feedback to product designers, product management leaders, and production leadership on manufacturing capacity and capability
3. **Business Leadership:** Communicate opportunities for manufacturing process improvements and additional data insights to business leaders

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
✓	**Advanced Analysis**
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

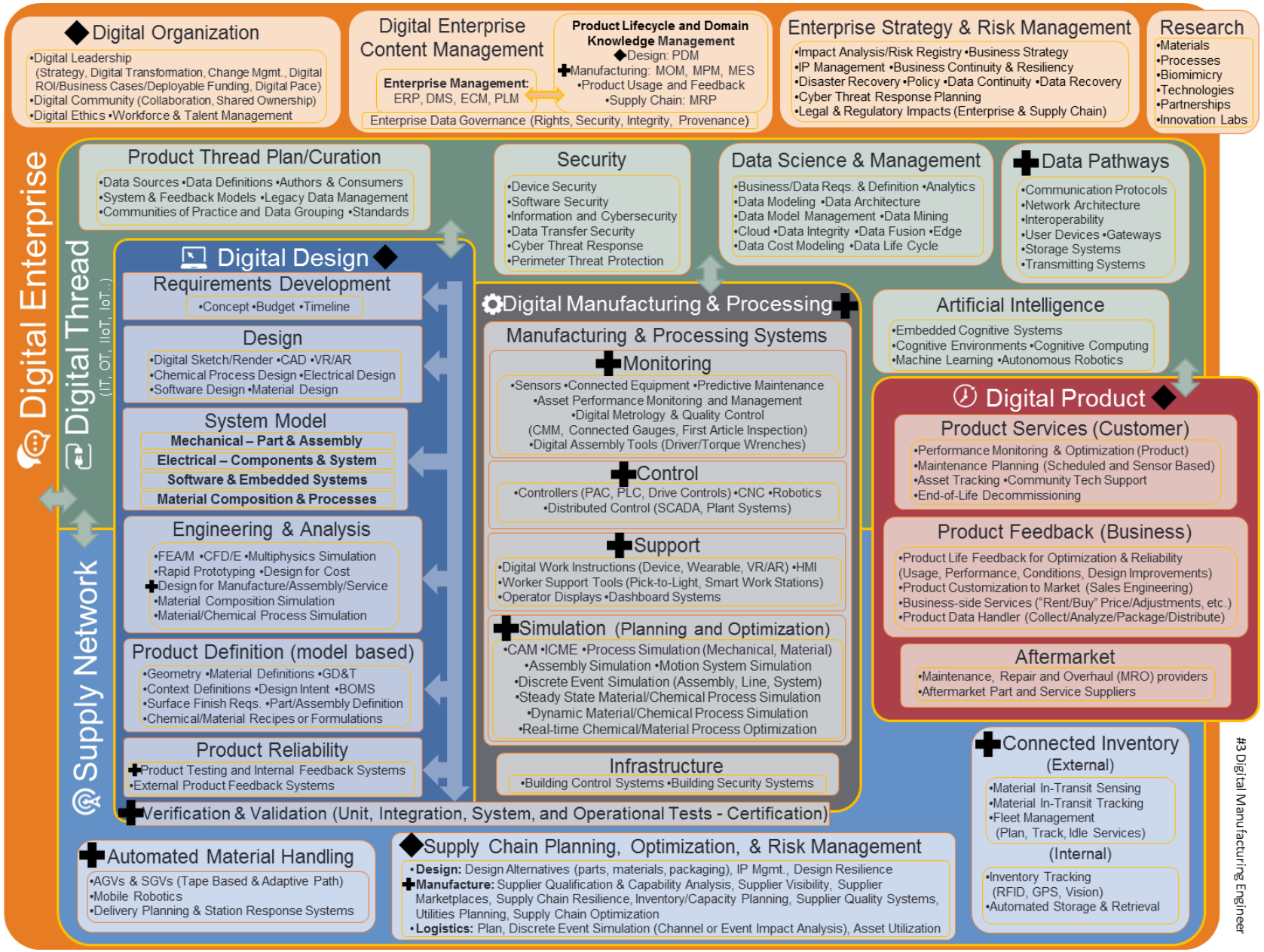
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- B.S. or greater in Mechanical, Industrial, Manufacturing Engineering, or Operations Management

Certifications

- LEAN
- 6 Sigma Green Belt, Black Belt preferred
- Product Lifecycle Management (PLM)

Experience Profile

- Experience with design and PLM methodologies and tools
- Experience simulating manufacturing systems and processes
- Understand manufacturing processes and operations
- Customer-oriented view of authoring manufacturing data and insights
- Experience in manufacturing environments
- Strong understanding of test systems, procedures, and tools
- Product Lifecycle Management (PLM) experience (preferred) or certification (beneficial)

Section 6: Potential Progression

Role Cluster

12 Manufacturing Space Automation

Associated DM&D Community Roles

- Automated Guided Vehicle (AGV) Systems Specialist
- Collaborative Robotics Specialist
- Collaborative Robotics Technician
- Digital Factory Automation Analyst
- Digital Factory Automation Architect
- Digital Factory Automation Manager
- Digital Manufacturing Engineer
- Digital Manufacturing Safety Systems Specialist
- Factory Automation Engineer
- Instrumentation Engineer
- Inventory Systems Automation Specialist
- Machine Learning Scientist
- Machine Learning Specialist
- Self-Guided Vehicle (SGV) Systems Engineer

Progression Roles

Digital Manufacturing Technician

The Digital Manufacturing Technician is focused on the foundations of actionable manufacturing data streams. They support the installation and maintenance of sensor and control systems throughout the manufacturing environment. In their role, they are responsible for the selection and calibration of appropriate sensor hardware for the operation, process, or system to be monitored or controlled. They are also responsible for the maintenance and tuning of control systems within the manufacturing environment with a focus on improving production quality and reducing process variation.

Digital Manufacturing Analyst

The Digital Manufacturing Analyst works through manufacturing data to identify areas for improved product quality, and the improved productivity of manufacturing operations, systems, and processes. In their role, they are responsible for applying appropriate analytic techniques to work through both legacy data sets and real-time streams of data. Their analyses primarily drive decisions and actions within the manufacturing environment, but can work across adjacent technical domains to share insights with design and supply chain staff.

Digital Manufacturing Systems Specialist

The Digital Manufacturing Systems Specialist has a broad understanding of technologies in the manufacturing space that support improved product quality, and the improved productivity of manufacturing systems and workers. They have a strong understanding of sensing and control systems, and are capable of identifying opportunities for the improvement of existing systems and the deployment of new systems to increase factory level control and data insights.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#04 | Digital Thread Engineer

Section 1: Job Role Identifier

Role Title: Digital Thread Engineer

Role Impact: Keystone

Summary Scope

Who finds a way to connect and collect data across a products lifecycle? A digital thread engineer supports the development and implementation of a product's or process' digital thread; the collection, repurpose, reuse, and traceability of product information and data throughout the product lifecycle. In their role, they will support the planning, management, and curation of product or process data that may run from product requirements development through end-of-life. The role will require both the establishment and security management of the data pathways that feed in and out of the digital thread, and will ensure that the lifecycle data can be utilized to make smarter more efficient business decisions across the enterprise and beyond.

Outcomes

- Unifying access to and structures of a digital thread plan aligning data sources, definitions, and interactions that occur throughout a product's lifecycle
- Efficiencies and integration from timely and efficient access to curated product data and management of both real-time and legacy data
- Development and management of data pathways across the product's lifecycle, including the potential for data pathways from the product itself and other outside sources
- Identification of product-centered data connectivity and security needs across the enterprise and external data systems in partnership with OT/IT systems staff
- Execution of Lifecycle Information Frameworks
- Documentation of Digital Thread connectivity and use solutions, best practices, internal standards, and tools

Domain Profile

1. Digital Thread
2. Omni

Generation Knowledge Range

G0G1G2G3

Generation Work Focus

G1G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

The Digital Thread Engineer plans and develops the data connections and pathways used across a product's lifecycle that drive actions across the enterprise, and improves both business and product performance. The connectivity and collection of data around a product enables effective feedback to stakeholders and traceability throughout a product's life. The Digital Thread Engineer is responsible for breaking down the silos of data in an organization that surround a product and enabling new avenues of employee interaction, insight, and productivity.

Section 2: Key Responsibilities

Activities

1. Plan and execute the data frameworks and information management systems around a product that include the data sources, definitions, and interactions that move along the digital thread throughout a product's lifecycle
2. Curate and manage incoming and legacy product data
3. Develop and manage data pathways across the product's lifecycle, including the potential for pathways from the product itself
4. Plan the Digital Thread connectivity and security needs across enterprise and external data systems in partnership with IT/OT Systems staff
5. Document Digital Thread connectivity and use solutions, best practices, internal standards, and tools
6. Direct the integration of systems that will provide access and communication of appropriate lifecycle data
7. Establish data certification and traceability systems that provide stakeholder access to trusted and appropriate data
8. Direct application of systems that generate value from lifecycle and traceability data

Accountabilities & Decisions

1. **Effective Data:** Have I planned the data frameworks and information management systems around a product in a manner that support actionable insights or lifecycle traceability?
2. **Building Connections:** Am I integrating critical product data systems that can bring value to stakeholders throughout the product lifecycle?
3. **Data Validation:** Have I established means of data certification, security, and traceability? Am I effectively curating data throughout a product's lifecycle in a manner that is impactful to product stakeholders?
4. **Guide New Insights:** Am I guiding the application of value-added product lifecycle data systems and educating stakeholders in what opportunities product lifecycle data can provide them?
5. **Support:** Am I capturing and documenting solutions, best practices, internal standards, and tools?

Interactions

1. **Product Managers:** Guide project managers in identifying value-added areas for collecting product lifecycle data
2. **IT/OT Systems Staff:** Work with IT/OT staff to meet product data connectivity and management needs
3. **Design:** Work with design teams to determine product lifecycle data needs and feedback mechanisms
4. **Operations:** Work with Operations teams to determine what product lifecycle data will enhance operations capabilities

5. **Manufacturing:** Work with manufacturing teams to determine what product lifecycle data will help improve product quality, support manufacturing assets, and provide process traceability
6. **Supply Chain:** Work with suppliers, distributors, downstream customers, and logistics teams to identify product lifecycle data needs and opportunities to enhance their insights and traceability to a product's digital thread
7. **Customers**: Work with end users to identify product centric data, insight, and traceability needs from upstream contributors to the digital thread

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
	Automation
	Biomimicry & Sustainability
	Advanced Analysis
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
✓	**Culture & Leadership**
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			■
	Drives Organization to Vision			■
	Aligns/Influences/Localizes Vision		■	
	Develops Plans		■	
	Operationalizes/Details/Directs Plans	■		
	Delivers Tasks Within Plans	■		
	Direct Customer Contact		■	
	Indirect Customer Contact		■	
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member	■		
	Project Work Team Member		■	
	Implementer		■	
	Delivery Expert	■		
	Program Leader (Formal/Informal)		■	
	Integrator/Coordinator	■		
	Coach		■	
	Evaluator			■
	Influencer		■	
	Networker	■		
	Thought Leader		■	
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting		■	
	Product Development & Research		■	
	Product Life Management	■		
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain		■	
	Product/Service Delivery & Support		■	
	Customer Experience			■
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization	■		
	Employee Engagement		■	
	Network Engagement	■		
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management			■

Section 4: Competencies

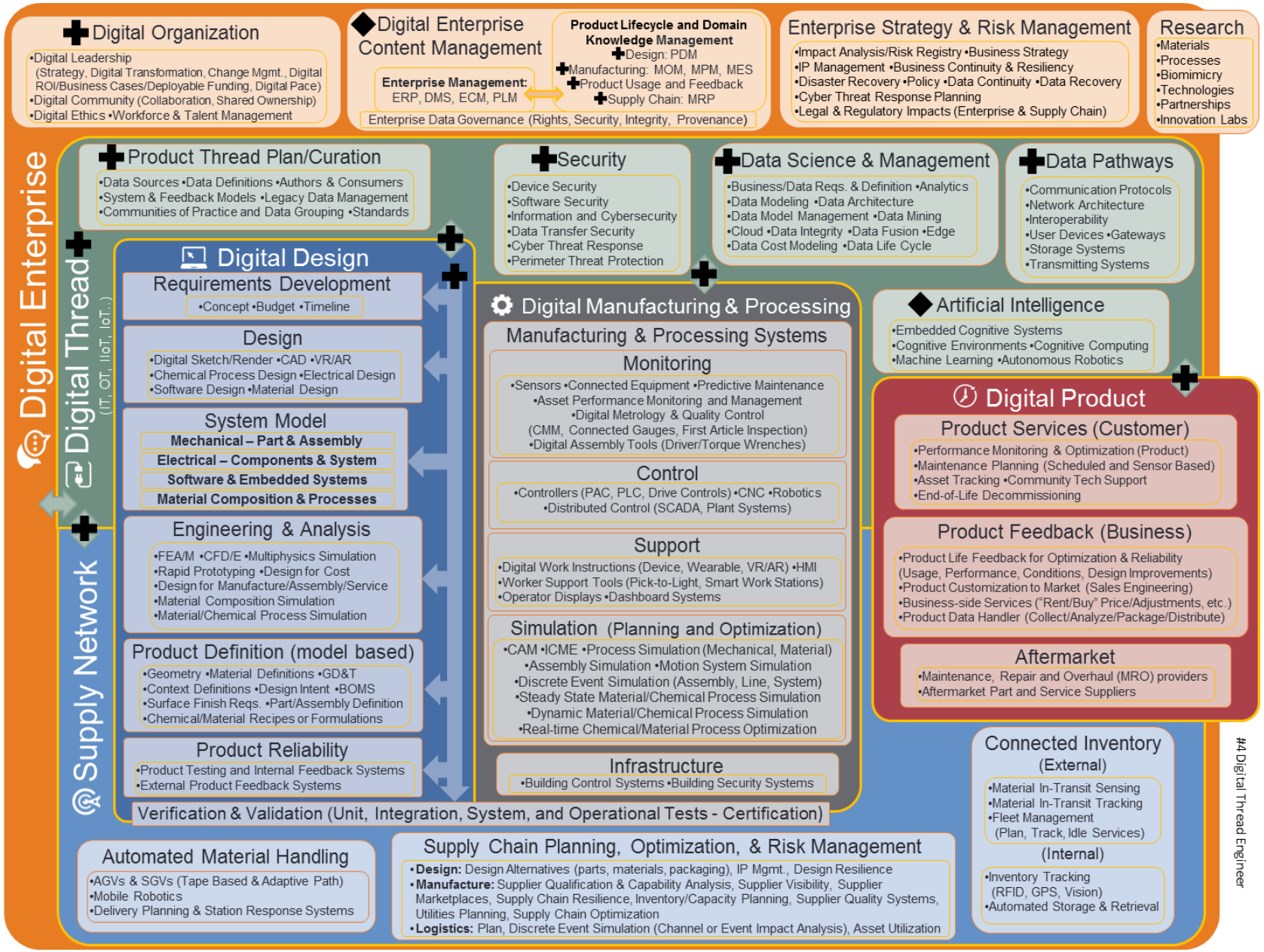
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- B.S. in Computer or Manufacturing Engineering, Computer Science, or Information Technology

Certifications

- Project Management Professional (PMP)
- LEAN
- Six Sigma Green Belt, Black Belt preferred

Experience Profile

- Experience in software development
- Experience in networking across business (IT) and operations (OT) environments
- Experience with product lifecycle data from design, engineering, manufacturing, supply chain, enterprise, and product systems through end of product life
- Deep understanding of design, manufacturing, and IT/OT teams and communication techniques
- Understanding of information feedback cycles and traceability needs throughout a product's lifecycle.
- Manufacturing and engineering environment experience

Section 6: Potential Progression

Role Cluster

7 Integrated Data Management

Associated DM&D Community Roles

- Data Management Analyst
- Data Management Manager
- Digital Data Tester
- Digital Knowledge Community Curator
- Life Cycle Digital Twin Analyst
- Life Cycle Digital Twin Architect
- Life Cycle Digital Twin Manager
- Model Based Systems Engineering (MBSE) – Engineer
- Product Life Cycle Data Engineer
- Product Life Cycle Quality Data Analyst
- Product Life Cycle Quality Data Manager
- Product Life Cycle Quality Data Specialist
- Supply Network Quality Data Analyst
- Supply Network Quality Data Manager
- Supply Network Quality Data Specialist

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#05 | Manufacturing Cybersecurity Strategist

Section 1: Job Role Identifier Section

Role Title: Manufacturing Cybersecurity Strategist

Role Impact: Pioneer

Summary Scope

In an industry where the connected factory of the future, where every device, machine, and even subassembly could have its own network address, who will determine how to protect the treasury of data, application integration, and the network of connected assets from the increasing reach of cyber threats? If you are looking for the role that will assess the overall risks to the digital thread and the world of increasing digital control of cyber-physical assets and chart the course for protection and assurance, where would you look for expertise? The Manufacturing Cybersecurity Strategist manages the overall risk assessment, sets cybersecurity goals, determines cybersecurity strategies and actions to achieve those goals, and sets direction to ready and/or mobilize the resources to guard access and integrity of the digital data bank and networks of connected production assets. The Manufacturing Cybersecurity Strategist is responsible for customer and corporate data privacy, designing a program that proactively reduces risk, maintains defenses and security, is operational, and is ready for disruptions. When disruptions or breaches occur, the Manufacturing Cybersecurity Strategist will enumerate effective detection, isolation, and responsive protocols and work to enable corrective actions, prevention techniques, countermeasures, and protection policy.

Outcomes

- Information security protection effectiveness; periods without breaches, network downtime, access compromises, data loss, leakage, or corruption
- Engagement of multiple levels of the business in cybersecurity program efforts and training
- Lowest possible commercial liability considering the business' risks and available resources
- Adoption of a cybersecurity strategy that is scalable, considers lifespan of systems, and provides enough flexibility within the strategy to maintain performance levels while still responding to the needs of the business
- Compliance and standards achievement and sustainment

Domain Profile

1. Digital Thread
2. Digital Manufacturing
3. Digital Enterprise
4. Supply Network

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

In addition to human assets, few other assets are as critical to digital manufacturing and design as the data created, housed, transmitted, and translated across the digital thread and enterprise. Data security represents the keys to the kingdom that protect treasured data and intellectual property that has been built up over the years. Investments in this role and its area of impact return high value and reduce the potential for major losses by stewarding and guarding data assets (product, user, etc.) as well as physical assets through data interfaces. The truism of a best offense is a great defense applies to this role.

Section 2: Key Responsibilities

Activities

1. Determine a coherent strategy for the data, platforms, networks, integrations, organizations, and services to deliver and manage security operations
2. Provide board and business leaders with balanced risk and needs information; provide guidance and recommendations to senior executives, leaders, and other key strategists, architects, and engineers
3. Assess the needs and the implications of cybersecurity within the organization to provide business practice direction as needed in addition to technology and security practices
4. Identify and assess vulnerabilities for various security touchpoints, such as, but not limited to, endpoint security, network security, applications security, data security, and web security
5. Incorporate strategies to ensure 'top down' and 'bottom up' IT/OT connections and security across production systems
6. Sponsor as well as advises, designs, and manages company programs for business and operating groups to improve their security practices
7. Determine the contexts for data access and use and direct the development of related standards and policies
8. Advise on and learn from investigations and analysis of incidents and disruptions
9. Participate with security alliances, industry groups, and government agencies to advance the issues and practices of cybersecurity

Accountabilities & Decisions

1. **Right Risk Profile:** Have I determined the appropriate risk profile for our business needs, our users, our application, our services, our data profiles, systems, and networks?
2. **Brand Contribution:** Have our cybersecurity strategies and practices contributed to the brand experience whether in obvious ways or through the subtle but tangible sense of user/customer or organizational data and asset security?
3. **Business Case Conversant**: Have I made an adequate business case for investments in cyber security initiatives relative to the risks that we have identified?
4. **Visionary and Proactive**: Are we keeping ahead of – and not just in pace with – the major threats and vulnerabilities?
5. **Compliance**: Have we maintained compliance with all related regulations and laws?

Interactions

1. **Business Continuity and Crisis Management:** Work with business leaders and critical management teams for readiness and recovery planning
2. **IT Infrastructure:** Work with IT staff to leverage their capabilities, and find areas of mutual support and partnership around network architectures in the business, working towards alignment of IT and OT network security strategies
3. **IT Applications:** Work with IT staff to leverage their capabilities and support partnership in the development of applications to identify and mitigate security risks across operations and business networks
4. **Plant Operations, Production, and Infrastructure:** Work with management staff in operations, production, and infrastructure areas of the factory to understand requirements and operational contexts of their assets and systems
5. **Marketing and Customer Facing Functions:** Work with staff in marketing and customer-facing functions to better understand manufacturing cybersecurity's potential impact on consumer and customer requirements
6. **Corporate Communications:** Work with corporate communications staff in partnership on messages regarding cybersecurity incidents and disruptions in the manufacturing environment
7. **Technology User Base:** Work with user base of operations technologies (OT) as needed for advocacy and direction on best practices and reinforcement of training in the manufacturing environment

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
✓	**Biomimicry & Sustainability**
✓	**Advanced Analysis**
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
	Bridge Building
	New Capabilities & Frontiers
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates		■	
	Drives Organization to Vision	■		
	Aligns/Influences/Localizes Vision		■	
	Develops Plans	■		
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans			■
	Direct Customer Contact			■
	Indirect Customer Contact			■
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member			■
	Project Work Team Member		■	
	Implementer			■
	Delivery Expert			■
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach		■	
	Evaluator	■		
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting			■
	Product Development & Research		■	
	Product Life Management			■
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain		■	
	Product/Service Delivery & Support			■
	Customer Experience		■	
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization	■		
	Employee Engagement		■	
	Network Engagement			■
	Product Quality Improvement	■		
	Process Quality Improvement	■		
	Financial Management		■	

Section 4: Competencies

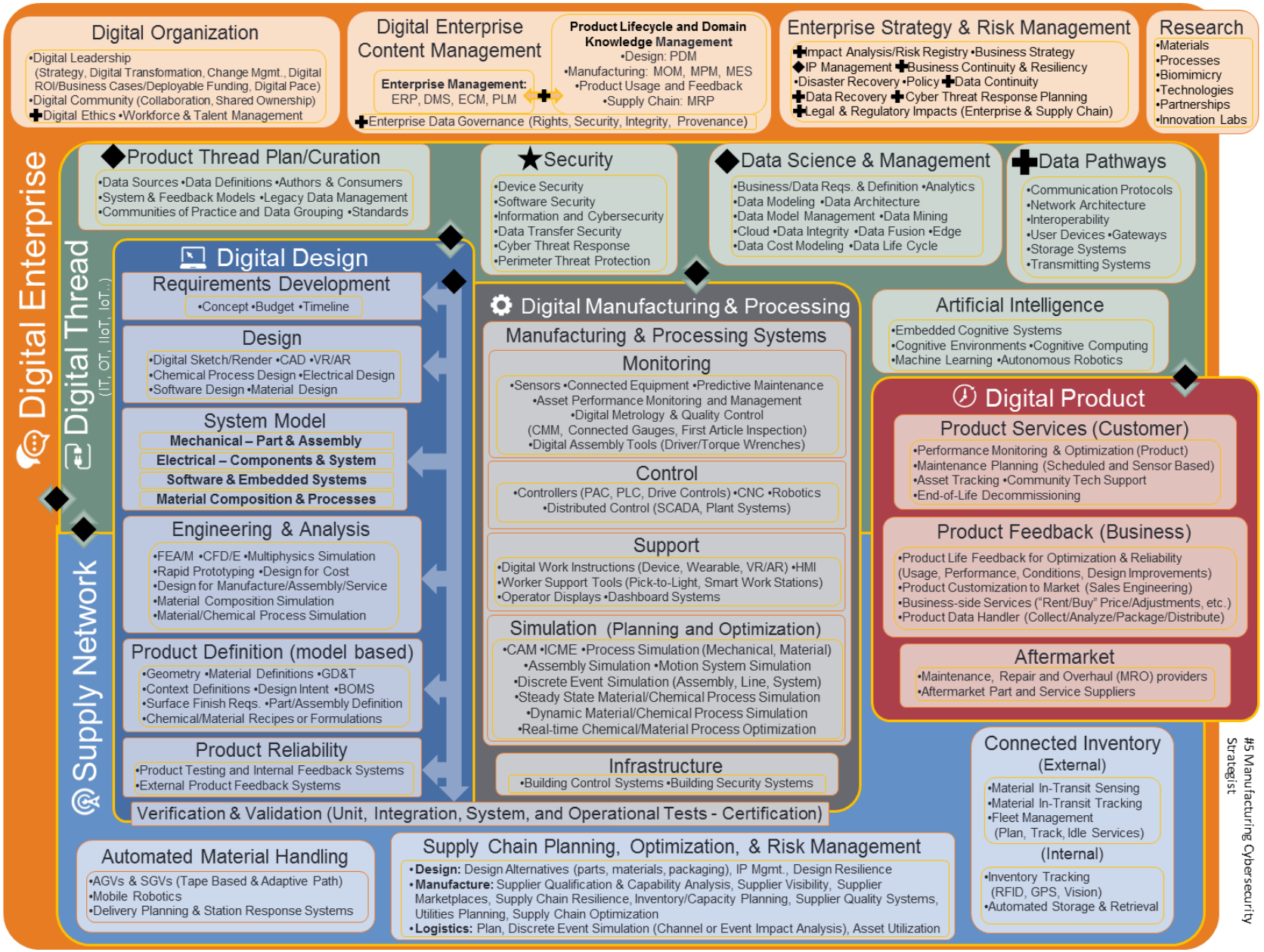
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Bachelor's degree in Information Systems or Science, Computer Science, Cyber Security, or related discipline

Certifications

IT focused certifications such as:

- CISSP – Certified Information Systems Security Professional
- CISA – Certified Information Systems Auditor
- CISM – Certified Information Systems Manager
- CCSK – *Certificate of Cloud Security Knowledge*
- CCIE – Cisco Certified Internetwork Expert
- CTFI – Cyber Threat Forensic Investigator
- ….and many others from professional societies, educational institutions, government agencies, and systems providers

OT and ICS/SCADA focused certifications and programs such as:

- ISA 99 / IEC 62443 – Cyber Security Certificate Program
- GIAC – Global Industrial Cyber Security Professional (GICSP)
- CSSA – Certified SCADA Security Architect
- ICS-Cert

Experience Profile

- 10 years or more of increasingly responsible experience in progressive technology systems or software architecture with significant experience and results in information security and cyber analysis, engineering, and business strategy/ ions support
- Proven experience in related innovation, program direction and management, general leadership, and problem solving
- Extensive knowledge of the broad cyber security arena, including internal security, public and commercial consumer data security, and where necessary, national/international intelligence systems
- Understanding of physical, social, and operational use of the IT and OT systems and platforms
- Ability to work independently, on teams, with leadership, and with outside agencies in a variety of technical business and customer settings
- Ability to work across diverse stakeholders and on multi- discipline business, technical teams across the product life cycle

Section 6: Potential Progression

Role Cluster

6 Information Security

Associated DM&D Community Roles

- Manufacturing Cybersecurity Analyst
- Manufacturing Cybersecurity Application Developer
- Manufacturing Cybersecurity Architect
- Manufacturing Cybersecurity Engineer
- Manufacturing Cybersecurity Programmer
- Manufacturing Cybersecurity Strategist
- Manufacturing Cybersecurity Technician
- Manufacturing Cybersecurity Tester

Progression Roles

Manufacturing Cybersecurity Analyst

There is a progression of manufacturing cybersecurity roles seen as critical to the success of DM&D organizations that reflect some of the varied IT and OT intersections for technologies and the digital thread. Of special interest is the Manufacturing Cybersecurity Analyst role, which will work to define, analyze, and document requirements and work practices with the direction of the Manufacturing Cybersecurity Strategist. Their work can be used to capture an organization's existing and evolving cybersecurity framework efforts as well as examine areas for improvements.

Manufacturing Cybersecurity Engineer

The Manufacturing Cybersecurity Engineer works to build and maintain an organization's OT security solutions, taking into account the security needs of manufacturing, process, and plant technology systems. In their position, they work to establish and maintain protections in the OT environment, setup systems to detect and respond to cybersecurity events, and recover systems that may have become impaired. They configure host-based, network, and cloud-based security systems, along with the installation and configuration of network security architectures that include firewalls, Demilitarized Zones (DMZ), router Access Control Lists (ACLs), gateways, and other network content filters. In their role, they may perform vulnerability testing, risk analyses, and security assessments of OT systems in conjunction with their counterparts that work to maintain the security and resilience of the business' IT systems. They evaluate new technologies and methodologies to enhance their organization's protection and supervise changes to software, hardware, and systems that impact their OT networks. In their position, they can support the definition, implementation, and modification of their organization's security policies and procedures. Their technical reports and security findings within the organization support efforts to secure and improve systems across both OT and IT networks.

Manufacturing Cybersecurity Architect

The Manufacturing Cybersecurity Architect leads the vision and oversees the implementation of cybersecurity systems within the manufacturing segment of an enterprise. They are responsible for the complex security architectures that cross the manufacturing environment, tie into enterprise IT systems, and connect out into the manufacturing supply chain. They have a strong understanding of both the network costs and integration issues that may arise during the development, deployment, and tie in of manufacturing assets, software, and data systems. In their position they have a complete understanding of the OT systems they are responsible for and how they tie into IT systems within the enterprise. They are responsible for the research and planning of the security architectures that support OT projects within the manufacturing environment. They develop the requirements within their organization for network structures, and the selection of hardware, devices, and systems. In their position, they review and approve the installation of new security and network systems and provide technical supervision to a security team. They establish, define, implement, and maintain corporate security policies and procedures, working with security staff to refine and update policies as needed. In their position, they are also responsible for the security education and awareness programs within their organization, supporting their workforce in cybersecurity and reducing employee-level threats to the enterprise.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#06 | Embedded Product Prognostics Engineer

Section 1: Job Role Identifier Section

Role Title: Embedded Product Prognostics Engineer

Role Impact: Pioneer

Summary Scope

Who makes products smarter to keep them operating at peak performance? Who creates a crystal ball to look into a product's future life experiences, both the good and the bad? An Embedded Product Prognostics Engineer develops the sensing, analytic, and diagnostic systems that may be embedded in a product to monitor a product's performance and predict impending events or maintenance needs. They develop the sensing systems to collect data from the product and its environment, these data streams can include information on temperature, pressure, vibration, position, and more. After the development of sensing systems to gather information they develop analytics systems to make sense of the data being collected, sorting through any noise and unimportant information within the data streams to develop an understanding of what the data is telling us about the state or performance of the product. After establishing the sources and data and cleaning up signals to develop understanding of what our sensors are telling us, diagnostics are applied to encourage the product or operator to take action. These diagnostic responses can be as simple as the "low fuel" light on a car's dashboard that indicates it is nearly time to fill up the gas tank, or much more complicated, such as analyzing the vibration signature of an operating gearbox to anticipate when a bearing or critical component is about to fail. In their role they must be experienced in a range of sensor and signal analysis technologies, and what these streams of data may reveal. They must have a strong understanding of the operating modes and failure mechanisms of the product they will be working with and how they may be monitored. Bringing these skill sets together allows us to create systems within our products that anticipate when they may fail, or how they will perform, so we can take maintenance action before product failure, or adjust product parameters to improve the products performance during operation.

Outcomes

- Intelligent product sensing and analytics systems designed and supported for diagnostics and prognostics
- Condition Based Maintenance (CBM) support of products providing Identification of product condition and additional performance indicators
- Improved monitoring systems via classification of product condition indicators in healthy, unhealthy, and failure states
- Improved product performance and availability through Reliability, Maintainability, and Availability (RMA), and Reliability Centered Maintenance (RCM) programs
- Increased visibility into factors for performance and failure analysis based on legacy and real-time data
- More accurate predictions of product lifespans (and resulting cost, risk and opportunities) based on both probability and measurement data models

Domain Profile

1. Digital Product
2. Digital Thread
3. Digital Design
4. Digital Manufacturing

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

Embedded Product Prognostics Engineers add operating and performance intelligence to the products an organization produces. They design and implement the sensing, analytics, and advanced control systems that keep a product operating at peak performance, and predict when maintenance or service is needed. The technologies they develop and implement provide greater value to both the customer and manufacturer based on operating and performance data that is collected and processed. Feedback from embedded prognostics systems can be used to improve designs, boost product performance, reduce both operating and maintenance costs, and create additional service opportunities for an organization.

Sidebar Roles

Factory Prognostics Engineer
The Factory Prognostics Engineer performs similar tasks as an Embedded Product Prognostics Engineer; however, their primary focus is in adding prognostics systems to factory assets both new and legacy. In their role they apply their expertise in sensor and signal analysis techniques to develop sensing, analytic, and diagnostic systems for a factory's assets. They understand the operation and failure modes of plant assets and the monitoring techniques that can be deployed to reduce operating costs, improve reliability, and performance. They need to be able to prioritize their work based on criticality of assets that support factory operations as well as manufacturing systems. Their work provides insight into the status, operation, performance, and degradation of factory assets that range from complex integrated systems to individual critical components in the manufacturing environment. This may include the monitoring of whole production systems, independent machinery, automation equipment, compressors, pumps, chillers, drives, motors, motion systems and more. They have the ability to add both "sense" and intelligence to a factory's systems.

Section 2: Key Responsibilities

Activities

1. Design and support the development of sensing and analytics systems for product diagnostics, prognostics, and optimization
2. Provide Condition Based Maintenance support (CBM) of products
3. Identify product condition and performance indicators
4. Develop classification of product condition indicators in healthy, unhealthy, and failure states
5. Support the Reliability, Maintainability, and Availability (RMA) of products and drive Reliability Centered Maintenance (RCM) offerings
6. Analyze performance based on analytical models, historic, and real-time data
7. Predict product lifespan based on both probability and measurement data models
8. Diagnose and document product faults & failures based on analytical models and sensor data, follow up with corrective actions and recommendations

Accountabilities & Decisions

1. **Enabling Product Feedback and Intelligence:** Have I planned and deployed the correct sensors, onboard analytics and communications pathways to enable product performance and prognostic feedback? Have I looked into all solutions to capture/collect data from the product?
2. **Communication of Risks and Value:** Do I understand the product cost, schedule impact and technical risks surrounding proposed embedded prognostics systems? Have I effectively captured the value of the embedded prognostics capabilities for my organization and our customers, weighing the value of the insights different sensors and systems may provide versus their cost of implementation for the product?
3. **Define and Lead Implementation of Solutions:** Have I properly defined the embedded product prognostic system requirements, design, and architecture, enabling the product implementation teams to complete their tasks?
4. **Prognostics Model Development:** Have I developed appropriate physics-based and data-driven maintenance and failure models of the product's critical systems?
5. **Efficient System Value:** Have I looked into alternatives within the product and its components that will eliminate the need for a physical sensor? Have I identified all the tools accessible to scrub and decipher the product data that is being collected?
6. **Efficient Service Value:** Have I determined the appropriate sensing, filtering, and processing systems to meet the embedded prognostics goals for the product?
7. **Intelligent Product:** Have I embedded the prognostic systems in the product or is additional support infrastructure required by the customer?
8. **System Improvement:** Have I supported the tuning, optimization, and operation of the product's embedded prognostics systems?
9. **Validate Prognostics Systems:** Have I properly validated and optimized the performance of the prognostic system's analytical models and signal processing algorithms with historic data and real-time product data?

10. **Investigate and Resolve Product Problems:** Am I investigating product faults, failures, and performance based on analytical models, historic data, and real-time sensor data? Have I developed resolutions for detected product faults, or notified the appropriate design, engineering, production, or management teams to improve future product generations?

Interactions

1. **Management:** Educate product and business management personnel on embedded prognostic technology capabilities, risks, cost, and value
2. **Engineering (Quality and Design):** Work in collaboration with quality engineers to identify key product problem areas and with design engineers to improve product design based on historic and real-time data analysis
3. **IT/OT Staff:** Work with IT/OT personnel to ensure product data connectivity back to the enterprise, availability of data storage space, and processing capacity for the analysis and response to both historic and real-time operating data
4. **R&D:** Works with R&D staff to identify and develop new algorithms, sensing, and data processing techniques
5. **Customers:** Work with customer to notify them of product maintenance needs, system health, operation warnings, and other areas of potential performance improvement
6. **Maintenance:** Works with customer's maintenance personnel and external service providers to notify of maintenance needs and diagnose root causes of faults and failures

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
✓	**Advanced Analysis**
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
	Bridge Building
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

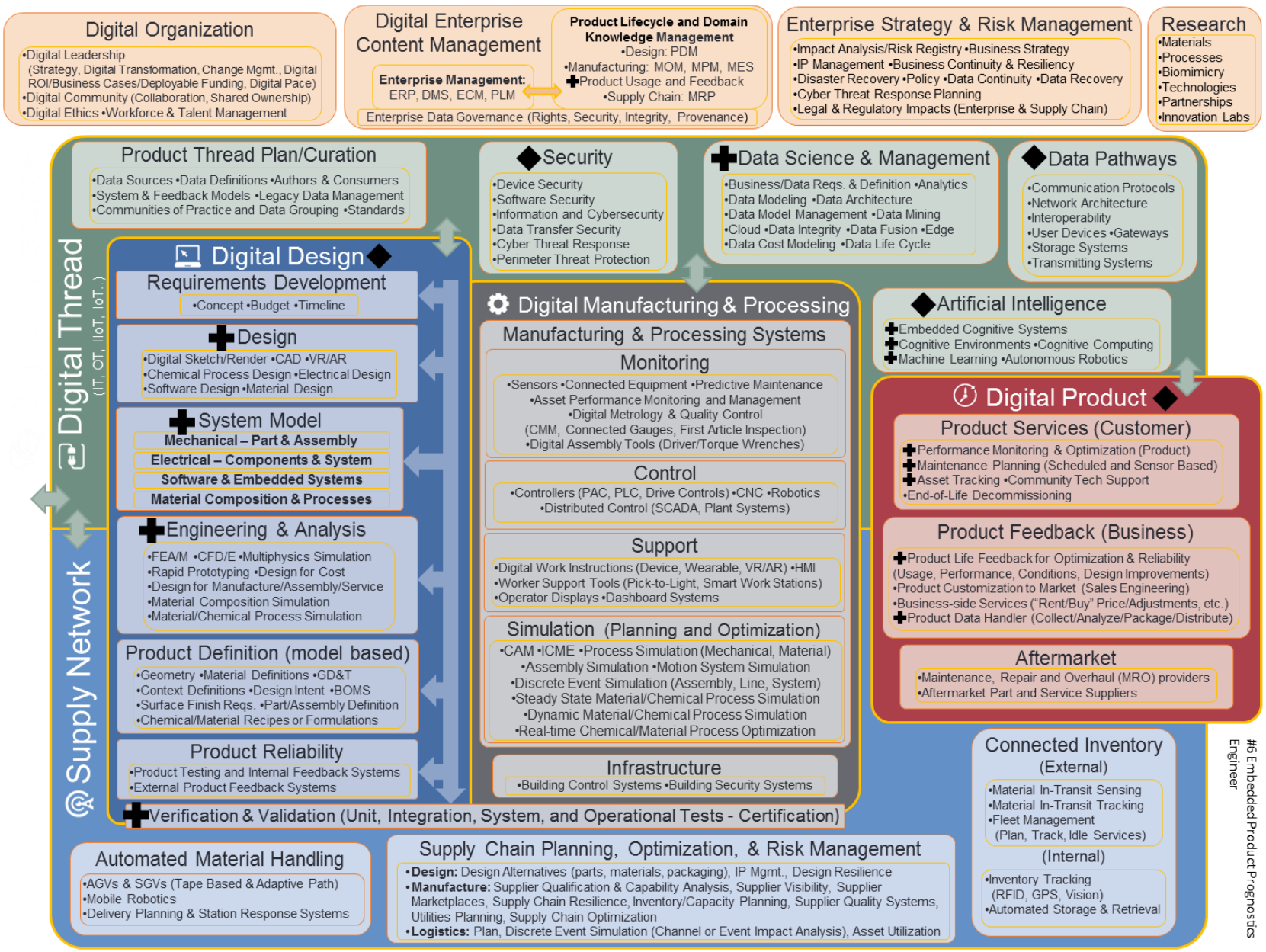
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- BS through PhD in Mechanical, Electrical, or Computer Engineering, or Computer Science

Certifications

- A number of online certifications are available in signal analytics that may be beneficial in improving worker awareness of new technologies, tools, and techniques

Experience Profile

- Must have experience supporting manufacturing and business systems
- Must be familiar with instrumentation, control, HMI, and SCADA platforms
- Experience with measurement and instrumentation of system operation and performance
- Experience with modeling of physical systems and algorithm development
- Skilled in signal processing (including digital filter design), frequency analysis (FFT, STFT, etc.), and statistical analysis of measurements and signals
- Experience with machine learning and data pattern recognition
- Experience with microcontrollers, embedded systems, and product data networks
- Experience with programming languages such as R, Matlab, Simulink, JSL, SQL
- Experience with techniques such as FMECA, FRACAS, and JRMET

Section 6: Potential Progression

Role Cluster

9 Integrated Product Management

Associated DM&D Community Roles

- Digital Product Manager
- Digital Product Support Manager
- Embedded Product Prognostics Analyst
- Predictive Maintenance System Specialist
- Predictive Supply Network Analytics Engineer
- Product Embedded Cognitive Systems Engineer
- Product Embedded Cognitive Systems Specialist
- Product Performance Optimization Engineer
- Supply Network Business Analysts
- Supply Network Community Manager

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#07 | Virtual Reality / Augmented Reality System Specialist

Section 1: Job Role Identifier Section

Role Title: Virtual Reality / Augmented Reality System Specialist

Role Impact: Pioneer

Summary Scope

Who can help visualize and demonstrate a product or process in an immersive virtual world? Who can enhance how workers see the world around them, guiding them through their tasks and displaying the information they need to get their job done? Who can enhance a customer's experience as they learn to operate and maintain a product? A Virtual Reality / Augmented Reality System Specialist works to apply VR/AR systems that support a product through its lifecycle. During their work, the systems they deploy can support the development, design, manufacture, assembly, operation, and service of a product. VR/AR systems offer the opportunity to engage the environment, product, and peripheral support media in new ways that enhance the productivity of our workforce and create new value in our products for our customers. From jet engines to consumer electronics, workers may engage a virtual environment to learn how to do complex tasks without having to be on a production floor or in a busy work environment. They can be exposed to and interact with virtual models of complex assemblies, learning how to perform production or maintenance tasks without having to handle the physical product. When engaging the actual product in real life, augmented reality systems may feed additional information to the worker, supporting them and coaching them through the task at hand. In the realm of design and engineering VR and AR can be used to better visualize the performance of components and systems within a design, study product motion, customer interaction, and even assist in the visualization and exploration of simulation results. This role supports the move away from paper based (and even screen based) instructions and training, truly looking to bring harmony between digital support technologies and the workforce.

Outcomes

- Support of a product with VR/AR system applications throughout its lifecycle
- Implementation of VR/AR systems that support Product Development between customers and designers in the Requirements Development and Design stages of a product's lifecycle
- Deployment of VR/AR systems that support Engineering and Analysis stages of product development to better help visualize mechanical actions, simulation results, product geometry, clearances, customer interactions and assemblies
- Application of VR/AR systems in a manufacturing environment to support workers through digital work instructions, maintenance procedures, machine operation, and data visualization throughout the facility
- Introduction of VR/AR applications that support the product beyond the factory such as training, operation, maintenance, field service, and even product upgrades adding additional value to downstream customers and service providers

Domain Profile

1. Digital Design
2. Digital Manufacturing
3. Digital Product

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The Virtual Reality / Augmented Reality Systems Specialist supports the application of Virtual Reality and/or Augmented Reality systems that assist the workforce and customers interacting with a product throughout its lifecycle. These systems can provide new insights and enhance the productivity of the design, engineering, manufacturing, and maintenance staff. In the application of systems that support the product outside the factory they have ability to add new value and convenience to the customer and those performing MRO tasks on products. Virtual Reality applications give the opportunity to view a product, its function, and performance in a virtual world, while Augmented Reality applications give the opportunity to enhance the data and information we can present around a product in the real world.

Sidebar Roles

Augmented Reality Manufacturing Systems Specialist
The Augmented Reality Manufacturing Systems Specialist works to apply AR systems and solutions in the manufacturing environment. Their focus is narrower than the Virtual Reality / Augmented Reality System Specialist yet they share many of the activities, accountabilities, and interactions, just with a focus on AR technology applications in the manufacturing environment. In their role they identify opportunities for AR applications to improve the performance, safety, and capabilities of workers in a company's factories and production spaces. They understand what software and hardware solutions are available on the market, their costs, potential impact, and how to efficiently implement those solutions in the facilities they work out of. Some of the manufacturing workforce they may have an impact on includes workers performing assembly, maintenance, material handling, quality control, testing, welding, and other fabrication work. The AR tools implemented may provide workers additional information about the task at hand or the environment around them, help them locate inventory, alert them of hazards in processes or around equipment, provide feedback on operating conditions and states of equipment, quality of production parts, even safety, operating, and maintenance procedures. In their role they are responsible for the identification, development, deployment, and maintenance of AR systems, along with the training of manufacturing employees on these solutions.

Section 2: Key Responsibilities

Activities

1. Apply VR/AR systems in applications that support both the workforce and consumers that interact with a product through its lifecycle
2. Implement VR/AR systems in the Requirements Development and Design Stages to support early product development efforts between customers and designers
3. Deploy VR/AR systems as needed during the Engineering and Analysis stage of product development to better help visualize mechanical actions, simulation results, product geometry, clearances, and assembly processes
4. Implement VR/AR systems in a manufacturing environment to support workers with AR work instructions, asset maintenance procedures, machine operation, inspection, and data visibility throughout the facility
5. When the product has left the factory VR/AR applications may be used to support product training, operation, maintenance, field service, and even product upgrades
6. Train employees in VR/AR systems use
7. Identify VR/AR application needs, at both pilot and large scale, across internal and external business stakeholders and consult as a technical advisor on deployment implications
8. Scout new VR/AR hardware, software, and integration platforms for new opportunities

Accountabilities & Decisions

1. **Identify:** Have I identified appropriate VR/AR applications and technologies to deploy throughout the business that support the workforce, customers, and product throughout its lifecycle?
2. **Plan:** Have I properly planned the VR/AR system deployment, support, and optimization for a particular application?
3. **Deploy:** Have I effectively lead the deployment of appropriate VR/AR systems throughout the enterprise and beyond?
4. **Support:** Have I properly supported VR/AR system adoption, usage, maintenance, and refinement?
5. **Optimize:** Am I monitoring and identifying trends in VR/AR technology utilization and adjusting systems for the greatest workforce or customer impact?

Interactions

Work to educate on VR/AR applications, build business cases for deployments, and support user needs. Pilot and large scale system deployments will take the cooperation and buy-in of multiple organizations and parties.

- Management
- Design
- Engineering
- Operations
- Manufacturing
- Maintenance
- Field Service
- Customers
- IT/OT Staff

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
	Data Compliance, Management, Privacy & Security
	Automation
	Biomimicry & Sustainability
	Advanced Analysis
✓	**Engaging Digital Twins**
	Customer Centrism
	New Data Connectivity
	Org. Business Ecosystem & Stakeholder Networks
✓	**Workforce & Talent Platforms**
	Culture & Leadership
✓	**Ties to Digital Thread**
	Bridge Building
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			■
	Drives Organization to Vision			■
	Aligns/Influences/Localizes Vision		■	
	Develops Plans		■	
	Operationalizes/Details/Directs Plans	■		
	Delivers Tasks Within Plans	■		
	Direct Customer Contact		■	
	Indirect Customer Contact	■		
Peer Context	Leadership/Management			■
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member		■	
	Project Work Team Member		■	
	Implementer	■		
	Delivery Expert	■		
	Program Leader (Formal/Informal)		■	
	Integrator/Coordinator	■		
	Coach	■		
	Evaluator			■
	Influencer		■	
	Networker		■	
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting			■
	Product Development & Research	■		
	Product Life Management			■
	Product Design	■		
	Product Engineering	■		
	Production	■		
	Connected Product	■		
	Supply Chain		■	
	Product/Service Delivery & Support	■		
	Customer Experience	■		
	Org. Management & Optimization			■
	Talent Management & Optimization		■	
	Tech Management & Optimization	■		
	Employee Engagement	■		
	Network Engagement	■		
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management			■

Section 4: Competencies

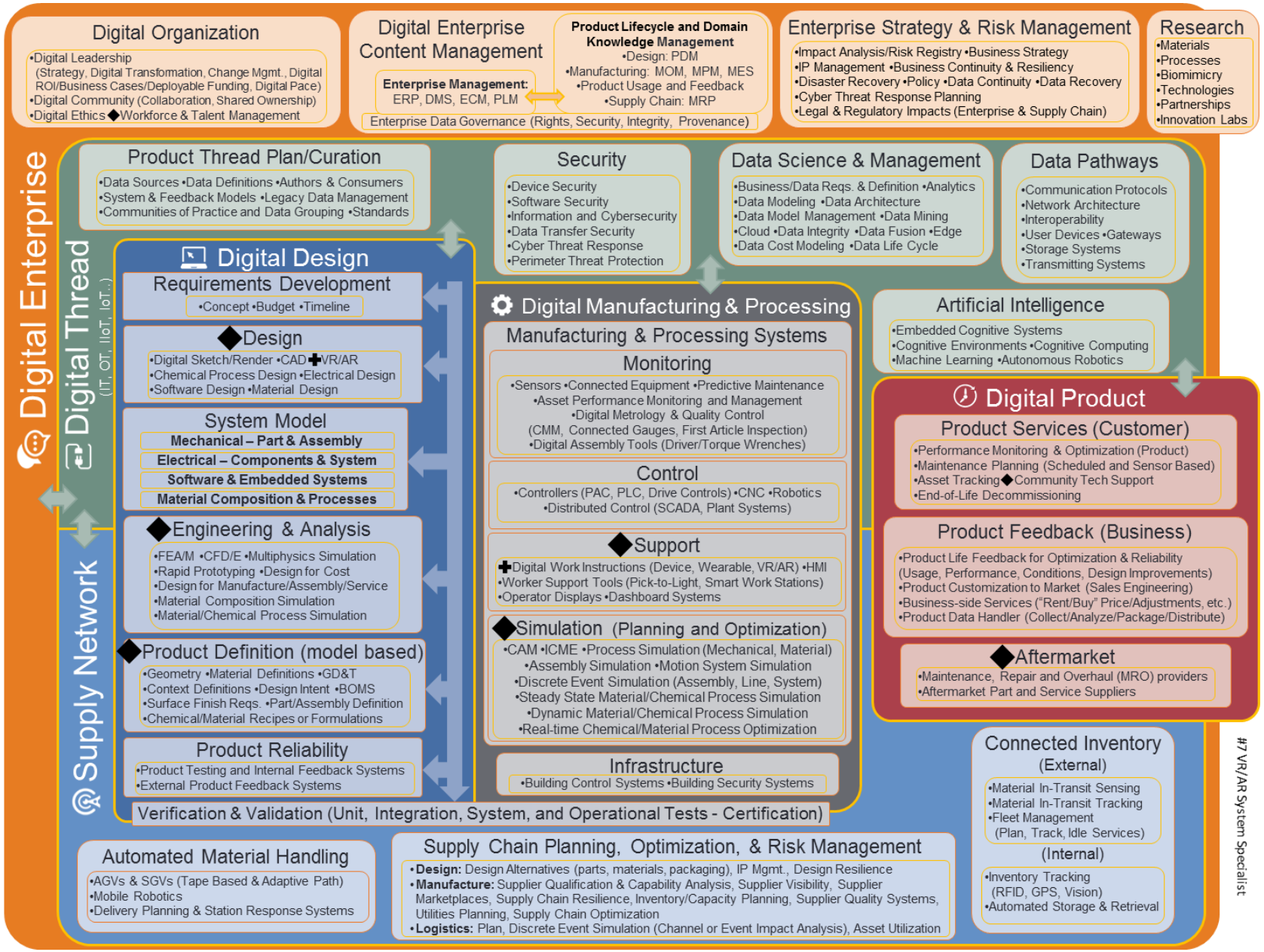
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- AAS or B.S. in Engineering, Manufacturing or Design with experience across multiple application environments (design, engineering, production, customer, etc.)

Experience Profile

- Experience with VR and AR systems and peripherals
- Experience with VR and AR use cases throughout design, engineering, manufacturing, field service, and customer environments
- Experience with commercial VR and AR hardware and software offerings
- Experience with development platforms such as Unity or Vuforia is desirable
- Experience with commercial industrial data or IoT/IIoT platforms is desirable

Section 6: Potential Progression

Role Cluster
16 VR/AR

Associated DM&D Community Roles

- Augmented Reality Manufacturing Systems Specialist
- Virtual Reality/Augmented Reality Hardware Engineer
- Virtual Reality/Augmented Reality Software Engineer
- Virtual Reality/Augmented Reality System Manager
- Virtual Reality/Augmented Reality System Modeler
- Virtual Reality / Augmented Reality System Modeler
- Virtual Reality / Augmented Reality System Manager
- Virtual Reality / Augmented Reality Hardware Engineer
- Virtual Reality / Augmented Reality Software Engineer
- Virtual Reality / Augmented Reality System Scientist

Progression Roles

Virtual Reality / Augmented Reality System Scientist
The Virtual Reality / Augmented Reality System Scientist works to develop new hardware and software technologies in the virtual and augmented reality technology space. They advance the limits of what is possible with virtual reality or augmented reality software and hardware, leading to new capabilities and application opportunities. They have a strong understanding of how the human mind and senses interpret and react to virtual environments or visual augmentation leading to targeted improvements of hardware, displays, software, and graphics. They may develop new ways of displaying and interacting with data and environments, along with improving how visualizations are aligned and displayed for the user. Their work advancing the performance of systems makes experiences more impactful to the user and less distracting, ultimately working towards a sense of seamless engagement in the virtual or augmented environment.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#08 | Predictive Maintenance System Specialist

Section 1: Job Role Identifier Section

Role Title: Predictive Maintenance System Specialist

Role Impact: Pioneer

Summary Scope

Who can look into their crystal ball and let you know the health of a critical manufacturing asset and when it may fail? Who can provide feedback and insight into how manufacturing and infrastructure assets are performing? A Predictive Maintenance System Specialist utilizes sensing, analytic, and diagnostic systems on existing assets and infrastructure to monitor and predict their performance and maintenance needs over time. Their role primarily covers the application of sensor and real-time data-driven predictive maintenance, driving towards reduced asset downtime and reduced operations interruptions. In their role they may also work with more traditional preventative maintenance systems to develop a baseline understanding of an asset's prescribed maintenance needs and estimated maintenance intervals. A predictive Maintenance System Specialist typically has an understanding of the operating modes and failure mechanisms of the assets they will be working with, and has an understanding of the monitoring tools they will deploy to gain needed insight on asset performance, degradation, and operating condition.

Outcomes

- Improvement of asset and infrastructure reliability through the implementation of technologies, management systems, and work practices that focus on Condition Based Maintenance (CMB), and analysis of historic maintenance data
- Improved monitoring systems via classification of asset condition indicators in healthy, unhealthy, and failure states
- Improvement of existing maintenance strategies through continuous improvement efforts and analysis of operations and asset data
- Movement from reactive to active asset reliability processes, from prescriptive to predictive
- Greater insight into asset performance through sensing and analytics
- Greater insight into asset failure modes and failure rates through processes site-wide such as Bad Actors, Root Cause Failure Analysis, FMEA, MTBF, etc.

Domain Profile

1. Digital Manufacturing
2. Digital Thread
3. Supply Network

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

Predictive Maintenance System Specialists implement and manage the maintenance technologies and processes that keep site assets performing their best while minimizing production disruptions and unplanned stoppages. They work to drive continuous improvement in site-wide asset performance and availability while providing maintenance feedback to other roles during times of capital investment and new asset deployment. Moving from preventative to predictive maintenance provides a competitive advantage to companies looking to drive increases in productivity, and reduce operating costs through the reduction of unplanned or over-planned (preventative) maintenance operations.

Section 2: Key Responsibilities

Activities

1. Implementing technologies, management systems, and work practices that focus on improving asset reliability and performance while reducing unplanned downtime and maintenance interruptions
2. Implement active asset reliability processes site-wide such as condition and performance monitoring systems to perform Condition Based Maintenance
3. Implement passive and reactive asset reliability processes site-wide such as Bad Actors, Root Cause Failure Analysis, FMEA, MTBF, etc. that leverage real-time and historic asset data
4. Analyze and recommend changes to maintenance strategies and technologies to drive continuous improvement in asset availability and performance
5. Train and mentor engineers, maintenance, and plant staff on the fundamentals of predictive maintenance technologies and their impact on operations
6. Document condition monitoring and maintenance methods, processes, and results
7. Develops historical data sets through measurement and analysis that will be used to improve asset/component lifecycles
8. Inspect equipment and infrastructure to identify causes of problems or failures
9. Integrate into existing business intelligence (CMMS, MES, ERP, etc.) and connectivity tools

Accountabilities & Decisions

1. **Manage Maintenance Systems and Practices:** Have I established and maintained management systems and practices that are driving continuous improvement of asset reliability?
2. **Maintenance Support:** Am I providing appropriate technical support in condition-monitoring activities to our operation, production, electrical, and mechanical technical staff and engineers?
3. **Application Opportunities:** Am I identifying appropriate opportunities for condition-based monitoring systems to bring both maintenance and utilization optimization value to the business?
4. **Set Maintenance Priorities:** Are maintenance tasks being prioritized based on historic- and condition-based monitoring data? Are they planned based on asset criticality and minimal disruption to operations?
5. **Deploy Monitoring Systems:** Am I selecting, calibrating, and operating the appropriate sensors and systems used for condition monitoring of different assets?
6. **Supervise and Direct:** Have I been properly supervising and directing the work of maintenance trainees and staff?
7. **Resolve:** Am I working with staff to determine the best solutions to fix asset/infrastructure problems or failures?
8. **Analyze:** Have I analyzed both historic and real-time asset data to track and predict failure modes?
9. **Input and Guidance:** Am I providing input to the operations risk management plan regarding asset reliability risks?

10. **Benchmarking:** Am I able to benchmark systems against systems using platforms that have been provided?
11. **Uptime/Downtime Calculations:** Am I able to determine when systems are running at their ideal operating equipment efficiency (OEE)?

Interactions

1. **Project Engineers:** Work with Project Engineers to provide input on new capital projects and upgrades to existing assets
2. **Control Systems and Factory Automation Engineers:** Work with Control System and Factory Automation Engineers at the asset/systems level to determine maintenance needs and implement condition monitoring systems
3. **IT/OT Staff:** Work with IT/OT Staff to integrate data systems from the asset level (OT) to an IT level where predictive maintenance and analysis software systems can leverage the data and provide information into additional enterprise level IT systems.
4. **Operations:** Work with Operations team members to plan and facilitate preventative maintenance efforts focused on reduced operations interruptions and downtime.
5. **Production:** Work with Production team members to analyze asset utilization, overall equipment effectiveness (OEE), remaining life, reliability, operating conditions, and operating costs through data drawn from connected assets.
6. **Maintenance:** Work with the maintenance supervisor / manager to ensure assets are properly and routinely maintained.

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
	Data Compliance, Management, Privacy & Security
✓	**Automation**
	Biomimicry & Sustainability
✓	**Advanced Analysis**
	Engaging Digital Twins
	Customer Centrism
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
	Bridge Building
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
 **Line of Sight**	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
 **Peer Context**	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
 **Life Cycle | Business Process**	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

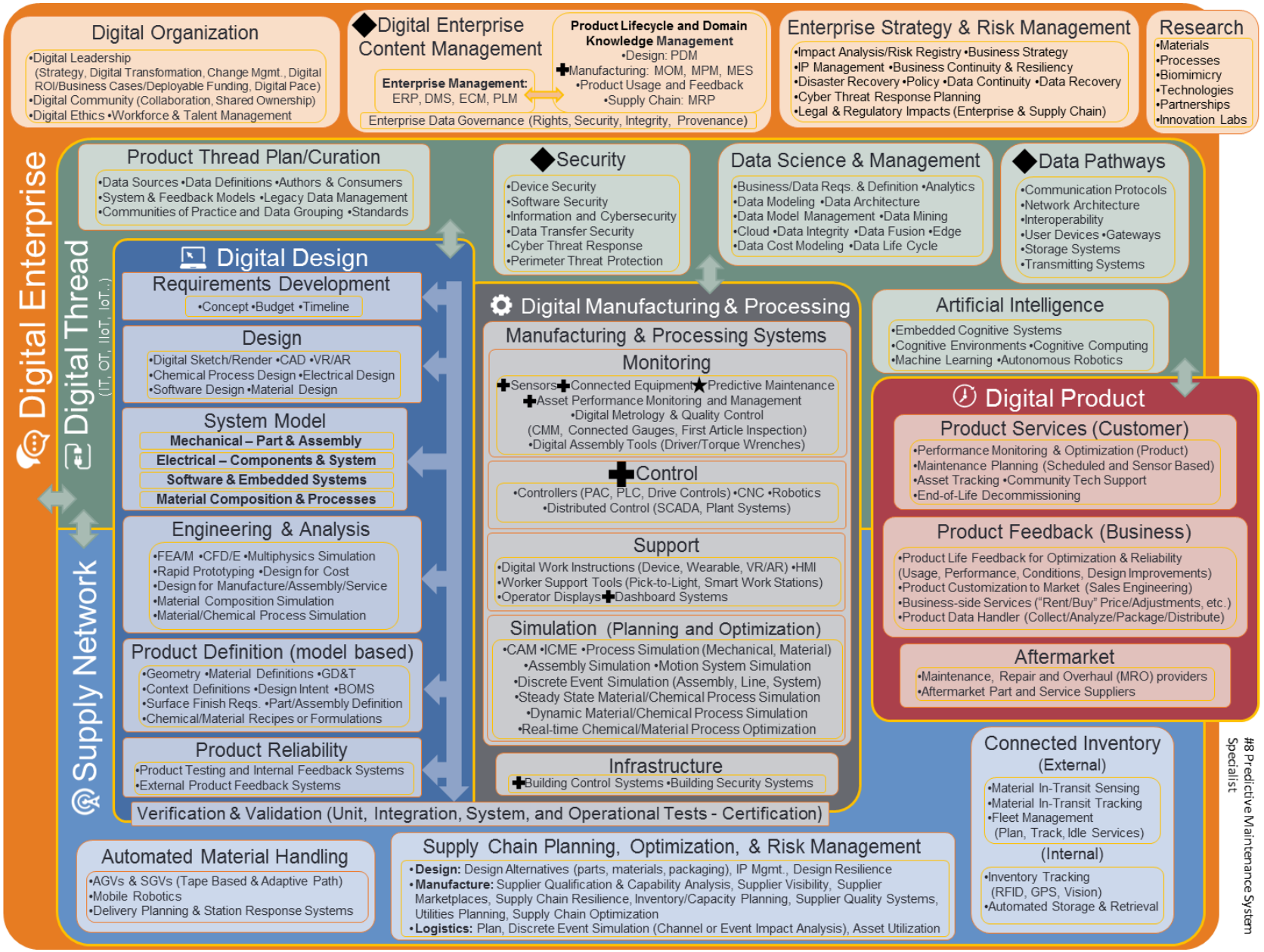
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- B.S. Mechanical or Electrical Engineering

Certifications

- Level II Vibration Analysis certification
- Vibration Monitoring Category 3

Experience Profile

- In-depth technical knowledge of vibration, power, pressure, temperature, and flow monitoring and signal conditioning techniques
- Mastery of basic and advanced analytics tools such as FFT, harmonic locators, peak enveloping, etc.
- Ability to analyze sensor data and troubleshoot assets remotely and in person
- Strong knowledge of continuous condition monitoring systems
- Strong knowledge of route-based condition-monitoring methods and systems
- In-depth knowledge of critical industry, manufacturing, and production assets
- Must be familiar with business and operations software systems such as ERP, PLM, MES, WMS, integration tools, etc.
- Industrial systems knowledge
- Familiarity with operations technology (OT) devices, software, protocols, standards (OPC), and network systems (Profinet, Profibus, etc.)
- Experience with non-destructive testing (NDT) techniques is desirable

Section 6: Potential Progression

Role Cluster

13 Manufacturing Space Production

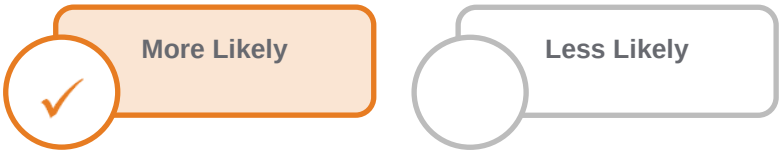
Associated DM&D Community Roles

- Digital Manufacturing Analyst
- Digital Manufacturing Systems Architect
- Digital Manufacturing Systems Specialist
- Digital Manufacturing Technician
- Factory Prognostics Engineer
- Fleet/Asset Optimization Analyst
- Fleet/Asset Optimization Manager
- Fleet/Asset Optimization Specialist
- Manufacturing Systems Designer
- Manufacturing Systems Engineer
- Manufacturing Systems Modeler
- Manufacturing Systems Simulation Engineer
- Manufacturing Systems Simulation Manager
- Manufacturing Systems Simulation Specialist

Overview of Progression

Maintenance Technician → Predictive Maintenance Technician → Predictive Maintenance Specialist

Considered as a Transitional Role



PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#09 | Machine Learning Specialist

Section 1: Job Role Identifier Section

Role Title: Machine Learning Specialist

Role Impact: Pioneer

Summary Scope

Serving as a bridge between the functional use of automated learning at the machine automation level, and the complex yet elegant technologies that make machines smarter and more connected to higher-level functionality, the Machine Learning Specialists apply data engineering and data science to meet user functionality and needs. They assemble and automate knowledge bases and create expert systems, emulating the decision-making process of human expertise on a task, in decisions, or across a field.

Representing one of the primary innovation pathways within the broader digital enterprise, the Machine Learning Specialist has some heavy lifting on envisioning data-driven and data-informed products on the design side; they must be change adept on the people side to integrate some specialized but increasingly core technologies that equally excite and put off some users; and they have to be a primary technology expert on the development side. Being passionate and an advocate about machine learning technology and what it can do for building business applications and new product opportunities, they bring modern and emerging practices and tools to acquire, share, process, store and expose datasets. The Machine Learning Specialist analyzes needs, defines requirements and designs algorithms and models for designing and building systems that crunch big sets of ever increasingly complex data from disparate sources for the benefit of the individual or organizational user. Working side by side and supporting engineers and other related analysts, specialists, system architects and other IT/OT cross functional teams, the Machine Learning Specialists bring expertise in machine learning, software engineering and data science performing a wide range of requirements analysis, programming, testing, and results evaluation.

This role is the one to turn to when you are asking: Who's an emerging expert at enabling software to improve its performance over time as it obtains more data? Who understands the opportunities for combining innovations in data analysis disciplines, including data mining, pattern recognition, predictive analytics and more so that a system will be able to increase its value and contribution?

Outcomes

- New/increased revenues from smarter, differentiated products, processes, and services built with cutting-edge technologies
- Increased accuracy and breadth of decisions by decision makers using results of enhanced data
- Customized user experiences based on preferences and patterns of use/behavior
- Optimized business processes benefitting from real-time performance monitoring and predictive analytics

Domain Profile

1. Digital Manufacturing
2. Digital Thread

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

Machine Learning Specialists drive increased value from helping build products and systems or apply software solutions that can process and learn from large amounts of data, and assemble results into decision support or increased functionality. Machine Learning Specialists improve functional value, build out analytics, increase user engagement, and optimize business applications and decisions. The technology they apply has the potential to extract patterns in large data sets that would have gone unnoticed in the past.

Sidebar Roles

Cognitive Systems Specialist
A Cognitive Systems Specialist works to help an organization identify opportunities to apply cognitive systems and guides their implementation, within an enterprise or product, to improve system or human cognitive performance based on learnings from data and interaction. They have a strong understanding of cognitive system solutions, along with the architectures and hardware necessary for their implementation. Their work may also include leading the design and implementation of High Performance Data Analytics (HPDA) and High Performance Computing (HPC) solutions that support the operation of a company's cognitive systems. To bring order and action to a company's data they may also guide the development of the workflows necessary to move and transform data from existing sources in an organization into formats that are accessible for cognitive systems, organizing the chaos of the data lakes and streams that have become available.

Cognitive Systems Scientist
A Cognitive Systems Scientist utilizes both machine learning and AI (artificial intelligence) techniques in tandem with human interaction to create systems that can help people make choices or decisions from much more complex and meaningful sets of data than machine learning systems would traditionally process on their own. The development of these intelligent decision support systems provide the ability to augment the cognitive capabilities of humans, supporting their thoughts and actions. In the coming years cognitive systems will be critical in helping people work through the ever increasing lakes and streams of data, providing hypotheses and insights to consider based on training data and human feedback on prior results. A Cognitive Scientist may also work to develop cognitive systems that are embedded in products, improving their ability to learn from their human interaction and tasks they perform, adapting themselves to better support the task at hand or the experience of the user. In a manufacturing environment these systems can lead to better forecasting of production and supply chain schedules, identifying opportunities for improved operations and throughput, or identify bottlenecks before they occur. They can improve the performance of automation systems and collaborative robotics systems, learning from their tasks, interactions, and the environment in front of them. In the design space these systems can learn from prior designs and assemblies, prior product configurations, manufacturing data, and product performance data to assist designers in improving product designs. Cognitive System Scientists take us from the world where we were originally limited by computing power and data storage capacity, into a world where our tools and systems are now able to enhance their own performance and that of the human expertise that works alongside them.

Section 2: Key Responsibilities

Activities

1. Responsible for building a deep understanding of information/content/data, machine capabilities, user needs, and business opportunities to develop enriched product or system capabilities
2. Provide technical guidance on data science, machine learning and various software practices including hypothesis testing, analysis, modeling, and production deployment
3. Model, program, evaluate and improve how systems can infer new decisions or correct answers that increase learning and accuracy, and optimize performance
4. Combine analytic methods (natural language analysis, classification tasks), neural networks, case-based learning, genetic algorithms, rule induction, and analytic learning
5. Apply statistical probability methods (measures, distributions and analysis methods) to develop algorithms for building and validating models
6. Evaluating new datasets for alpha potential; conduct quantitative alpha research, applying advanced statistical learning methods to diverse data sets in order to build robust models for forecasting performance, risks and outcomes
7. Build efficient tools and scalable systems for the team to allow easy adoption of common machine-learnings techniques by other designers and engineers in their projects
8. Support system maintenance and product improvement
9. Work closely supporting a variety of teams along with counterparts in other disciplines
10. Provide documentation and coaching to associates and related groups

Accountabilities & Decisions

1. **Ecosystem Understanding:** Do I understand the broader ecosystem of actors and functions, the systemic interrelationships for which I am designing and am I writing working software that will successfully integrate and interface between them and then beyond?
2. **Volume to Value Conversion:** How well do my software outputs describe and discover what is going on within high volumes of diverse data and then convert to high-value or actionable data?
3. **Translating Science to Business:** Am I effectively considering my varied stakeholders needs to understand the resulting data, and am I designing the communication of complex scientific results in understandable ways?
4. **Meaningful Outcomes:** Are the data insights and predictions available from my machine-learning efforts meaningful for increasing functionality or making business decisions that matter?

Interactions

1. **Users/Customers:** works with others to understand strategic goals, business requirements, processes, needs, and preferences to solve business problems and improve decisions and performance
2. **Senior-level Business and Technology Decision Makers:** succinctly translates technical and business opportunities focused on outcomes that contribute to business value
3. **Product Teams:** works with designers, product managers, brand management, and product engineers to conceive, plan, and deliver systems and software; as a key enabler to other groups involved throughout the life cycle, represent passion for the capabilities of machine learning and augmented human performance
4. **Creative and Development Teams:** bring needs and designs to life with machine learning design and software development; work with teams of analysis, engineers and developers; collaborates with various project-level development teams, and quality assurance roles to conceptualize, design, prototype, and develop breakthrough systems and software

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
	Data Compliance, Management, Privacy & Security
✓	**Automation**
✓	**Biomimicry & Sustainability**
✓	**Advanced Analysis**
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
✓	**Culture & Leadership**
	Ties to Digital Thread
✓	**Bridge Building**
	New Capabilities & Frontiers
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

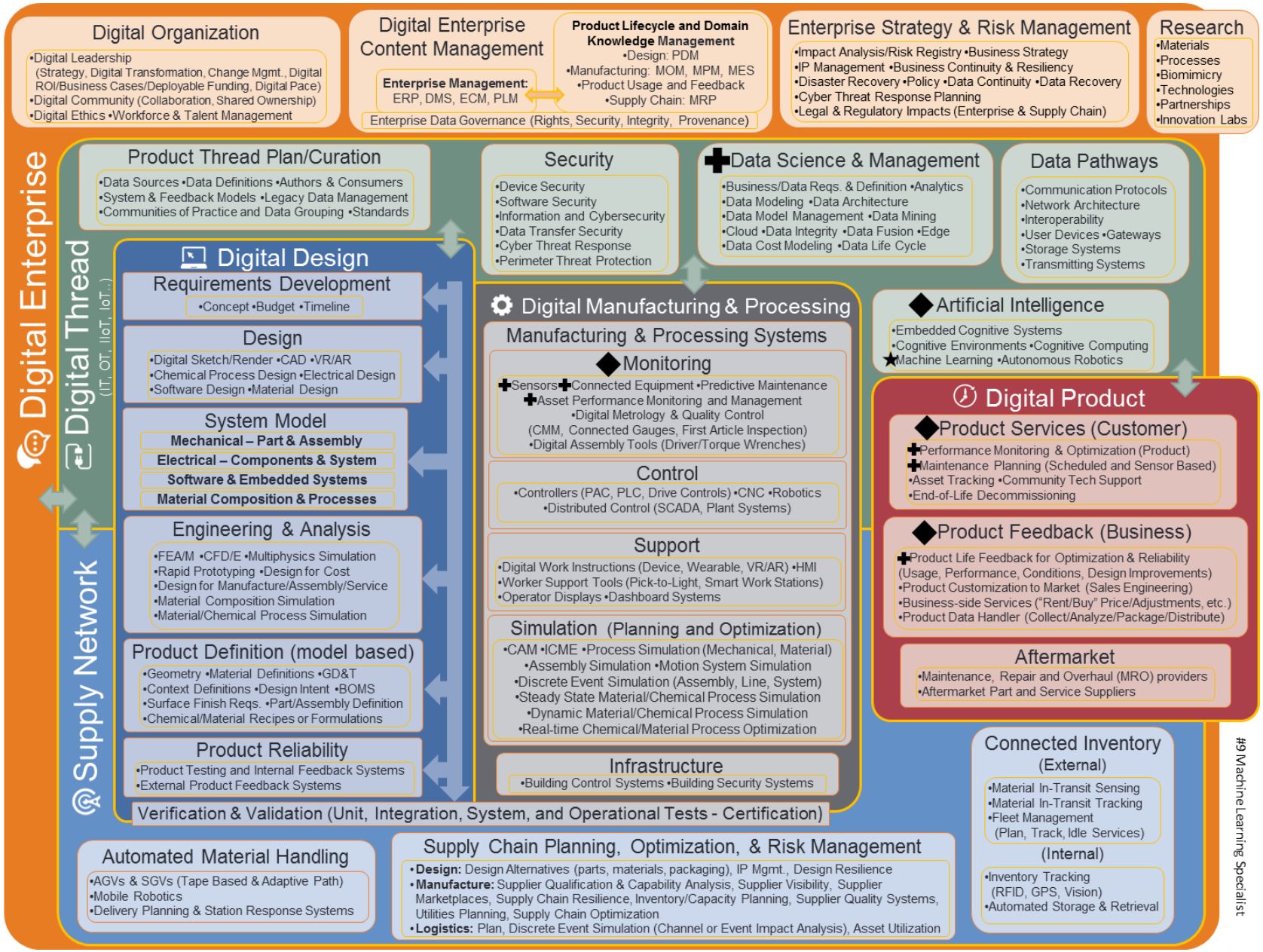
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Bachelor's degree required, and Master's or PhD degree preferred or in progress, in a field such as Computer Science, Computer Engineering, Machine Learning, Artificial Intelligence, Statistics, Economics, Mathematics, Physics, Robotics, Controls

Certifications

- There are a number of online certificates and introductory courses in machine learning and analytics available.

Experience Profile

- Integrated hybrid mix of technical, analytical skills and a research-orientation to continuously seek validated new data solutions
- Highly self-motivated individuals capable of both independent and cross-functional teams
- Demonstrated capabilities applying Machine Learning in related industrial settings with large-scale data
- Three years' experience with Agile software development across a wide range of machine learning-related projects: completing statistical modeling, machine learning algorithms, data pipelines
- Three years' experience in data science projects
- Two years' experience in prototyping and feasibility analysis
- Demonstrated experience with a widening toolkit of these technology stack/tools including but not limited to:
  - Bash, C++, Caffe, Cassandra, CUDA, D3.js, Docker, Hadoop, Haskell, HTML5, Java, Kafka, Kaggle, Kubernetes, LISP, Mallet, Open Source ML/NLP, Pandas, Python, R, Scala, Scikit-learn, Spark, SQL, TensorFlow, Theano, Vowpal, Wabbit, WebG, Weka

Section 6: Potential Progression

Role Cluster

12 Manufacturing Space Automation

Associated DM&D Community Roles

- Automated Guided Vehicle (AGV) Systems Specialist
- Collaborative Robotics Specialist
- Collaborative Robotics Technician
- Digital Factory Automation Analyst
- Digital Factory Automation Architect
- Digital Factory Automation Manager
- Digital Manufacturing Engineer
- Digital Manufacturing Safety Systems Specialist
- Factory Automation Engineer
- Instrumentation Engineer
- Inventory Systems Automation Specialist
- Machine Learning Scientist
- Self-Guided Vehicle (SGV) Systems Engineer

Progression Roles

Machine Learning Scientist

A Machine Learning Scientist works to develop new methodologies and tools that learn how to collect, share, store, process, and work through datasets that form throughout an enterprise. Their work focuses on the refinement of algorithms that are able to adapt themselves over time and work in both supervised and unsupervised data and control environments. They work to develop software solutions that can extract patterns in large data sets and make predictions based on data being streamed in. Machine learning systems are deterministic in their behavior and actions they can take. In a manufacturing enterprise their work may be focused on the development of adaptive systems that identify patterns in product quality issues, improve the control and performance of automated manufacturing systems, and even develop systems that improve product design and manufacturability. In their work they are able to embed intelligence into the systems that others have worked to pull data from, producing smarter software systems and machines. This may include the development of a machine tool or robot that can learn how to best manufacture or manipulate parts based on sensor measurements, outcomes, and prior work cycles. They enable a technology space where real-time decisions can be made in the system and no longer rely on human interpretation and engagement.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#10 | Digital Twin Architect

Section 1: Job Role Identifier Section

Role Title: Digital Twin Architect

Role Impact: Pioneer

Summary Scope

Who develops and manages a framework that enables the creation of a virtual representation, or digital twin, of a product, process, or system? Who enables the exploration of new capabilities or performance optimization in a digital environment? A Digital Twin Architect designs the framework of data, connections, models, and software standards that will enable the creation of a digital twin (or digital copy) of a complex product, process, or system.

- Their strong understanding of a product's lifecycle will allow them to develop a framework for both product optimization as well as provide valuable data to all product stakeholders from product concept to beyond end-of-life. Depending on the detail level of the product's digital twin framework, there is the potential to outline the Digital Thread across the full product lifecycle.
- Their strong understanding of process technologies in industries such as chemical, pharmaceutical, and materials production allow them to develop a framework that leverages connected models and data sources throughout for effective design, commission, operation, optimization, and modification of the subsystems and physical assets that come together in process industries.
- Their strong understanding of systems in production and manufacturing environments, including manufacturing equipment and automation technologies allows them to develop a framework that has a positive impact on systems throughout their factory, with system-level digital twins supporting the design, commission, operation, optimization, and modification of complex manufacturing systems.

The Digital Twin Architect establishes the frameworks that support effective development, testing, and optimization in the digital environment with input from real world products, processes, or systems, a merging of two worlds. Their approach can help companies launch products faster, provide greater service to their customers, operate more efficiently, improve safety, and improve product quality in a world where our products, processes, and systems are becoming more complicated and advanced every day.

Outcomes

- Creation of a product, process, or system digital twin framework that outlines the data, connections, models, and software that make up a digital twin
- Management and optimization of the data channels and systems that support a digital twin throughout its stages of development and use
- New opportunities and services to meet the needs of business stakeholders through the recommendation of technologies, systems, and processes that leverage the digital twin
- A data and model framework that supports MBSE efforts and provides additional downstream value

Domain Profile

1. Digital Thread
2. Omni

Generation Knowledge Range

G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The Digital Twin Architect leads the development of a digital twin's framework to meet business, customer, and stakeholder needs; from requirements development through beyond end-of-life for a product, or from design through modification of a process or system. In their role, they are responsible for the delivery and operationalization of a scalable digital twin framework and driving the continuous assessment and release of new capabilities within the digital twin. Their role enables greater value extraction from effective data collection throughout a product, process, or system's life for enterprises that are both developing and deploying ever more advanced offerings for their customers.

Section 2: Key Responsibilities

Activities

1. Leads and coordinates the development of digital twin frameworks that enable an enterprise and their customers to build, manage, and run a product, process, or system digital twin
2. Develops the standards and best practices for analytical model, software, and data systems integration into the digital twin
3. Develops a product, process, or system's digital twin architecture to be both scalable and adaptable throughout development and utilization, supporting technology changes as needed
4. Balances digital twin business priorities with a product, process, or system technical requirements and the supporting workforce's abilities
5. Provides technical mentoring to enterprise leaders, stakeholders, and support team members
6. Develops strategies and templates for building digital twins for different product, process, or system families
7. Develops long-term digital twin technical roadmaps
8. Identifies and assess new analytical, modeling, and data technologies for digital twin integration
9. Develops computing and data handling strategies for the digital twin
10. Uses agile software development processes

Accountabilities & Decisions

1. **Framework Development:** Have I developed a digital twin framework that covers the product, process, or system functional components from development to operational environments?
2. **Framework Management:** Am I documenting digital twin framework development, revisions, and application cases, and managing the stakeholders that are both contributing and utilizing the digital twin?
3. **Framework Deployment and Support:** Have I developed a digital twin framework that can be deployed and adapted as needed? Do I have procedures in place to support the framework's implementation and use?
4. **Opportunity Identification:** Have I identified appropriate data sources, systems, connections, models, and software that support the digital twin?
5. **Education and Guidance:** Am I properly supporting staff and stakeholders on the possibilities and capabilities of the product's digital twin? Am I properly guiding appropriate and efficient capabilities in the digital twin framework?

Interactions

1. **Leadership and Management:** Work with enterprise leadership and product managers across the product lifecycle to support product strategy and effective implementation of digital twin assets
2. **Customers and Stakeholders:** Work with product customers and stakeholders to determine digital twin value areas, performance information, and operation insight needs
3. **Analytics:** Work with analytics teams to identify and deploy appropriate analytics and modeling tools that create value from data collected across the product lifecycle, or across the stages of process or system
4. **Software**: Work with software teams to operationalize and continuously integrate technologies within the framework as the digital twin matures over time
5. **User Experience Designers:** Work with user experience designers to develop effective digital twin interaction mechanisms that are both convenient and effective for customers and stakeholders
6. **IT/OT Staff:** Work with IT/OT staff to drive and align data system integration across the digital thread and into the digital twin

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
✓	**Advanced Analysis**
✓	**Engaging Digital Twins**
	Customer Centrism
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
✓	**Culture & Leadership**
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

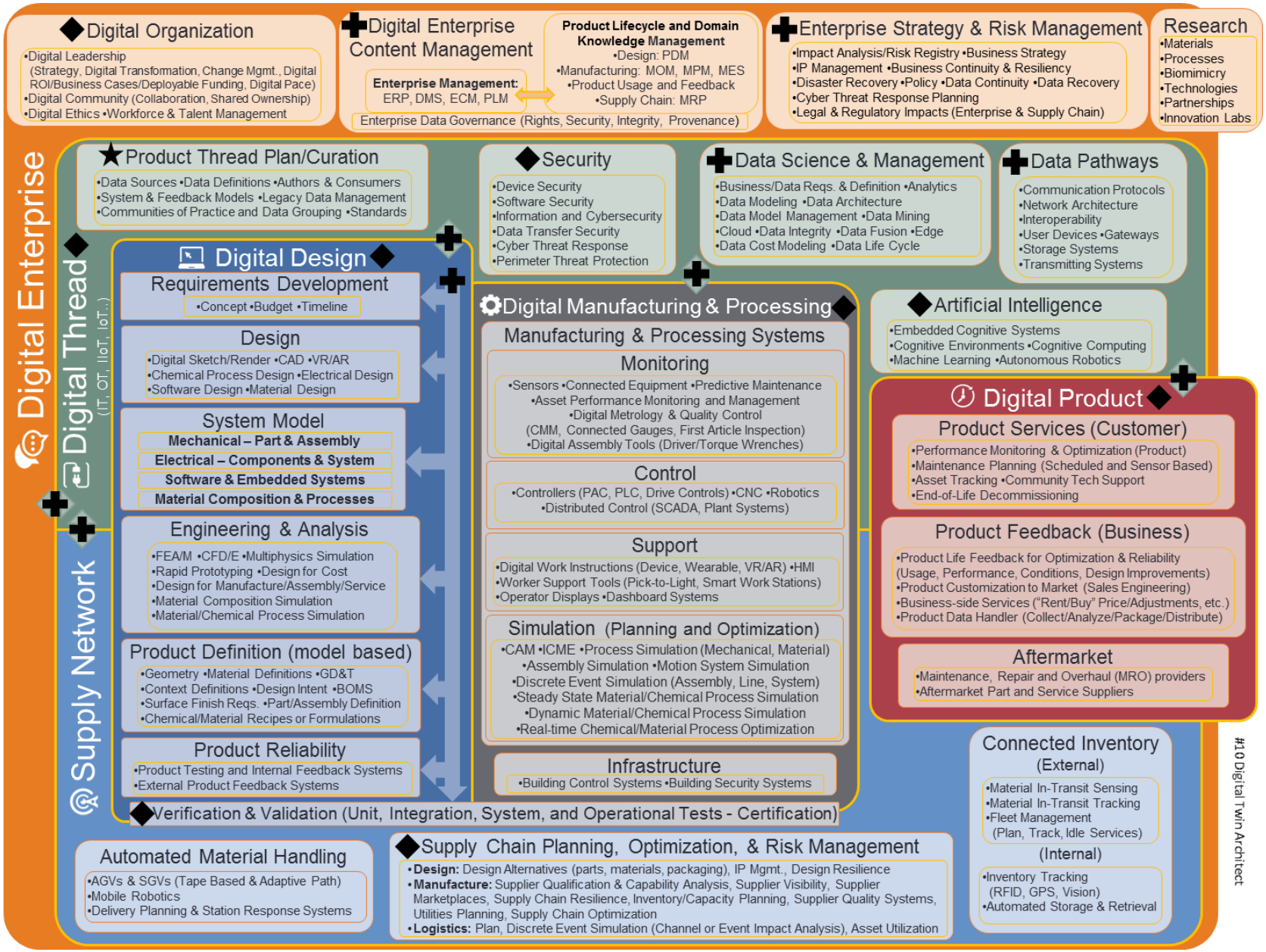
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- M.S. to PhD. in a software, engineering, analytics, or mathematics program with experience in the other areas

Experience Profile

- 15+ years of experience in software engineering and 10+ years of experience in software architecture development
- 5+ years of technical leadership experience in an engineering or software development environment
- Experience with programming languages/analytics tools such as Matlab, R, python, etc.
- Knowledge of scalability methods (server, cloud, hybrid)
- Experience with cloud computing/hosted services
- Experience in the development of databases
- Experience in Object-Oriented Analysis and Design, software design structures, coding principles, and multi-language systems
- Experience with industrial control systems, embedded software, and real-time operating and control systems
- Experience with data sources that support Digital Twins
  - across a product's lifecycle (design, manufacture, test, operation, maintenance, end-of-life, and beyond)
  - throughout processes in process industries (chemical, pharmaceutical, material)
  - throughout production systems (manufacturing equipment, automation systems)
- Understanding of Enterprise Content Management systems
- Understanding of Data Science, Management, Security, and Pathways
- Familiarity with Artificial Intelligence

Section 6: Potential Progression

Role Cluster

7 Integrated Data Management

Associated DM&D Community Roles

- Data Management Analyst
- Data Management Manager
- Digital Data Tester
- Digital Knowledge Community Curator
- Digital Thread Engineer
- Digital Twin Analyst
- Digital Twin Manager
- Model Based Systems Engineering (MBSE) - Engineer
- Product Life Cycle Data Engineer
- Product Life Cycle Quality Data Analyst
- Product Life Cycle Quality Data Manager
- Product Life Cycle Quality Data Specialist
- Supply Network Quality Data Analyst
- Supply Network Quality Data Manager
- Supply Network Quality Data Specialist

Progression Roles

Digital Twin Manager

The Lifecycle Digital Twin Manager is responsible for the management and execution of Digital Twins, including their framework, data connections, models, AI, and systems that support their operation and services throughout the product's lifecycle. In their role they work with multiple product stakeholders within an enterprise to make sure that the data and needs and service offerings for the Digital Twin are being met. At times, they may have to support the adjustment of a Digital Twin's framework to ensure that the correct data, models, and systems are lined up to provide necessary services to both internal and external enterprise customers. A manager in this role will typically oversee data analytics, software, and hardware teams to implement and operationalize technologies that support the Digital Twin throughout a product's life. In their role, they will also work to engage other product lifecycle teams to make sure they are receiving appropriate information back from the Digital Twin to improve product performance through updates in design, manufacturing, operation, and service of the product throughout its lifecycle.

Digital Twin Analyst

The Life Cycle Digital Twin Analyst works to analyze data that is going into the models, AI, and systems that make up a Digital Twin as well as examine the resulting information and prediction quality. In this role, an analyst has the ability to organize and free up product lifecycle data across departments that were once traditionally siloed within an enterprise, allowing departments to learn from one another leading to improvements in product design, manufacture, operation, and service. A Life Cycle Digital Twin Analyst supports decision making throughout an enterprise, providing the right information at the right time, leveraging data from machines, materials, workers, processes, and operation. In their role, they are able to perform "what-if" scenarios throughout design, manufacture, and operation, simulating risks that might occur between different stages and providing insight into the best potential outcomes and opportunities. Analysts are able to utilize streaming data to develop continuous production, supply chain, and operations insights. In their position, they can also utilize segments of the Digital Twin to support failure reporting, analysis, and corrective actions back to design, manufacturing, and supply chain teams under a FRACAS process to improve product quality and reliability. Analysts are able to augment their own capabilities through the captured knowledge of their peers and colleagues as Digital Twins get smarter and capture broader sets of data.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#11 | Predictive Supply Network Engineer

Section 1: Job Role Identifier Section

Role Title: Predictive Supply Network Analytics Engineer

Role Impact: Pioneer

Summary Scope

Global and national business strategies, regulations, innovations, cost pressures, and business resiliency efforts all have put an on-demand focus on supply networks more than ever before. Digital brings the power of analytics, integrated data, multi-source access, and other insightful mechanisms so that companies can hone their supply sources and partner interactions in ways that weren't possible before. So who will apply digital modeling and data analysis, systems management, statistics, forecasting, and predictive decision support design; who will apply their focus on supply network optimization, operations, and inventory management, all to transform data into real-time, forward focused supply network insights? That role would be the Predictive Supply Network Analytics Engineer.

These Predictive Supply Network Analytics Engineers work to create data connections, systems, tools, and processes to address specific supply network initiatives and solve emerging process, partner, or operational problems. They both design and build supply network analytics systems and use those to address issues that have immediate impact on the business and their customers. Through requirements analysis, design, and development of systems and tools that model and visualize possible supply network activities and outcomes, these engineers can bring insights to decision makers on many supply network/life cycle considerations. They look for all opportunities to optimize their networks, from monitoring and forecasting demand or inventory; modeling capacity and predicting production volatility; scheduling; looking for network collaboration or integration opportunities and impacts; supporting supplier selection and arrangements; and optimizing logistics planning. Their data systems and modeling work are essential to more accurate, dynamic, and prescriptive financial forecasting, such as purchasing and price forecasting, new customer costs, and contract negotiation cost-benefits. On the product side, their modeling and systems work across the supply network can improve supply quality and ultimately product quality through supply error prediction, supply network gap identification, isolation of failing material lots, and more.

As a 'designer-engineer-user-coach,' these engineers are as much business as they are technical, and they lead and direct supply network professionals in the design and execution of digital supply chain solutions and connectivity across the supply chain. They create increased proactive visibility and enable the supply network management and operations community to drive innovation. The engineer's advanced analytics merge real-time data and models to envision future scenarios and prescribe profitable and purposeful decisions. Leveraging the spectrum of advanced analytics from across the digital thread is key for successes within the manufacturing industry; these Supply Network Engineers lead early in that effort.

Outcomes

- Higher fidelity of data and models across the supply network creating business, product, and customer value
  - Understanding of current supply network state through descriptive analytics
  - Understanding of what could happen within the supply network through predictive analytics
  - Understanding of what should happen within the supply network through prescriptive analytics
- Recommendations on supply network decision systems and emerging technologies
- Specifications for new supply network system and process concepts, architectures, and solutions
- Decision-maker friendly data analytics and more broadly applied insights across supply network management that drive product value and positive customer outcomes

Domain Profile

1. Supply Network
2. Digital Thread
3. Digital Manufacturing

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

Predictive Supply Network Engineers build intelligent supply chain management solutions that leverage advanced analytics and provide sophisticated insights that allow companies to respond in a timely manner and align decisions with business and customer goals and objectives. The company can gain fuller visibility into the integrated product life cycle and product supply chain, increasing decision value and communication across teams, customer bases, and throughout supplier and partner communities. Business decisions will be supported by supply network data and analytics, and the analytic tools will be in the hands of decision makers impacted by the organization's supply network. Data and insights will be provided to the right people for action, providing an understanding of the supply network's state, what could happen, and what should be done.

Section 2: Key Responsibilities

Activities

1. Serves as key technical lead, providing analytical systems support, useable data, insightful recommendations, and timely analysis for business stakeholders needing better decision making and increased understanding of complex supply networks
2. Works individually with senior leaders as well as leads roles within business and technical teams on full-systems life cycle efforts to identify opportunities to provide impact from supply network data. Identifying systems, analytics solutions, and required actions; designing solution approaches; scheduling, planning, and managing projects; and driving engagement for impactful supply network system and data use
3. Provides clear data visualizations and analysis tied to impact on desired business outcomes impacted by the supply network
4. Seeks out innovations in visualization and end-user decision support tools; supports individual and community use of related supply network analytics to support both individual and collective system decision making
5. Leads analysis efforts around complex supply network datasets to determine key drivers related to any and all supply network factors impacting product flow, such as customer churn, marketing campaigns, supplier trends, competitor activity, material flow impacts, etc.
6. Defines and delivers on data strategies to identify, map, connect, and sustain data connections across the supply network and programs connections from multiple systems and datasets
7. Executes data and analytics pilots and tests and then translates them into scalable, mobile, adaptable, and replicable solutions, deploying through cloud-based or enterprise system-level solutions
8. Engineers supply network business intelligence tools, databases, dashboards, systems, or methods for a wide variety of stakeholder users across the product/service life cycle
9. Continuously maintains the integrity and realism of supply network models related to various products and services by staying in-sync with the actual product and service in use
10. Extends analytics systems and support into prescriptive analytics to go beyond identifying possible future states to provide the best possible action plans to reach a desired outcome through optimization, heuristics, segmentation, and propensity models and other available modeling and directional guidance methods
11. Collaborates with broader engineering community, the IT community, and the business to assist with ongoing systems and process improvement initiatives to ensure efficient data capture and reporting capability for contributing systems as much as the primary supply network systems
12. Increases reliability and validity of predictive scenarios by identifying and incorporating additional external data streams

Accountabilities & Decisions

1. **Insights That Make a Difference:** Am I leveraging historic and real-time data to feed predictive models that support more decisions, better decisions, and higher-value decisions for supply network stakeholders?
2. **Robust Scenarios:** Are my working and predictive scenarios enabling me to gain crucial insights into strategies not easily seen with other forecasting methods? Are the modeling and forecasting guidelines effectively serving as both smart risk assessments and innovative opportunity assessments?
3. **Sustainable and Scalable:** Am I creating tools, systems, processes for our supply network of the future that can scale to our volumes, locations, and user needs?
4. **Data Silo Busting:** Are our systems, models etc. ensuring the data required to drive analytics insights is accessible when, where, and to whom it needs to be? Are we looking at whole pictures and not just pieces – but can we drill to the details when we need to?
5. **Resilient Data Integration:** Are we connected well enough, and deep enough, and cross-disciplinary enough, across our own systems and to whatever extent possible with our partners and suppliers so we can dive deep enough into our collective realities and see possibilities? Do we have sufficient protections and backups for our most important data sources and models?

Interactions

1. **Supply Network Professionals:** Across the cycle of designing, building, testing and using, they support, enable, and coach a variety of supply network practitioners
2. **Business Managers and Leaders:** Works to support better decision making, improved business results, decreased operations risks, and identify new areas to seek supply network insights
3. **Information and Operation Technology:** Works in parallel to leverage data sources, systems, platforms, and tools, as well as bring innovation to processes and integrated systems in IT and OT environments
4. **Factory Automation Teams**: Works together to extend the digital thread of the factory of the future and establish links across the supply network
5. **Analytics and Business Intelligence Roles:** As a colleague and co-practitioner, looks to leverage shared analytics and market information across business issues and opportunities

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
	Automation
	Biomimicry & Sustainability
✓	**Advanced Analysis**
	Engaging Digital Twins
✓	**Customer Centrism**
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
	Bridge Building
	New Capabilities & Frontiers
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates		■	
	Drives Organization to Vision		■	
	Aligns/Influences/Localizes Vision	■		
	Develops Plans			■
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans		■	
	Direct Customer Contact		■	
	Indirect Customer Contact		■	
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context	■		
	Functional Work Team Member		■	
	Project Work Team Member	■		
	Implementer	■		
	Delivery Expert	■		
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach		■	
	Evaluator	■		
	Influencer		■	
	Networker		■	
	Thought Leader		■	
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting	■		
	Product Development & Research			■
	Product Life Management		■	
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product	■		
	Supply Chain	■		
	Product/Service Delivery & Support	■		
	Customer Experience		■	
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization		■	
	Employee Engagement			■
	Network Engagement		■	
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management		■	

Section 4: Competencies

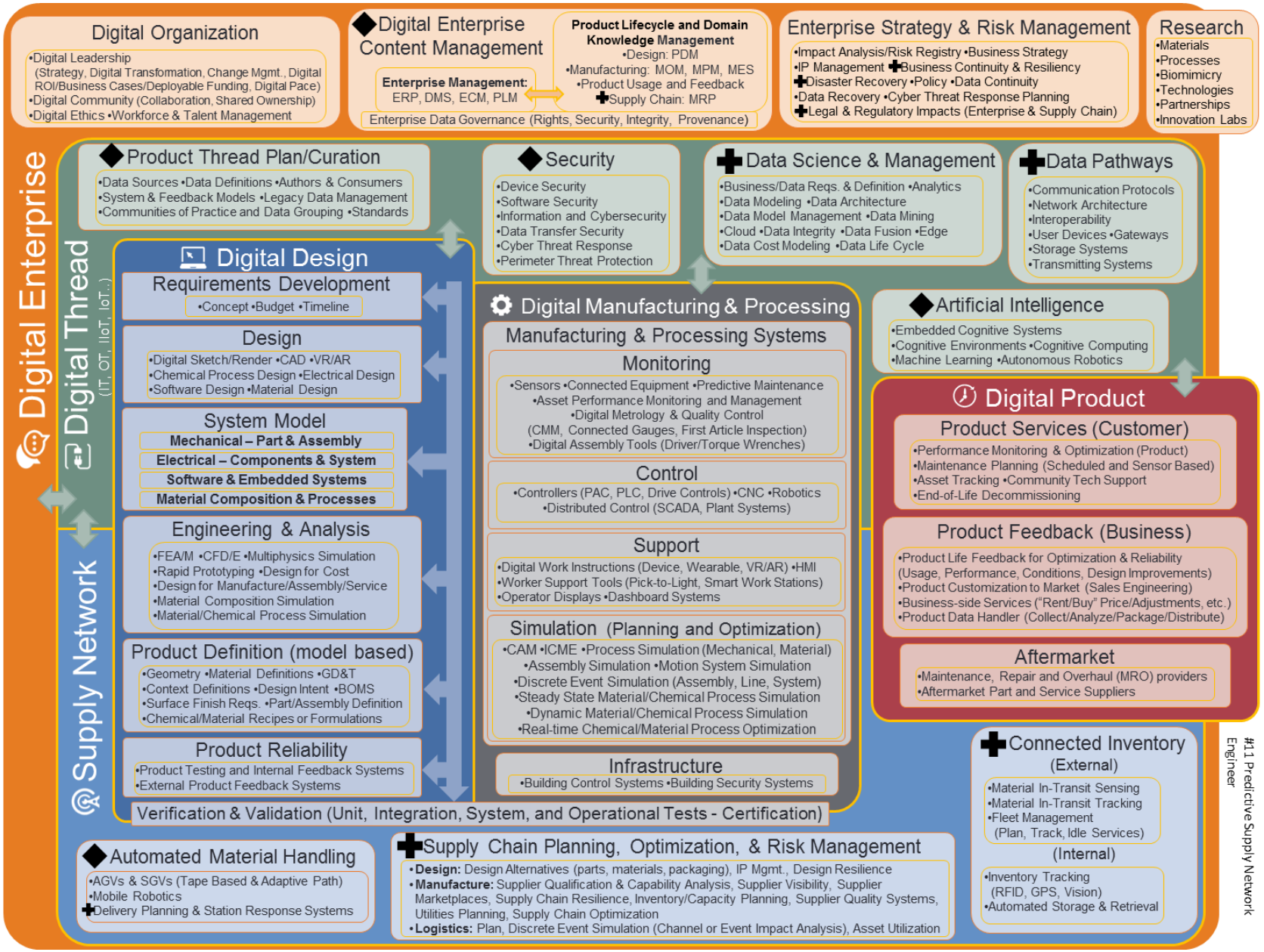
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



#11 Predictive Supply Network Engineer

ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- BA/BS in Industrial Engineering, Supply Chain Management, Operations/Operations Research, Logistics, Computer Science, Data Science, or similar focus
- MBA/MA/MS preferred

Certifications

Beneficial for supply chain professionals:

- CSCP (Certified Supply Chain Professional)
- CPSM (Certified Professional in Supply Management)

Additional beneficial certificates exist covering:

- Business Analytics
- Prescriptive Analytics

Experience Profile

- A minimum of 5-8 years relevant work experience with increasing responsibility in supply network or enterprise systems positions with a strong emphasis on integrating business systems and systems engineering for decision support, modeling, and forecasting
- Track record of managing and improving complex data collection and analytics processes
- Very strong organizational and problem-solving skills
- Passion for developing and deploying new digital technologies for supply chain
- Skilled in working with large datasets, including data mining, assessing data quality, statistical/trend analysis, and predictive analytics
- Strong quantitative analysis (i.e., statistics, optimization, simulation), data visualization, and communication skills
- Strong ability to communicate complex concepts simply, verbally, visually, and in writing to a variety of audiences
- Strong analytical, creative, and innovative abilities to solve problems independently, especially in ambiguous situations
- Expert-level skills in MS Excel, MS PowerPoint, and MS Access, especially advanced Excel VBA, macros, v-lookup, formulas, and pivoting skills
- Demonstrated skills in or training in supply chain information systems, analytics platforms, visualization tools/software, and other solutions (e.g., Hybrid Transactions Analytic Platforms [HTAPs] like SAP HANA, R, Python, Tableau, Coupa, Llamasoft, SQL, Alteryx, Supply Chain Guru, AnyLogic, Gurobi/CPLEX, and/or, JDA, Elementum, OneNetwork, FusionOps, GT Nexus, E2Open) or other equivalent supply network/analytics/visualization-oriented technologies, tools, and/or visualization systems
- Exceptional interpersonal skills to collaborate with stakeholders across the business
- Experience with digital and social platforms, technologies, providing communities
- High affinity for customer journeys and digital enablement

Section 6: Potential Progression

Role Cluster

9 Integrated Product Management

Associated DM&D Community Roles

- Digital Product Manager
- Digital Product Support Manager
- Embedded Product Prognostics Analyst
- Embedded Product Prognostics Engineer
- Predictive Maintenance System Specialist
- Predictive Supply Network Analytics Engineer
- Product Embedded Cognitive Systems Engineer
- Product Embedded Cognitive Systems Specialist
- Product Performance Optimization Engineer
- Supply Network Business Analysts
- Supply Network Community Manager

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#12 | IT/OT Systems Engineer

Section 1: Job Role Identifier Section

Role Title: IT/OT Systems Engineer

Role Impact: Keystone

Summary Scope

Who works to bridge critical data systems from the plant floor up through the enterprise? Who makes sure that errant web traffic does not interrupt manufacturing operations? Who enables new value and insight across manufacturing and business operations? An IT/OT Systems Engineer is responsible for coordinating the construction, maintenance, and expansion of an organization's computer systems, software, and networks that connect business information technologies (IT) and manufacturing operations technologies (OT). Their work to develop different types of software, applications, network control systems, and middleware effectively bridges the data gap between office and production environments. In their position, they need to be aware of the intricacies and needs of business software systems that work with data inputs and outputs and operations-side devices and processes that require real-time data. They make sure that the voices of machines are heard on the top floor of the enterprise and their messages find their way without interference or influence.

Outcomes

- Connection of business information technologies (IT) and manufacturing operation technologies (OT) through coordinated construction, maintenance, and expansion of an organization's data-centered systems
- Design and setup an enterprise's business and manufacturing intranets
- Design and implementation of security and data assurance systems protecting connected assets in business and manufacturing environments
- Removal of data silos between business and manufacturing environments, moving data from "producers" to "consumers" and ultimately providing actionable insights across the enterprise
- Bridging of data connectivity gaps through the interconnection of disparate systems
- Upgrade or integration of networks from a mix of legacy networks and fieldbuses into modern IT/OT network infrastructure
- Enhanced network security in business and operations environments
- Identification, evaluation, and integration of existing software solutions to meet organizational objectives

Domain Profile

1. Digital Thread
2. Omni

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

The IT/OT Systems Engineer coordinates the construction, maintenance, and expansion of an organization's computer systems, software, and networks to bridge the data gap between office and production environments. In their role, they enable enterprise and external systems to provide actionable insights based on real-time manufacturing environment data. Their work helps break down the traditional siloed nature of data within a manufacturing organization, leading to new insights, interactions, and feedback loops across the product lifecycle. Effective management of these different networks leads to higher productivity across the organization and a network structure that is easier to secure from both external and internal threats.

Section 2: Key Responsibilities

Activities

1. Support the optimization of business and manufacturing processes through the use of connected data systems
2. Provide support for data systems across the full enterprise, including their connections, maintenance, and repair
3. Design and set up an enterprise's business and manufacturing intranets and establish their interconnectivity
4. Design and implement security and data governance systems, protecting both business and manufacturing environments
5. Develop and configure applications to interconnect disparate systems (software, data, control, etc.)
6. Upgrade or integrate legacy fieldbuses into modern network infrastructure
7. Support IT/OT team members in their roles, provide coaching and training to technicians, specialists, and analysts
8. Lead the management of systems and network documentation
9. Work to keep production systems running and operating in real time
10. Maintain business-level systems and communication networks
11. Develop IT/OT project roadmaps and workflows

Accountabilities & Decisions

1. **Connectivity of Systems**: Have I developed proper applications, systems, and networks that securely connect and utilize data across the enterprise?
2. **Integration of Systems:** Have I successfully integrated data systems from equipment, assets, processes, and other sources onto and across networks?
3. **Data Integrity:** Have I established governance of policies, procedures, and standards across network environments that protect connected assets and data?
4. **Data and System Security:** Am I ensuring both network and data security, integrity, and access across both IT & OT networks, and between systems by implementing unified policies and security measures?
5. **Oversight:** Have I properly managed the adoption, execution, and integration of new data systems and projects?
6. **Network Alignment:** Am I promoting and supporting a single view of the enterprise's information and system management tools?
7. **Opportunity Identification:** Am I actively pursuing new operational areas where additional value may be obtained from data?
8. **Traffic Management:** Have I developed network designs for effective traffic management at current and future capacity?

Interactions

1. **Manufacturing Functional Departments:** Make sure software systems and assets are being fully utilized and adding value to their department based on the data and insights they can provide
   - Operations and Production Teams
   - Maintenance Teams
   - Material Handling and Logistics Teams
   - Supply Chain Teams
2. **Business Functional Departments:** Make sure software systems are adding value to their department and supplying actionable data from across the enterprise
   - Management
   - Design Engineering
   - Manufacturing Engineering
   - Finance
   - Additional Business Functions

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
	Advanced Analysis
	Engaging Digital Twins
	Customer Centrism
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
	Workforce & Talent Platforms
✓	**Culture & Leadership**
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			■
	Drives Organization to Vision			■
	Aligns/Influences/Localizes Vision		■	
	Develops Plans	■		
	Operationalizes/Details/Directs Plans	■		
	Delivers Tasks Within Plans	■		
	Direct Customer Contact			■
	Indirect Customer Contact			■
Peer Context	Leadership/Management			■
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member	■		
	Project Work Team Member		■	
	Implementer	■		
	Delivery Expert	■		
	Program Leader (Formal/Informal)		■	
	Integrator/Coordinator	■		
	Coach		■	
	Evaluator			■
	Influencer		■	
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting			■
	Product Development & Research			■
	Product Life Management			■
	Product Design			■
	Product Engineering			■
	Production	■		
	Connected Product	■		
	Supply Chain	■		
	Product/Service Delivery & Support		■	
	Customer Experience			■
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization	■		
	Employee Engagement			■
	Network Engagement	■		
	Product Quality Improvement			■
	Process Quality Improvement			■
	Financial Management			■

Section 4: Competencies

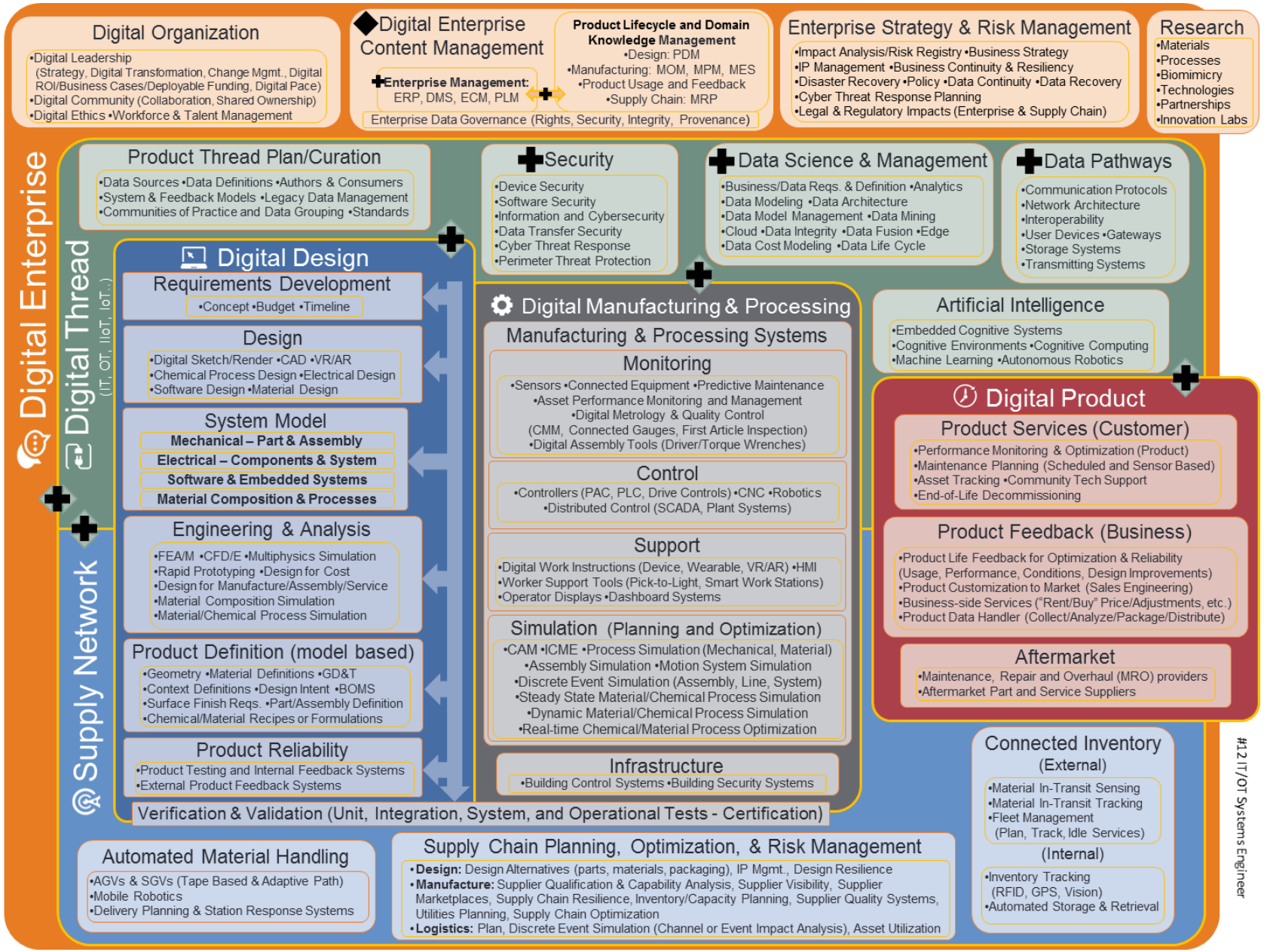
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Bachelor's degree in Electrical Engineering, Information Technology, Computer Science, or Manufacturing with working familiarity of the other areas

Certifications

- Beneficial to have certifications in business and operations network technologies

Experience Profile

- Experience with or understanding of ANSI/ISA-95 international standard on Enterprise-Control System Integration is desirable
- Experience supporting manufacturing (OT) and business (IT) devices, software, and network systems
- Experience with setup of networks in business, production, and automation environments
- Must have comprehension of and experience with business and operations software systems such as ERP, PLM, PDM, MOM, MPM, MES, MRP, WMS, integration tools, etc.
- Must have comprehension of and experience with instrumentation, control, HMI, DCS, and SCADA platforms
- Must have comprehension of and experience with server virtualization, network routing, and switching for IT and OT environments, firewalls and network segmentation, storage area networks, databases, and VPN

Section 6: Potential Progression

Role Cluster

10 Manufacturing Space and Systems Integration

Associated DM&D Community Roles

- Cognitive Systems Designer
- Cognitive Systems Specialist
- Operation Technologies Integration Engineer
- IT/OT Application Developer
- IT/OT Systems Analyst
- IT/OT Systems Architect
- IT/OT Systems Engineer
- IT/OT Systems Specialist
- IT/OT Systems Strategist
- IT/OT Systems Technician
- IT/OT Systems Tester

Progression Roles:

IT/OT Systems Specialist

An IT/OT Systems Specialist is responsible for deploying and maintaining an organization's computer systems, software, and network devices that connect business information technologies (IT) and manufacturing operations technologies (OT). With experience of network and data communications systems in both IT and OT networks ranging from legacy fieldbuses to TCP/IP, a working knowledge of coding, and network systems design is a must. They apply solutions to bridge data gaps that exist in IT and OT networks. Their work helps drive productivity across an enterprise's organizations, providing bridges of information that was not previously available. They have a strong understanding of the deployment, operation, and maintenance of the technologies used to join IT and OT networks together.

Work is performed in both business and operations environments that may require the merging of both data and control systems, with activities including: system administration, maintenance, and configuration of servers, network hardware, workstations, security systems, and more. When problems arise on a network, they are likely to be the first to have to respond. In their role, they may assist in the development of procedures and guidelines for implementation and use of network systems and elements while supporting special/critical network projects. They also support high-level enterprise compliance and disaster recovery functions. In their work, they may be responsible for performing compliance and regulatory tasks, along with assisting in the establishment and implementation of disaster recovery and business continuity processes and tools critical to supporting resiliency across the enterprise. Their experience in testing procedures and safe practices reduce risk, minimize data loss, and guarantee data integrity as they perform their work.

IT/OT Systems Architect

The IT/OT Systems Architect works to plan, develop, and refine network architectures that handle data from Information Technology (IT) and Operations Technology (OT) environments across an enterprise. The networks they design increase productivity across business and manufacturing environments due to new insights, interactions across roles, and new feedback loops introduced throughout the product lifecycle. In their work, they develop the functional and nonfunctional requirements of networks, including reliability and security, while taking into account cost, risk, and scalability. When designing IT/OT networks, they design architectures that can be readily managed, maintained, and modified as needed overtime, taking into account emerging technologies, industry trends, and evolving business needs.In this position, they are required to work on and manage a mix of both systems and software engineering tasks. Their business relies on their strategic direction and expert-level leadership in developing scalable secure networks that join IT and OT, taking into account the devices, services, and software resources that will be deployed. They understand how to mitigate risks when introducing new technologies or architecture changes, recognizing that interruptions to network dervices can lead to interruptions in both business and manufacturing environments.

Often they will have to work in environments where there is existing network architecture in place, focusing their work on refining what is in place and leading the development of compatible systems across the enterprise, taking into account alternatives that can improve network or system performance while still optimizing cost and risk. An understanding of industry standards, state of the art, and how networks and systems will have to change over time is critical for effective design, roadmapping, future planning, and education of stakeholders within their organization. They are also able to support their colleagues by identifying, analyzing, and resolving complex IT/OT problems that are escalated within their organization.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#13 | Digital Manufacturing Biomimicry and Sustainability Specialist

Section 1: Job Role Identifier Section

Role Title: Digital Manufacturing Biomimicry and Sustainability Specialist

Role Impact: Pioneer

Summary Scope

Forward looking manufacturers in all sectors of business increasingly 'look outside' and 'beyond the factory floor' for innovation and efficiency inspirations. Leveraging solutions from nature and using its learning in areas such as design, engineering, materials, production, IT/OT networking, organizational development, chemistry, etc. is increasing. Biomimicry patents, research grants, and findings have increased by more than 5 times since 2000, and manufacturing is a lead area of application. Additionally, stakeholders from many arenas make purchases, investments, employment decisions, and compliance decisions based on manufacturers' overt commitments to environmental and sustainability concerns; and others benefit whether they know where the strategies and motivations come from or not.

Who can answer: What would nature do and what can we do for nature? What role can blend the bridge between digital manufacturing business and design and the innovation from nature via biology and ecology? Digital Manufacturing Biomimicry and Sustainability Specialists develop, advocate, and advance biological and natural system emulations and sustainability as innovation strategy. Including but expanding on the sustainability and green manufacturing, this role integrates the increased inclusion of biomimicry – the approach to innovation where concepts for new materials, structures, or systems are modeled after biological entities and/or processes – with environmental sustainability as a dual foundation. These specialists apply nature's genius in optimizing digital tools, technologies, products, processes, and organizations; and vice versa, use digital as an accelerator for product and process innovation based on sustainability, natural systems, and biological emulations.

Whether it's in new nanomaterials not feasibly integrated without digital and biology working together, digital designs of aero efficiencies modeled after a bird's beak, IT swarm technologies based on bee behaviors, or digital ecosystem management strategies inspired by the nurse log and canopies of the redwood forests, the Digital Manufacturing Biomimicry and Sustainability Specialist avoids 'checking the go green box' and brings exponential value to almost all areas of the DM&D arena. Digital Manufacturing Biomimicry and Sustainability Specialists support strategists and business units as a support for technical, operational, research, strategy, or policy needs. They facilitate interdisciplinary teams in discovering and applying natural innovations, and the same time make it more natural and profitable to respect and manage natural resources and environmental systems. Acting as applied expert and functional liaison between sustainability and biomimicry innovations within the organization, these specialists serve as a pragmatic and applied change agent and innovation strategist. This Specialist positions biomimicry to transform the way we design, produce, distribute, and manage resources, goods, and services as more and more companies are approaching natural systems for innovative ideas to help solve complex human and business problems.

Outcomes

- Reduced costs and increased revenue opportunities; business-case justifications for innovation and efficiency strategies
- Time/cost/waste reduction achieved for digital processes, products, strategies via biomimicry emulations and sustainability initiatives
- Design innovations and performance improvements in products, processes, strategies based on biomimicry emulations

- Customer branding and employee engagement based on increased corporate social responsibility; customer engagement/satisfaction increases or brand capital improved by biomimicry emulations and sustainability efforts
- Operational savings from resource optimization and compliance; reductions in material waste, energy, water and other resources
- Revenue streams from carbon offsets and future compensatory options
- Proactive responses to standards and regulations
- Secure future intellectual property and design increased employee engagement and talent acquisition based on social innovation and environmental performance
- Excellence in stewardship and improved environmental, species, and natural systems health

Domain Profile

1. Digital Enterprise
2. Digital Design
3. Supply Network
4. Digital Manufacturing
5. Digital Product

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

An innovation and sustainability accelerator role with a social responsibility bonus, the Digital Manufacturing Biomimicry and Sustainability Specialist brings process, product, and organizational innovation access, serving as both a keystone and pioneer role for rapid and meaningful digital application, design, and implementation. Biomimicry could account for over 1.5 million US jobs by 2025; $425 billion of US GDP; and $1.6 trillion of total global output by 2030. Listed as one of the Society of Manufacturing Engineers innovation and economic game changers, this role and work area is a viable differentiator now, and will become a mainstay in the near future. Early adopters will leapfrog for internal wins; leverage learnings in their own digital organization transformations; and continue to improve critical supply network, environmental, and social responsibility goals.

Section 2: Key Responsibilities

Activities

1. Develops a high-value biomimicry and sustainability 'mission' and 'opportunity' within appropriate contexts across the organization and identifies productive paths to activate biomimicry and sustainability
2. Provides research and/or seeks out new trends and opportunities for internal and supply network innovations based on nature's patterns, strategies, forms, processes, ecosystem management approaches, and other innovation sources
3. Works across and facilitates interdisciplinary teams to discover and apply biomimicry and sustainability strategies; finds opportunities to advance digital strategies by integrating biomimicry and sustainability with digital; uses digital to model these innovations; uses digital to improve sustainability performance
4. Contributes to product road maps for product innovation and sustainability; co-builds the business case with teams of designers, engineer, leaders and others
5. Facilitates design thinking to create integrated solutions incorporating nature's lessons, ideas, and strategies – emulating the functional genius of natural patterns, forms, strategies, materials, processes, etc.
6. Coordinates and facilitates cross-functional teams to leverage digital technologies and strategies to enable continuous improvement in product and strategy and environmental performance
7. Generates and tests biomimetic practices and learnings to create an enterprise biomimicry practice template that boosts internal capability and the value of related efforts
8. Benchmarks industry approaches and incorporates learnings into company positions and decisions
9. Seeks out new vendors and opportunities in the supply network to bring new materials, processes, designs etc. into the product life cycle
10. Serves as a primary interface for external partnerships on key initiatives; builds and expands the network and capabilities within supply chains and the external sustainability community; adds to the company's brand and credibility
11. Coaches individuals and teams and facilitates capability development across the enterprise
12. Develops integrated plans for improving the environmental footprint of company efforts, tracked against stated goals via key metrics to successfully deliver on sustainability and biomimicry objectives

Accountabilities & Decisions

1. **Triple Bottom Line:** How am I positioning and implementing biomimicry and sustainability achievements in multiple areas, serving customer, communities, employees, the environment, and investors? How do our measures both ethically and commercially support holistic social, biological, and environmental decisions (people, profit, and planet)?
2. **Abstracting the Right Function from Nature to Business and Manufacturing**: Have I sufficiently found and "de-biologized" the natural systems or organism designs to the needed functional design of the product, process, system, or strategy? Have I found where nature has produced a biological system sufficiently similar to the manufacturing target system that can be used to develop a technical equivalent?

3. **Heart of Business Strategy:** Am I promoting and implementing sustainability not as a parallel to business strategy and innovation but as close to the heart of business strategy and innovation as possible?
4. **Innovation Source**: Are we using biomimicry as a methodology for innovation not just a direct copy or imitation resource? Are we taking a holistic view in identifying fundamental principles that occur across multiple biological systems as new insight in how to do sustainable design and manufacturing?
5. **Interdisciplinary Champion**: Are we increasing coordination between groups for our opportunities to apply biomimicry to and with digital manufacturing? How well are we leveraging and connecting our supply network?
6. **Building an Internal Practice:** Am I creating methods of sustainability and biomimicry planning and design that can be replicated across the business, and in situations needing innovation for process, product, and materials?
7. **Ethos:** Are we avoiding 'green washing' and 'bio-mockery'?

Interactions

1. **Business Leaders:** Engage in deep conversations on the risk/rewards of various practices, relationships, decisions, and designs, maintaining a holistic and objective perspective of stakeholder interests, innovation, and sustainability needs
2. **Design Engineering Community:** Influence user, material, and other design decisions and practices in light of innovation options and holistic ethical and regulatory considerations
3. **Production Community:** Co-consider production issues for biomimicry and sustainability in light of technical, business, ethical, cultural, environmental, and legal factors
4. **Communications and Marketing; Enterprise Supply Network:** Guide ethical practices and decisions relating to external stakeholders (market, consumer, and partner) messages, relationships, and decision guidelines in light of technical, business, ethical, cultural, environmental, and legal factors
5. **Legal:** Co-develop policies and implementation approaches; share risk management and opportunity analysis
6. **HR:** Inspire and co-shape leadership, culture, and organizational practices with solutions and strategies from nature

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
	Data Compliance, Management, Privacy & Security
	Automation
✓	**Biomimicry & Sustainability**
✓	**Advanced Analysis**
	Engaging Digital Twins
✓	**Customer Centrism**
	New Data Connectivity
✓	**Org. Business Ecosystem & Stakeholder Networks**
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
	Ties to Digital Thread
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates		■	
	Drives Organization to Vision			■
	Aligns/Influences/Localizes Vision	■		
	Develops Plans		■	
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans		■	
	Direct Customer Contact		■	
	Indirect Customer Contact		■	
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member		■	
	Project Work Team Member	■		
	Implementer	■		
	Delivery Expert		■	
	Program Leader (Formal/Informal)		■	
	Integrator/Coordinator		■	
	Coach	■		
	Evaluator	■		
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting			■
	Product Development & Research	■		
	Product Life Management		■	
	Product Design	■		
	Product Engineering	■		
	Production	■		
	Connected Product			■
	Supply Chain		■	
	Product/Service Delivery & Support			■
	Customer Experience		■	
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization			■
	Employee Engagement		■	
	Network Engagement	■		
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management			■

Section 4: Competencies

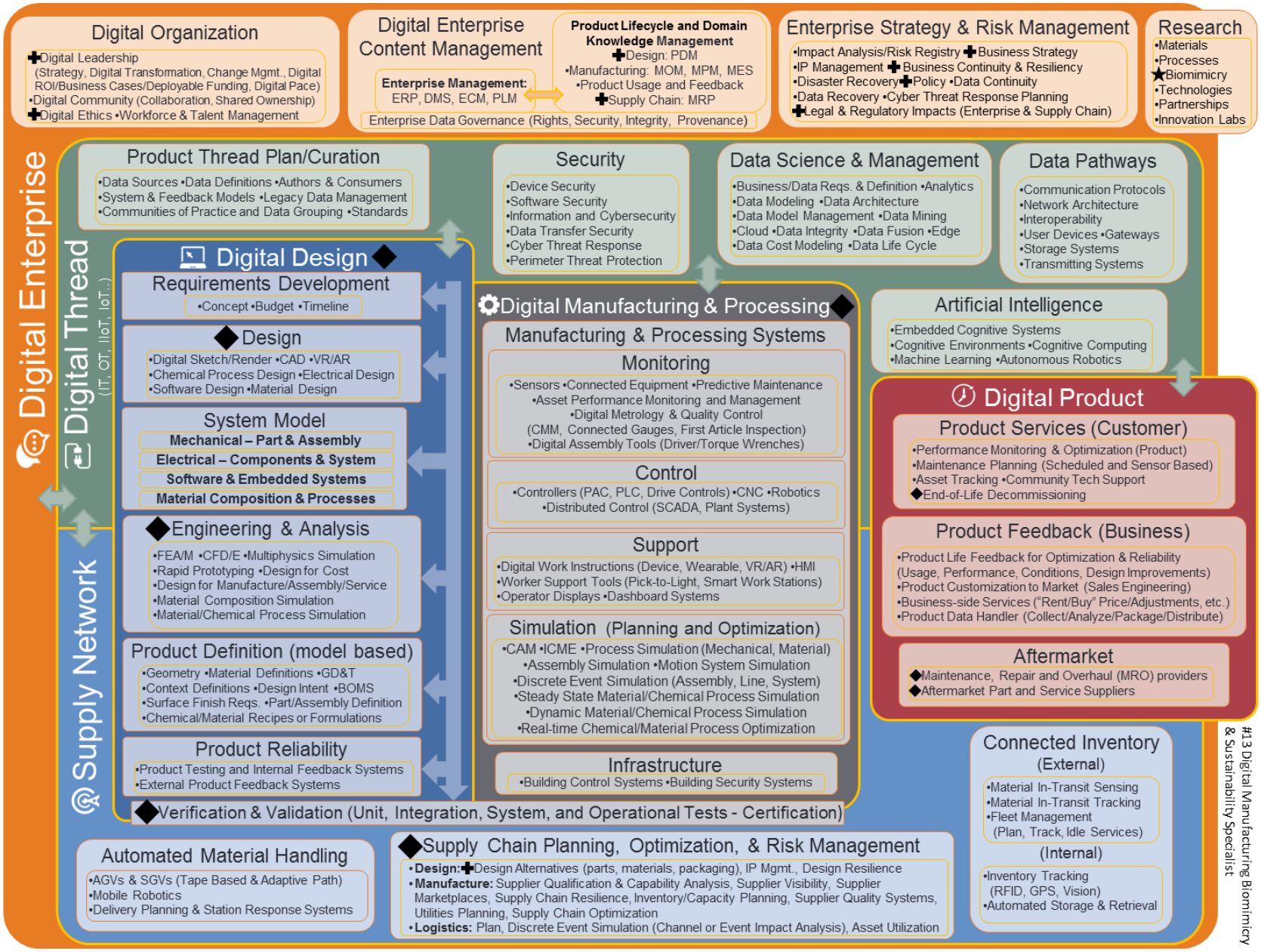
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Master's degree in Biomimicry and/or Masters or PhD in Sustainability, Environmental Sciences, Biology, Microbiology, Ecology, Chemistry/Biochemistry, Chemical Engineering, Environmental Engineering, or a related science area with a very strong business and organizational orientation

Certifications

- BSpecialist: Certified Biomimicry Specialist
- BProfessional: Certified Biomimicry Professional

Experience Profile

- Minimum of 2-5 years of biomimicry and/or sustainability experience in related field
- Previous experience with operational and strategic manufacturing concerns (design, production, supply networks, etc.) and innovations in a broad range of areas, such as product, process, materials, organizational/enterprise designs, and strategies
- Proficiency in creating and delivering both actionable technical information and inspiring business communications for a wide variety of stakeholders
- Familiarity with emerging Biomimicry ISO Standards 18458 and 18459; familiarity with related environmental, quality, and sustainability standards, such as: ISO14000, ISO26000, SA8000, ASO/PC277, ISO20400, ISO45000, FairTrade, ISEAL Alliance, SuRe, etc.
- Strong applied data and statistical analysis and visualization (reporting) skills
- Experience with and a passion for innovation and sustainable materials, processes, and products
- Experience with structured research and design methodologies that support functional abstraction of biological and ecological strategies into innovative and applicable manufacturing materials, products, process, and/or organizational/enterprise designs and strategies
- Strong entrepreneurial desire to advance natural innovations and sustainable living and address interconnected social, economic, and environmental issues in the world
- Experience with digital best practices and strategies, emerging ideas, and tools
- Ability to work autonomously or collaboratively, as environment or project dictates
- Team player with demonstrated community-building skills

Section 6: Potential Progression

Role Cluster

4 Design Engineering

Associated DM&D Community Roles

- User Experience Architect
- User Experience Analyst
- User Experience Designer
- Digital Design Analyst
- Digital Design Engineer
- Digital Design Specialist
- Worker Experience Designer

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#14 | Digital Manufacturing Organizational Change Management Strategist

Section 1: Job Role Identifier Section

Role Title: Digital Manufacturing Organizational Change Management Strategist

Role Impact: Keystone

Summary Scope

Considering the immense and iterative transformation that manufacturers undergo as they continuously 'go digital,' having a trusted change advisor – with a vast toolkit and a keen awareness of the people and the business – will empower their success. This is the role who can answer: How do we assess the people and business aspects of the company, and develop and implement solutions for improving leadership, culture, workforce, structure, roles, process, and other organizational factors? What do we need to understand more broadly about workforce, social, governmental, and business drivers that influence our company success? Whether jumpstarting growth, merging or acquiring, or handling a major issue, the DM Organizational Change Management Strategist facilitates leaders and groups in proactively embracing change as opportunity, determining needs for change readiness and acceptance, and creating the manufacturing organization of the future's capability for sustained change.

The Strategist is a directing role for 'the change network;' they assess anticipated timeline and trajectory of targeted business changes, and identify and design major change initiatives focusing on a mix of company structures, operations, culture, learning, communications, and the people side of change. They lead efforts to develop, deliver, implement, and reinforce high-priority, high-impact organization design and strategic organization system solutions. These solutions can be at many levels from company-wide to teams and individuals. The Change Management Strategist actively coaches senior leaders and executives in helping them fulfill the role of change sponsor to and through the digital transformation, and beyond. They support project teams by assessing needs, directing strategies, and aligning roadmaps as they enable the organization's capability through growth, innovations, transitions, and restructurings. The Change Management Strategist works to improve the work environment broadly, while driving faster adoption, greater productivity, and higher proficiency on the change and ongoing development impacting the organization. As with other key leaders and strategists, the Change Management Strategist empowers key stakeholders and systems to drive business results and limit employee and resource pain with optimal engagement of all involved.

Outcomes

- Savings (time, resources) and synergies (innovations, opportunities) via groups, resources, and efforts aligned and collaborating toward shared goals
- Better business results via a common focus, commitment, and operational/process improvements on strategic priorities
- Improved employee engagement
- Decreased transition time to new business models, structures, or processes, etc.
- Timely initiative completions
- Higher proficiency and clarity on the roles involved in the change
- Faster adoption via reduction in barriers to optimal performance and relationships
- Improved mission-critical processes
- Aligned and succeeding mission-critical roles

Domain Profile

1. Digital Enterprise
2. Digital manufacturing
3. Omni

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

Experienced digital organizations recognize and embrace the knowledge that the leadership and cultural aspects are often even more important to business success than technological changes. The Change Strategist catalyzes a dynamic hybrid people-business system as it evolves toward a new level of excellence. It requires mastering a disciplined practice of purposeful change readiness and leadership utilizing multiple organizational levers. These levers hold the keys to building an agile business environment and promoting workforce and leadership resilience at a time when there are diverse business and organizational models, social change, and workforce shifts. The Change Strategists help rethink organizational purpose, opportunities, and values, and partner to collaborate with leaders and teams to drive innovation and change in compelling, actionable ways. They design and build the readiness and sustainable capacity to scale innovation and improve operations across the business ecosystem.

Sidebar Roles

Digital Manufacturing Organizational Effectiveness Strategist
The Organizational Effectiveness Strategist will often work side by side with the Change Strategist. Often the same person may have a role that includes the broad range of change and effectiveness capabilities. Change strategies often focus deeply on engagement, alignment, communications, and development; Organization Effectiveness adds a focus on structure, systems, roles, performance measurement, and other business system and operational solutions. The best Change Strategist, who can have the most impact, incorporates the fuller perspective of Organizational Effectiveness and Change Management.

Section 2: Key Responsibilities

Activities

1. Serve as lead practitioner to increase collaborative organizational change capabilities by operationalizing the company change vision and creating an overarching plan and resource network to make 'agility' a reality

2. Educate senior leadership on the tangible and intangible values of continuously growing individual, team, and leader-level organizational change capabilities and secure support and resources

3. Actively assist organizational effectiveness and business leadership functions in operationalizing the change capability of the organization: recommend organization structures, roles, and business rules for a change community/network; align development opportunities and toolkits and then coach change practitioners across the network; monitor change network performance; and measure and manage change capability

4. Lead the change assessment and diagnosis of high-priority change and transformation initiatives: design and implement an assessment and diagnosis process; assess future-state requirements and current-state realities and identify gaps; determine the organizational dynamics at play; conduct stakeholder analyses and impact analyses to understand stakeholder needs, commitment levels, barriers, and enablers; validate and target root causes and priority issues to address

5. Lead in the strategic design of change solutions: design and implement organization readiness activities; design change strategies and change plans to support the stakeholders and meet business needs while maintaining organizational values

6. Collaborate with stakeholders to set holistic strategic change agendas and establish change priorities, develop roadmaps of diverse change efforts, and identify cohesive resource networks to align with intended impacts

   - Create digitally enabling and impactful organizational designs – business models, organizational structures (both at the large-scale enterprise level and smaller-scale team and individual levels); design innovative job role and team structures, performance measures, and role positioning to advance digital transformation and its new skill and collaboration requirements

   - Coach leaders on digital transformation leadership and effective practices for transforming people, culture, and the business

   - Create and facilitate a culture of collaboration and specific team improvement opportunities for dialogue and alignment through program approaches, group work strategies, and other team interventions

   - Consult on the change issues associated with acquisitions, divestitures, partnerships, and other company integration ensuring alignment between the organizations and resources

   - Lead major process improvement activities: group problem-solving and decision-making, group norm set up for group growth, improve leadership and authority, and intergroup processes

   - Translate keen understanding of how digital technologies affect organization design of innovative community and company governance

7. Create and socialize strategic action plans for major initiatives, providing blended spectrums of innovative interventions

8. Lead the change communications focus: develop communication strategies, plans, and strategic messages and communication plans to drive organizational change and specific events; align the relevance, consistency, integration, alignment, and appropriate timing of messages across the organization in support of a healthy progression through the change cycle; support project teams by reviewing and recommending refinements to direct communication work products
9. Develop and monitor continuous feedback systems with employees and other stakeholders on various agendas (initiative, functional, or strategic) to align and see how to contribute to success
10. Measure, monitor, and report on the effectiveness of the change efforts using common metrics and instrumentation established by the COE; assess and adjust change plans for improvements and enhancements to business and/or function initiatives

Accountabilities & Decisions

1. **Stakeholder Relationships Supporting the Digital Thread:** Have I advocated for, aligned, and cultivated relationships with and between key stakeholders across the business? Have I secured their active participation in collaborating to enable their people, business, technical, and cultural synergies required for holistic success?
2. **Promoting Innovation:** Am I evolving leaders and the culture to tolerate ambiguity, promote experimentation, and 'fail fast' in the highly disruptive and dynamic digital transformation era?
3. **Honesty and Clarity:** Am I considering the many factors – barriers and enablers – to sustainable change and 'speaking truth to power' if concerns about timing, unmet needs, leadership performance, or other organizational gaps pose a significant risk to success?
4. **Create Community:** Am I moving fast enough and in the most optimal way through our change and organization design efforts to create and maintain connected communities? Am I both working with internal and external communities, and coaching many business roles in their requirement to do the same?
5. **Change Networks:** Am I leveraging the efforts of other key "change advocates" – from IT to Lean Advisors to Product Life Cycle Planning – and am I part of developing capability in those networks as well as in the broader business?
6. **Digital Capabilities:** Am I focusing on creating an operating culture that enables digital transformation: a focus on learning and co-creating, being agile and resilient, transitioning to transparency, promoting knowledge and information sharing across the digital thread, etc.? Are the designs for change resources and in-house change practitioners achieving desired impact for the investment made?
7. **Learnability:** Am I maintaining a continuous improvement/lifelong learning approach to ensure relevance with emerging trends and best practices?

Interactions

1. **Leadership:** Supports and coaches leaders toward improving performance and understanding the barriers and enablers that need intervention and support
2. **Organizational Effectiveness Teams and Networks:** Works closely with business teams, company or unit operational leadership, partnering to understand and design change needs
3. **Program/Project Leaders:** Builds personal relationships as a trusted advisor who has ability to learn quickly, understand specifics, and bring real value to the operational changes needed
4. **IT, PMO, Strategy & Innovation, Business Planning:** Partners to keep a focused lens on the organizational aspects of major initiatives
5. **Collaborate Broadly with Key Stakeholders:** Joins with Human Resources Business Partners and other HR areas involved in the everyday business, including Talent Managers, People Analytics, Communications, Strategic Planning, etc., to understand business and stakeholder needs, design holistic interventions, and measure progress
6. **External:** Network across external organizations sharing best practices and discovering innovative practices

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
	Data Compliance, Management, Privacy & Security
	Automation
✓	**Biomimicry & Sustainability**
✓	**Advanced Analysis**
	Engaging Digital Twins
	Customer Centrism
	New Data Connectivity
✓	**Org. Business Ecosystem & Stakeholder Networks**
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
	Ties to Digital Thread
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates		■	
	Drives Organization to Vision		■	
	Aligns/Influences/Localizes Vision		■	
	Develops Plans	■		
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans		■	
	Direct Customer Contact			■
	Indirect Customer Contact		■	
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context			
	Functional Work Team Member			■
	Project Work Team Member		■	
	Implementer		■	
	Delivery Expert		■	
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach	■		
	Evaluator		■	
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation		■	
	Business Planning & Forecasting			
	Product Development & Research		■	
	Product Life Management		■	
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain		■	
	Product/Service Delivery & Support		■	
	Customer Experience		■	
	Org. Management & Optimization	■		
	Talent Management & Optimization	■		
	Tech Management & Optimization		■	
	Employee Engagement	■		
	Network Engagement	■		
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management		■	

Section 4: Competencies

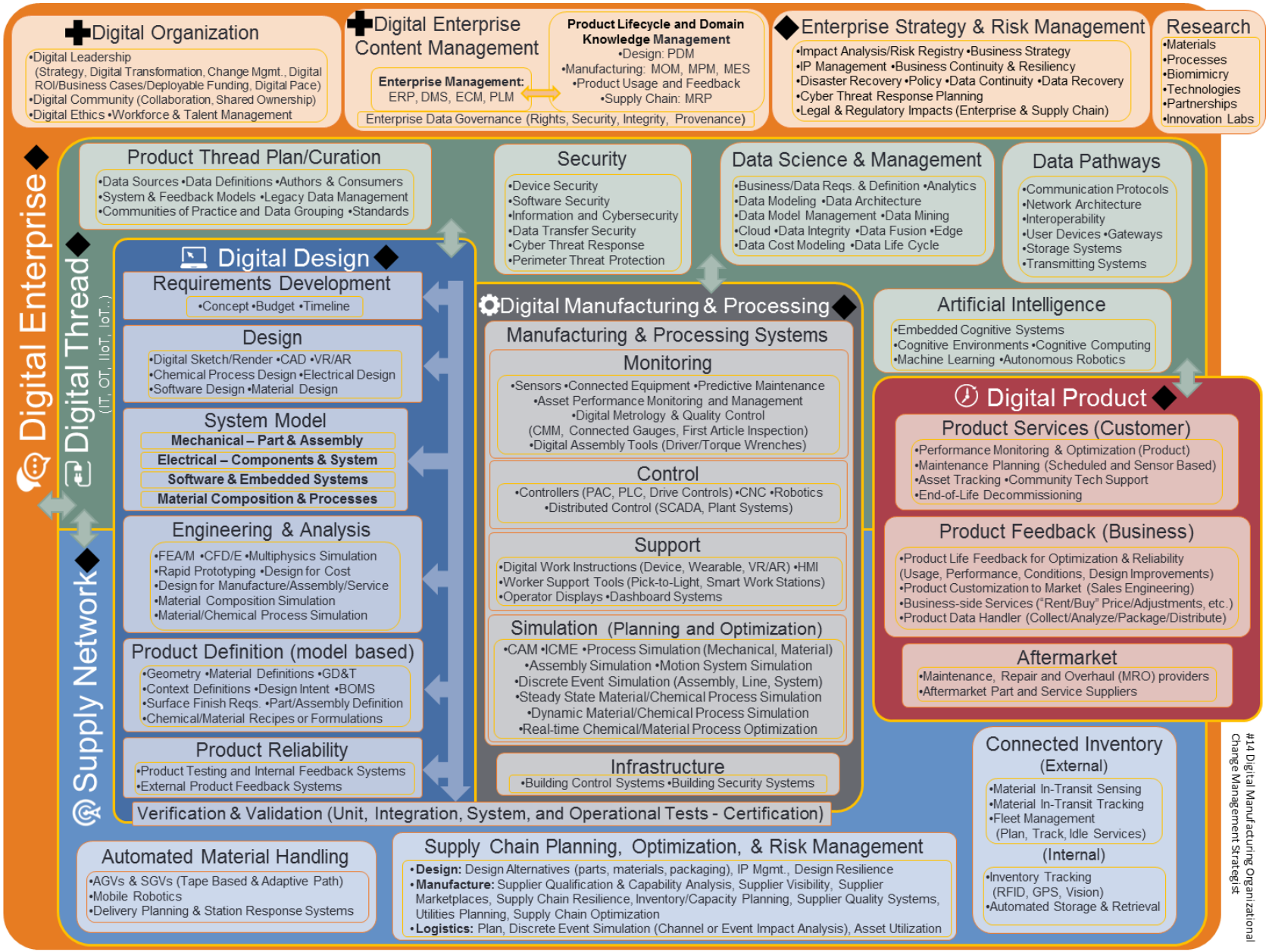
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



#14 Digital Manufacturing Organizational Change Management Strategist

ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- Bachelor's in business, human resources, psychology, or related areas with extensive experience required
- MBA with an Organizational Management focus or MA in Organization Development/Effectiveness; Human Resources; Organizational Systems; Learning and Education; etc. preferred

Certifications

- CCMP (Certified Change Management Professional)
- GPHR (Global Professional Human Resources)
- Other vendor or third-party certifications for various proven approaches, systems, and toolkits

Experience Profile

- 10 years or more of increasingly responsible experience in Change Management, Organizational Development/Effectiveness and/or business experience, including major change and transformation leadership
- Proven success in consulting management or advisor team and group management with responsibility for setting direction in how change management and organizational performance services and programs partner and benefit the business
- A blended portfolio combining applied and solutions with the systemic human and organizational theory/reasoning behind it all; clear passion for people and approachability combined with great insights and boardroom savvy
- Broad and deep experience on systemic change management and organizational effectiveness solutions
- Understanding and experience with the tools, trends, strategies, and issues influencing the organizations and workforces of today
- Continuous development and innovations in both personal and team-level systemic perspectives and toolkits addressing the many levers that affect people and organizational performance
- Flexibility in understanding and applying the spectrum of both informal and formal structures, organizational guidelines, and team performance designs
- Curiosity and formal inquiry skills, advanced assessment skills
- Analysis and reporting capabilities
- Expert communications and facilitation skills for individual, team, group, and large group working environments

Section 6: Potential Progression

Role Cluster

14 People, Knowledge & Change

Associated DM&D Community Roles

- Digital Manufacturing Organizational Effectiveness Strategist
- Digital Design & Manufacturing Community of Practice Manager (all domains)
- Digital Design & Manufacturing Technical Trainer (all domains)
- Digital Design & Manufacturing Vocational Instructor (all domains)
- Digital Manufacturing Knowledge Manager (all domains)
- Digital Manufacturing Technical Educator (Teachers 9-12)

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#15 | Enterprise Supply Network Manager

Section 1: Job Role Identifier Section

Role Title: Enterprise Supply Network Manager

Role Impact: Keystone

Summary Scope

In the connected ecosystem of digital manufacturing, an organization's life cycle and cost structure increasingly mirrors their supply network – their unique and active set of dependent provider ventures that require engagement and continuously innovative business community management. Maintaining and enhancing the resilience of a vibrant supply network is a treasury of requirements and advantage for those who see it and manage it as connected and dynamic. The complexity, volatility, shifting needs, regulations, and supplier-industry-geo specific challenges abound and demand a systems-thinking supply network professional for managing all or segments of these supply systems.

Who is on point to best sense, understand, lead, and act on the dynamics across the supply network? Who optimizes opportunities, performance, and profitability? The Enterprise Supply Network Manager marshals the connections to negotiate, create, and manage strong links and mutual success. They bring robust, holistic experience in end-to-end Supply Network strategies, processes, and systems. They think creatively in the immediate and longer term when negotiating, building, operating, or transforming connections resulting in sustainable solutions favorable for all parties and across multiple areas of goals/interests – including profit, people, planet, and mission. They apply knowledge of how, when, and where an organization can optimally link its flow and movement of materials, information, and other key resources to serve its end-customers, and increasingly, to serve the improved resilience of the network itself. These Network Managers – who naturally seek broader horizons and deeper connections – plan and manage activities involved in sourcing, procurement, conversion, logistics, service, and innovations to the product and customer life cycle.

Working with a connection-oriented mindset and having credibility through understanding and managing differences as much as similarities, the Enterprise Supply Network Manager builds business practices and enables partnerships to address unique business dynamics. This includes proactive awareness as well as real time management of local or targeted components, markets, and cultures. Maintaining or increasing flow and revenue, and being smart about risks, while seeing the value in creating partnerships and efficiencies, these Network Managers are primary leads that create advantages in working together to ensure the best possible value is provided to the end customer and other stakeholders

Outcomes

- Supply chain transformation goal attainment
- Financial objectives performance and identified contribution metrics from sub-segments of supply processes
- Increased resilience (performance and/or disruption metrics)
- Customer satisfaction
- Connected vendor or partner satisfaction and performance
- Compliance performance
- Sustainability performance
- Social responsibility performance

Domain Profile

1. Digital Enterprise
2. Digital Supply Network
3. Omni

Generation Knowledge Range

G0G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

Envisioning the supply chain as a network of partners, and being well-aware of the more holistic needs and goals of a risk savvy, smart, and responsive set of connected providers, these Enterprise Supply Network Managers represent the company's priority, and keep the interests of the contributors in sight while improving the prosperity of the overall system. They are some of the most complete business thinkers and doers in the digital enterprise, and they enable the resource flows to deliver the life cycle of products, services, and capabilities that embody the business strategy and customer experience.

Sidebar Roles

Supply Network Community Manager
The Supply Network Community Manager works to support the community of suppliers that provide materials, components, and services to an organization. In their position they work to build a community that is the bridge between their company and the pool of supply chain participants they are striving for. They lead efforts that provide educational and onboarding materials to effectively engage new suppliers and work them towards qualification with the organization. In this position they help establish guidelines for suppliers that align with company policy and the requirements surrounding the goods or services to be obtained. In the role they also have the opportunity to drive improvements in supply chain logistics and interactions based on feedback from established suppliers or the adoption of new technologies into the supply chain. The development of supply chain metrics and tracking systems for participants in the company's supply chain community can not only provide additional insights into their performance but can provide the opportunity to examine how the company can improve their interaction and processes where the supply chain meets the enterprise (along with design, manufacturing, and product areas). The supply chain community provides an environment to disseminate information on best practices, projected business needs / quote opportunities, and the opportunity to pulse for feedback from the business side. In this position the Community Manager will also work to assist suppliers in the resolution of any issues that occur, steering them to the appropriate resources and contacts as necessary, in a sense filling the role of supply chain "customer service". As enterprises connect deeper into their supply chains, and new digital tools emerge, the opportunity to further transform and drive improvements in already well established supply chains is here.

Section 2: Key Responsibilities

Activities

1. Manages end-to-end supply chain processes and relationships, gaining alignment and maintaining agreed upon principles/standards that optimize the network and bringing broader and deeper connections through digital technologies to the network
2. Acts as primary liaison between the business and network of suppliers, vendors, and partners to ensure alignment with business objectives, the related Supply Network Strategy and transformation programs; enables alignment and relationships through shared data, increased mutual or collective visibility; and increases the use of data and analytics by the decision makers, internally and externally, across the network
3. Serves as the key business transformer for the supply network: continuously advances subject matter expertise in innovative supply network management as well as in specific product/process areas; identifies and resolves business process issues; sponsors and brings results to identified opportunities; provides key reporting on progress of those initiatives
4. Delivers on the implementation of broader business strategies (design, production, service, etc.); resolves supply network issues as a whole and/or highlights and raises these issues to the leadership and specific functions for best integrated solutions
5. Develops and leads the supply network initiatives as a portfolio; manages the collective agenda of the network as well as addresses to successful completion the immediate or ad-hoc issues and needs of individual relationships; delegates as appropriate to other supply network professionals
6. Encourages and supports providers/vendors/suppliers to collaborate and improve collective performance and to support their connections through available digital platforms, shared data, and community connections.
7. Manages and works a diverse portfolio, including efficiency (time, cost/material/impact etc.), effectiveness (quality, customer experience), and impact (innovation, competitive positioning) initiatives, and tracks achievement to a holistic set of goals/ targets
8. Serves as the Business Lead and Champion for Supply Network process and data standardization and connection and the increasing use of connected data and analytics across the supply network
9. Develop and implement Change Management strategy, including internal and external communication, to gain business support
10. Serves as process and community owner for key Supply Network processes; encourages and manages healthy access to and collaboration amongst supply network members and the business
11. Creates and schedules interaction opportunities between the business and the supply network, and amongst the supply network itself
12. Identifies and manages risks in the Supply Network; leads, directs, or completes business impact analyses/audits and other reviews to determine compliance or risk assessments; manages increased use and sharing of integrated business continuity or resiliency approaches and tools, including increased shared data, forecasts, and other digital decision support systems
13. Supports and manages knowledge bases, libraries, and other collective resources on and across the supply network; and leads the drive for increased knowledge and capability across the supply network.

Accountabilities & Decisions

1. **Numerator and Denominator Thinking:** Are our supply network strategies integrating growth and development as well as efficiencies and cost/resource management?
2. **Full Life Cycle, Full Engagement**: Am I enabling real synergies across the life cycle where parties in the supply network can connect as much with each other as with my company to improve capability, capacity, and resiliency?
3. **Risk Intelligence:** How smart and proactive yet fast am I enabling our supply network to be when it comes to anticipating disruptions and determining the best possible follow on response, recovery, and resumption plans?
4. **Protection and Mitigation**: As a steward and guardian for margins at the resource or product level, how am I tangibly helping suppliers to build or strengthen their operations and livelihood; how am I part of their needed solutions as problems arise yet managing performance and ensuring the best possible set of partners?

Interactions

1. **Life Cycle Leads:** Understanding the business, functional, service, or product needs to translate into requirements and maintaining ongoing interactions to assess supply network performance and opportunities
2. **Customers and/or Account Advocates:** Understanding and interpreting end-to-end customer experience and results to see gaps or strengths that need attention or represent opportunities for the network
3. **Suppliers and Providers:** Serving as key link and connector, conductor, and community director to improve broad performance of the network and optimize individual partners as well
4. **Innovation Sources:** Discovering and building relationships with new and/or innovative sources of potential resource supplies or services is a strategic part of this role
5. **Regulators and Compliance Groups:** Maintaining oversight of the requirements for standards, legal, and regulatory action or reporting

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
	Automation
✓	**Biomimicry & Sustainability**
	Advanced Analysis
	Engaging Digital Twins
✓	**Customer Centrism**
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
✓	**Workforce & Talent Platforms**
	Culture & Leadership
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
	Visibility & Innovations

Section 3: Role Positioning

		More	Hybrid	Less
 **Line of Sight**	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
 **Peer Context**	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
 **Life Cycle | Business Process**	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

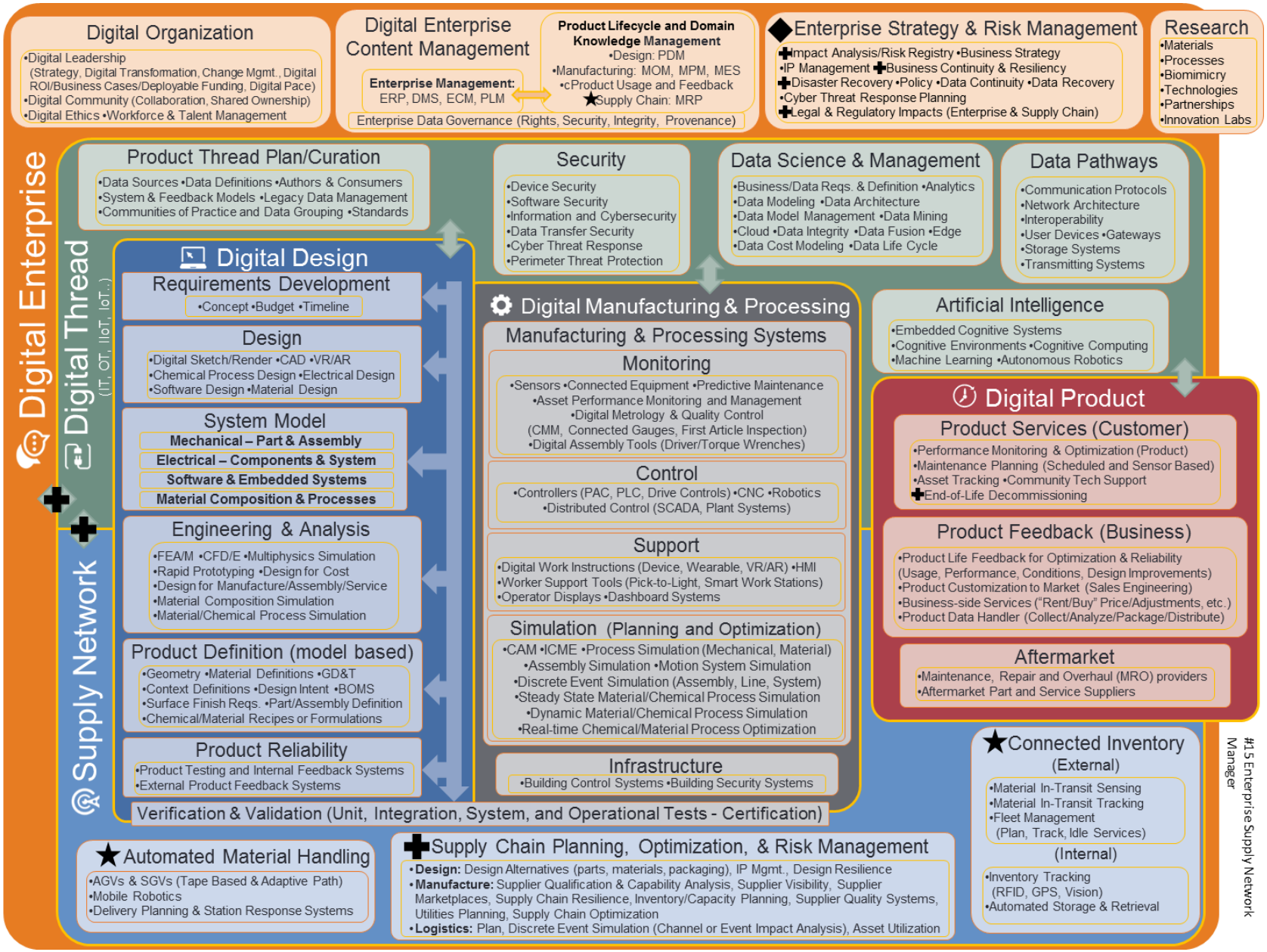
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



Section 5: Experience and Education

Education

Degrees

- Bachelor's Degree (Technical, Business, or Supply Chain) required
- MBA or MS, MA (Technical, Business or Supply Chain or related) desired

Certifications

- APICS Certified Purchasing Manager (CPIM) or Certified Professional in Supply Management (CPSM) or related
- LEAN or Six Sigma Certification or related
- Project Management certification (e.g., PMP) or related

Experience Profile

- Minimum 8-10 years' experience in related areas: manufacturing – operations, planning, quality, engineering, procurement, supply network, logistics, vendor management, ERP/IT systems
- Willingness and ability to view and apply strategies that enable the supply chain as a network; aptitude and ability to manage using strategies that consider yet optimize the networks interests as an ecosystem rather than only maximize as separate entities
- Awareness of holistic business, technology, resource, and environmental strategies that promote holistic performance across connected enterprises, partners, and customer bases in diverse geographies
- Experience in a global manufacturing and/or digital business setting
- Experience designing, managing, and improving supply chain processes and systems, including process mapping (VSM, process flow), lean, or other structured quality-improvement and business transformation approaches
- Experience in systems requirements, business side testing, deployment, and support
- Experience in large-scale program management
- Increasingly proven leadership skills for teams in a matrix environment or cross-functional team across multiple businesses, divisions, and/or technologies, especially with both internal and external stakeholders
- Has worked and managed geographically and culturally at regional or global scopes; willingness to travel and be mobile

Section 6: Potential Progression

Role Cluster

9 Integrated Product Management

Associated DM&D Community Roles

- Digital Product Manager
- Digital Product Support Manager
- Embedded Product Prognostics Analyst
- Embedded Product Prognostics Engineer
- Predictive Maintenance System Specialist
- Predictive Supply Network Analytics Engineer
- Product Embedded Cognitive Systems Engineer
- Product Embedded Cognitive Systems Specialist
- Product Performance Optimization Engineer
- Supply Network Business Analysts
- Supply Network Community Manager

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#16 | Worker Experience Designer

Section 1: Job Role Identifier Section

Role Title: Worker Experience Designer

Role Impact: Producer

Summary Scope

Workers want to feel safe, productive and engaged at work and set up in the workplace with the right tools, methods and policies to succeed. With the additions of technology in the workspace and more opportunities and needs for collaboration, how will the experience and workspace of the digital manufacturing and design worker be different? What tools and workspace arrangements will inspire good work, connected work, and safe work while achieving goals of individual and group performance? With more work being done through different digital devices, how will product or app design be considered in the interface with the workspace design? Why do we think 'one size fits all' for work environments can possibly be true? How do concepts from behavioral economics to environmental contact to worker engagement affect performance?

As people continue to increase their mobility and interface around the world with colleagues, customers and partners, The Worker Experience Designer will identify the human, business, technical and organizational needs of the worker, designing productive and efficient workspaces and operating environments. The Worker Experience Designer brings a wide range of specialized knowledge into the general area of work environments and work experience. Their role optimizes the environment where work is performed by considering and arranging people, process, facilities and technology. The Worker Experience Designer can have many areas of focus: helping designers and engineers interfacing with multiple screens and working on multiple projects with totally different groups of people simultaneously; or designing for factory of the future production cells and modules with robotics, AR or machine interfaces; or architecting an entire new facility to support multiple areas of the digital enterprise. They understand the holistic nature of good work space and experience design.

Engaging workers with workplaces that support their wants and needs is also an employment brand issue. Increasing conscientiousness on environmental and human conditions also increases awareness of the benefits of sustainable, efficient and 'people-friendly' manufacturing enterprise work spaces. Achieving waste and material efficiencies and using improved methods can rely greatly on space and how the worker interacts with it. People on the road need to land; people in high physical stress environments need support and respite. Part architect, part ergonomic specialist, part learning specialist, part sociologist, and more, these designers can have major effects on the organization and facilities. They "design it right' from the start. Whether on floor of the factory of the future, in a home office, the yards of a processing plant, in a sterile lab production facility, or office pod, the Worker Experience ensures the worker is supported in their work experience.

Outcomes

- Identification of compliance risks, business risks, and flight risks for key talent where environments are not conducive to safe and best work
- Empowered and engaged workers and an improved employment brand
- Improved worker performance levels
- Decreased costs or increased performance from identified process improvements
- Decreased costs and elimination of work and process inefficiencies

Domain Profile

1. Digital Design
2. Digital Manufacturing
3. Digital Product
4. Digital Thread

Generation Knowledge Range

G1G2G3

Generation Work Focus

G1G2G3

Generation 5-Year Work Focus

G2

Business Case Contribution

Worker Experience Designers can directly influence the bottom line by accelerating individual and functional performance, supporting cost management goal attainment, improving worker engagement and increasing worker presence by avoiding losses due to workplace risks and barriers whether physical, organizational or technological. Able to create cost-effectiveness in the long run by applying their interdisciplinary expertise during early design, the Worker Experience Designer defines innovative spaces and environments that bring process, people and technology safely together to optimize human performance. Going above what regulations require in this area not only drives improved performance but also drives increased employment branding for both current and future workers and partners.

Section 2: Key Responsibilities

Activities

1. Represent the holistic work experience design interests of roles across the digital enterprise taking into account the integrated physical, technological and social/organizational/cultural design perspectives.
2. Perform detailed work environment and task analysis of the needs, risks, and opportunities of work environments and routines.
3. Consider the performance and engagement needs of a diverse workforce including disabilities, multiple generations, cultures and ethnicities working together virtually or physically.
4. Prepare and maintain work experience design outputs, from virtual and physical models, process maps, journey maps, wireframes, documents, reports and other design deliverables as required of the specific project.
5. Present models for worker/project team/management review; produce virtual design simulations; integrate feedback from project teams to identify and resolve issues and align design directions.
6. Consider how fully-reconfigurable work spaces or manufacturing and component lines will bring together advanced technologies, communications technologies and devices, human-machine interfaces, programming and learning systems with robotics, flexible automation, and remote controlled equipment and systems. In production environments, also assess cumulative physical stressors with impacts on quality and performance.
7. Develop and maintain a project implementation plan for project teams; may include interface and management with outside vendors and partners as well as internal cross functional teams. Support execution and implementation of designs; lead field testing and design revision activities.
8. Conduct quality and implementation reviews of experience designs in practice and make recommendations to leaders for improved implementation/use and coach and motivate project team members in the optimal use of space.

Accountabilities & Decisions

1. **Worker Centrism:** How can the DM&D worker's experience best benefit from integrated design?
2. **Impact Identification:** Where is digital innovation a driver for investing new and improved worker experiences, products, processes, systems and facilities?
3. **Digital Trend Spotting:** What are the digitally related social, product, technical and experience trends that will positively impact our worker experiences and/or our internal culture and capabilities?
4. **Organization Design:** What flexible structures and arrangements will capture and accelerate digital optimization?
5. **Design Thinking, Design Community:** Am I a role model for design thinking across our integrated experience design 'network'? Am I integrated with the other parts of the company also responsible for organizational performance?

Interactions

1. **Target Workers:** Keep the primary focus on the effectiveness and engagement of the worker in any targeted role.
2. **Production Leaders and Engineers:** Rethink assembly, manufacturing, and material handling processes for digital and automation integration including flexible designs for downstream changes

3. **Design Colleagues:** Share design responsibility and efforts with associated roles in organizational change, innovation and automation, process engineering, biomimicry and others who look to improve human performance
4. **Innovation Ecosystems:** Professional liaison with design firms, research organizations, and other thought leadership sources of new digital friendly environments, strategies, and designs
5. **Finance and Supply Network Professionals:** Address factors that will most affect budgets, designs and decisions for corporate executives and facilities managers when it comes to design and functionality.
6. **Leaders and Executives:** Estimate and plan for ROI of building and workspace design or renovations or retrofits. Share perspectives on how emerging technologies and increased mobility may alter the way office and production work is conducted in 10 years.

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
	Data Compliance, Management, Privacy & Security
✓	**Automation**
	Biomimicry & Sustainability
	Advanced Analysis
	Engaging Digital Twins
✓	**Customer Centrism**
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

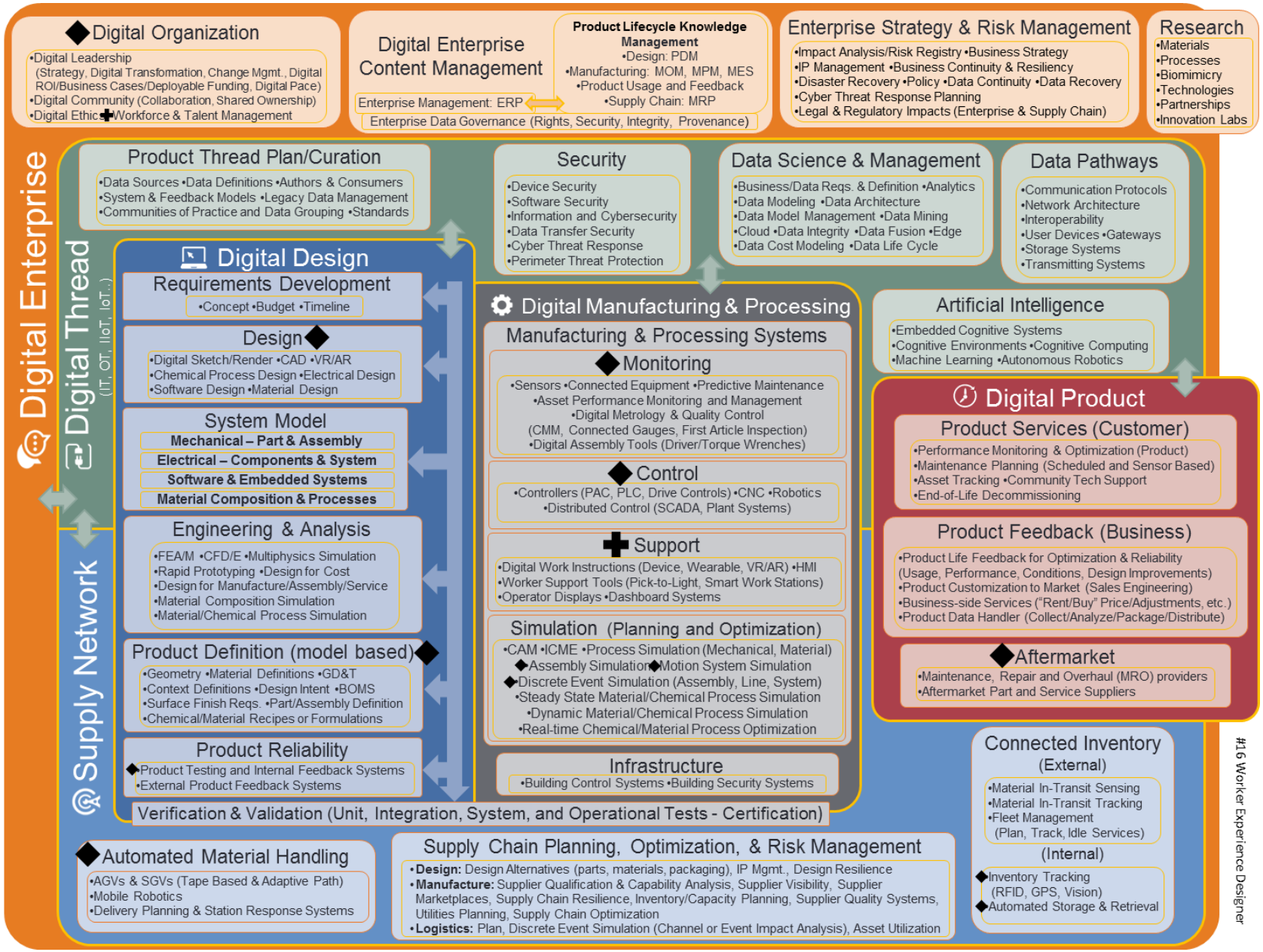
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



Section 5: Experience and Education

Education

Degrees

- Bachelor's degree in Industrial Design, Industrial Engineering, Human Factors/Ergonomics, Industrial/Organizational Psychology, Architecture, Interior Design, or other related discipline based on manufacturer background or needed specialization.
- MBA or Master's degree in related area preferred

Certifications

- Depending on areas of specialization or company need, these may include Certified Professional Ergonomist (CPE), Human Factors Engineering and Ergonomics (HFEE) Certificate

Experience Profile

- 4-7 years of experience with requirements analysis and design experience in creating effective work environments.
- Passion for advanced process, tool and methods, workspace, and workforce design.
- Ability to integrate people, process, culture and technology into physical, virtual and experiential designs across a range of roles.
- Skill in Design Thinking methodologies including defining personas and building journeys; requirements analysis experience including ethnographic studies.
- Business and cultural knowledge and principles from organizational change, organizational design, employee engagement and other organizational or social psychology area.
- Cognitive processing, decision support, information management, knowledge management and other work processing disciplines.
- Knowledge of human factors, ergonomics and related workplace regulations and safety codes.
- Knowledge of various worker experience related disciplines: interior design components; sustainable business practices; collaborative work methods; technology and automation integration, integrated process and systems, mobile app design and use, etc.
- Ability to work in team environment and influence others.
- Ability to effectively meet deadlines.
- Ability to communicate both verbally and in writing.
- Advanced design, visual and graphic presentation skills.
- Proficiency in modeling, layouts, schematics, process mapping, organizational maps, affinity diagrams, wireframing, use case development and other ways to tell a "business story" through design outputs.
- Proficiency in Photoshop, Illustrator, Sketchup, and InDesign graphic software required.
- Knowledge of Building Information Modeling (BIM) and Integrated Project Delivery (IPD) where needed.
- Proficiency in Revit required where needed.
- Proficiency in MS Office, including Word, Excel and Outlook.

Section 6: Potential Progression

Role Cluster

4 Design Engineering

Associated DM&D Community Roles

Digital Design Analyst

Digital Design Engineer

Digital Design Specialist

Digital Manufacturing Biomimicry and Sustainability Specialist

User Experience Architect

User Experience Designer

User Experience Analyst

Overview of Progression

The Worker Experience Designer is a senior role among the design, product and integrated technology teams and role clusters. Often progressing from an analyst, designer or engineering role after gaining additional expertise and broad workspace and process exposure, people in the Worker Experience Designer role have broad multi-disciplinary experience. They have worked on varied and integrated business, user, process, design and technical elements. Similar to user experience design roles, the Worker Experience Designer position requires advanced skills acquired over several years of many types of previous designs and build outs Particularly in DM&D, progression to this role is dependent on digital experience, and a hybrid of design experiences in laboratory, 'office', knowledge space, workstation, production and collaboration settings.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#17 | Digital Factory Automation Engineer

Section 1: Job Role Identifier Section

Role Title: Digital Factory Automation Engineer

Role Impact: Producer

Summary Scope

Who finds new ways to automate old processes? Who computerizes manufacturing operations with innovations in systems and technologies to improve productivity and quality? Who creates new opportunities for data insights into manufacturing operations? A Digital Factory Automation Engineer works to develop and deploy automation solutions that improve manufacturing productivity and product quality. In their role, they specify, design, program, simulate, test, and validate factory automation and control systems. They leverage insights from manufacturing data, such as cycle times, throughput, asset utilization and uptime, and production quality to identify appropriate areas for automation or improvement. Their experience and expertise helps them establish estimates on the impact automation initiatives may have on the factory floor along with their cost, resources, and risks faced for implementation.

The automation systems developed and deployed by a Factory Automation Engineer require ease of maintenance, and must take into account emerging automation technologies and the flexibility to support evolutions in product design or the creation of multiple product types. These engineers – who often bring a blended background of business systems, software systems, and mechanical systems – understand how to mitigate risks when introducing new automation technologies on the factory floor. They understand the impact any disruption to production will have across the business if they fail to manage those risks. As part of their role, they will likely be working with existing legacy automation equipment, working to upgrade or replace systems with a focus on keeping production disruption to a minimum while striving to improve manufacturing quality, consistency, and productivity. An understanding of industry standards in automation technologies and control systems and an awareness of emerging technologies are critical to having a positive impact in the factory.

To further drive impact across the enterprise from the factory floor, a close working relationship with IT/OT systems staff can make sure that data and communications from new automation systems effectively ties into enterprise systems. With their automation efforts focused on improving human work conditions and driving productivity in the factory, one won't worry they are leading the rise of our robot overlords but rather creating platforms for continued human ingenuity.

Outcomes

- Upgrade or replacement of obsolete manufacturing systems with a focus on improving productivity and value
- Innovation on the manufacturing environment via the design and integration of new automated manufacturing and support systems
- Improved access and knowledge sharing though the documentation of manufacturing and automated systems for safe and effective deployment, test, operation, maintenance, and modification
- Increased compliance by supporting regulatory and organization demands for automation and manufacturing system design and safety
- Development and integration of production-tracking systems into automated manufacturing systems
- Meaningful feedback on product quality and insights into production through connected manufacturing systems and factory assets and the deployment of sensing and monitoring systems

Domain Profile

1. Digital Manufacturing
2. Digital Thread

Generation Knowledge Range

G1G2G3

Generation Work Focus

G1G2

Generation 5-Year Work Focus

G2

Business Case Contribution

A Digital Factory Automation Engineer develops and supports factory automation and control systems throughout the production environment. Their role is critical in driving improvements to manufacturing productivity and product quality, relying on experience and shop floor data to make smart decisions on automation activities. In addition to automation equipment, they are also responsible for the implementation of sensing and monitoring systems that provide greater visibility to factors that may impact manufacturing system performance or product quality, and greater insight into the status of manufacturing systems across the factory floor. Their modification or development of new automation systems can open up new product possibilities and manufacturing flexibility, providing faster production system change over in some manufacturing environments, and opening doors to new customized product capabilities.

Sidebar Roles

Operation Technologies Integration Engineer
The Operation Technologies Integration Engineer works to ensure that data and insights can be drawn from factory and production assets. They work at developing systems that support the capture and availability across Operation Technology (OT) networks of information from the lowest levels of the manufacturing environment. Their efforts range from the development of new sensing and data capture systems, to the development of systems that translate legacy manufacturing environment asset data sources to be compatible with factory's main Operation Technology (OT) network systems. Often they are working in an environment full of legacy equipment, data collection systems, and fieldbuses, focusing their work on refining the mass of systems already in place and driving data system alignment and compatibility across the factory at the OT level. This first step in the data "value chain" is critical to drive efficient and effective utilization of data streams originating in the factory. In their role, they need to consider alternatives, solution cost, and risk as they work to both improve legacy and deploy new factory data systems. Close work with Digital Factory Automation staff and IT/OT Systems staff is critical to everyone's success along the primary manufacturing data chain within the enterprise.

Section 2: Key Responsibilities

Activities

1. Upgrade or replace obsolete manufacturing systems
2. Design, program, simulate, integrate, and test new automated manufacturing and production support systems
3. Develop and integrate production tracking systems
4. Outfit manufacturing systems and factory assets with sensing and monitoring systems that provide feedback on product quality and insights into production
5. Program and integrate PLCs, HMIs, SCADA, and other equipment or process control systems
6. Prepare automation systems for appropriate data output at the OT level, including fieldbus or industrial ethernet connections
7. Use software to monitor and evaluate the performance of automation systems, machines, and assets
8. Troubleshoot automation systems and assist in determining root causes of equipment failures
9. Benchmark manufacturing processes to determine appropriate areas for automation

Accountabilities & Decisions

1. **Plan Automation:** Have I properly designed and developed automated manufacturing and process control systems?
2. **Lead Automation Implementation:** Have I efficiently led the initial start-up and debugging of automation systems deployed or upgraded in the factory?
3. **System Compliance:** Am I leading the support of regulatory and organizational demands for automated system design and safety?
4. **Documentation of Automated Systems:** Am I maintaining sufficient documentation of automated systems for operation, safety, and maintenance?
5. **Guide Machine Advancement:** Am I supporting manufacturing and operations goals by identifying new machinery needs or appropriate changes to existing systems?
6. **Maintenance Insight:** Am I supporting maintenance teams by specifying appropriate preventative maintenance tasks?

Interactions

1. **Product Designers:** Works with product designers to optimize product design for automated production
2. **Supply Chain and Logistics:** Works with supply chain and logistics staff to integrate materials and inventory systems
3. **System and Equipment Vendors:** Works with equipment and machine parts vendors to source components, integrate systems, and troubleshoot as needed
4. **Technical Technicians:** Leads electrical, mechanical, and maintenance technicians in the start-up, debugging, and maintenance of automated systems
5. **Robotics:** Works with collaborative and standard robotics specialists/engineers to integrate robotics and motion system platforms with production systems
6. **Manufacturing and Operations Management:** Works with manufacturing and operations management to identify and quote factory automation projects

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
✓	**Advanced Analysis**
	Engaging Digital Twins
	Customer Centrism
✓	**New Data Connectivity**
✓	**Org. Business Ecosystem & Stakeholder Networks**
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
✓	**Ties to Digital Thread**
	Bridge Building
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
 Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
 Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
 Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

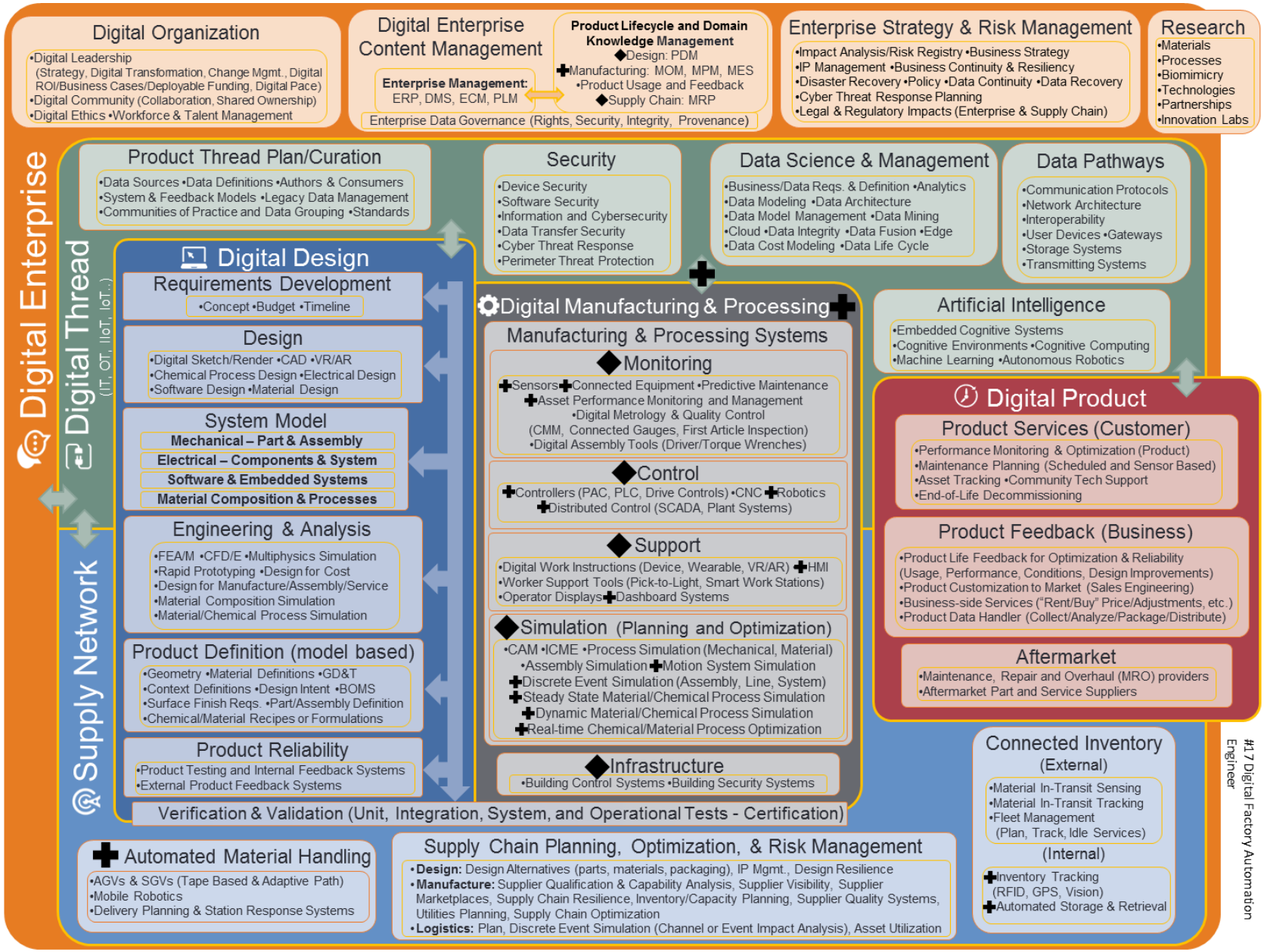
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



#17 Digital Factory Automation Engineer

ManpowerGroup | DMDII

Section 5: Experience and Education

Education

Degrees

- AAS in Automation and Control Technology (Technician Level)
- B.S. in Engineering (Mechanical/Electrical/Chemical/ Manufacturing)
- B.S. in Mechatronics

Certifications

- Certified Controls System Technician
- Certified Automation Professional

Experience Profile

- 7-10 years' experience working with mechanical, electrical, and computer systems in industrial settings
- Experience in:
  - Electro-mechanics
  - Electrical Theory, Electrical Circuits, and Wiring
  - CAD
  - Robotic Systems
  - Kinematics
  - Sensor Technologies
  - Feedback Systems
  - Engineering Schematics & Diagrams
  - Automation and Controls – Regulations and Standards
- On-the-job experience in automation of manufacturing/processing systems
- Knowledge of control systems and instrumentation
- Experience with and a passion for innovation on the shop floor and in production environments
- Experience with business requirements analysis, machine programming, basic systems development and systems integration
- Strong desire to leverage conventional and newer equipment and technologies
- Experience with digital factory/factory of the future practices and strategies, emerging ideas, systems, process improvements, and tools
- Ability to work autonomously or collaboratively, as environment or project dictates
- Team player with demonstrated community-building skills
- Ability to train and coach others on use of newly automated capabilities
- Experience programming and designing operator interfaces for control systems such as PLCs and HMIs
- Experience working with external engineering contractors and automated system suppliers
- Understanding of the interactions between different control system topologies (distributed [DCS], information systems [IS], supervisory control and data acquisition systems [SCADA], manufacturing execution systems [MES], etc.)
- Experience with design tools such as CAD

Section 6: Potential Progression

Role Cluster

12 Manufacturing Space Automation

Associated DM&D Community Roles

- Automated Guided Vehicle (AGV) Systems Specialist
- Collaborative Robotics Specialist
- Collaborative Robotics Technician
- Digital Factory Automation Analyst
- Digital Factory Automation Architect
- Digital Factory Automation Manager
- Digital Manufacturing Engineer
- Digital Manufacturing Safety Systems Specialist
- Instrumentation Engineer
- Inventory Systems Automation Specialist
- Machine Learning Scientist
- Machine Learning Specialist
- Self-Guided Vehicle (SGV) Systems Engineer

Progression Roles

Digital Factory Automation Manager

The Digital Factory Automation Manager works to lead an organization's team of factory automation professionals to improve manufacturing productivity and quality through automation, data collection, and production systems integration initiatives. In their position, they lead the identification of automation and digitization opportunities in the factory environment, working with business leaders and their team to prioritize efforts based on potential impact and ROI. With opportunities identified in the factory, they lead the efforts to design, implement, integrate, validate, and support factory systems. Their role is critical in driving improvements to factory automation systems along with opening new opportunities for effective data insights and systems connectivity in the manufacturing environment. In their position, they support automation staff when hurdles are faced engaging complex technical challenges. Effectively their organizational impact comes from leading the intern identification, 'sale,' and management of factory automation and digitization projects.

Digital Factory Automation Analyst

The Digital Factory Automation Analyst supports the digital factory automation team in effectively identifying opportunities to improve manufacturing productivity or quality through automation or data collection initiatives. In their role, they analyze data that captures both manufacturing system and workforce performance to examine cycle times, throughput, asset utilization, asset up time, and production quality to determine appropriate areas for automation or improvement. Their insights help develop a full picture of the impact automation or data collection initiatives may have on the factory floor. In order to have the greatest impact possible, they need to be able to interact with a full range of product

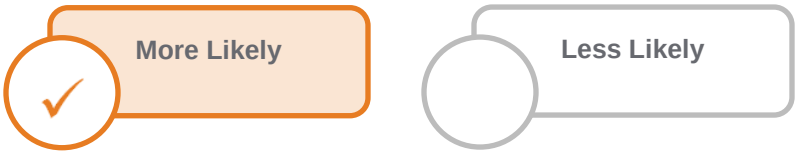
stakeholders, understanding what data may be critical to track from a design perspective that could be pulled from the factory environment, what data is critical to track from the supply chain to make sure materials and components entering the factory do not have a negative impact on product quality, and what data can be collected throughout the factory environment to provide actionable insights to operations and enterprise leadership staff.

Digital Factory Automation Architect

The Digital Factory Automation Architect works to plan, develop, and refine broad automation systems across a manufacturing environment. At times, their efforts may also include overseeing the deployment of parallel (duplicate) systems in a factory or across multiple production sites. In their work, they develop the functional and non-functional requirements of automation systems to be deployed within an organization, including the design standards. This can include the families of hardware and software to be used, effectively driving standard equipment and interfaces across automation systems in the enterprise. When setting standards and planning large automation systems, they design automation and data collection architectures that can be readily managed, maintained, and changed as needed over time, taking into account emerging technologies and industry trends. In this position, they are responsible for strategic direction and leadership in developing scalable automation and data collection frameworks. They understand how to mitigate risks when introducing new automation and data collection technologies and understand the impact interruptions in the manufacturing environment can have across the enterprise. Often, they will have to work in environments where existing automation and data collection systems are in place, focusing their work on refining what is in place and leading the development of compatible systems across the enterprise, taking into account available alternatives that can improve manufacturing performance while optimizing cost and risk. A strong knowledge around industry standards in automation technologies, control systems, and data collection, along with an understanding of emerging technologies, is critical for effective roadmapping, future planning, and education of stakeholders across the organization.

In their role, it would be best for them to work closely with an IT/OT Systems Architect to make sure that automation and data collection efforts in the manufacturing environment are effectively tying into enterprise systems and providing the greatest value possible.

Considered as a Transitional Role



PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#18 | User Experience Architect

Section 1: Job Role Identifier Section

Role Title: User Experience Architect

Role Impact: Producer

Summary Scope

We face a technology future that will increase the level of hyper-connected human-machine-information interaction and what it means to be a technology user or worker. User design and development teams are bringing technologies from robotics to 3D printing to synthetic biology and user wearables to the workplace. What does it take to accelerate and optimize the creation of digital products, services, and tools that have the potential to be game changers for a company, a group of users/customers, or even an industry? Who provides direction for crafting digital experiences for external customers, bringing together the optimal interplay of humans and technology at their point of physical, visual, and cognitive interaction? Who enables the optimization of the functionality of the product or system through the user touchpoints by setting the major guideposts for many parameters among the product design and development life cycle? When it comes to weaving the unity of engineering, digital technology, physical, and visual interfaces with the needs of the business and the needs of the human users of the technology, count on the User Experience Architect for leadership. Responsible for evaluating and developing the broad information architecture, the interaction element guidelines, various standards and strategies for the user experience, setting the broad directions toward design guidelines for related solutions, the User Experience Architect works across interdisciplinary teams to guide visual design, interaction design, inter-usability of conceptual models, productization, and platform design. And in this era of agile development, User Experience Architects have to provide enough initial reference and technical elements that establish extensibility, security, and scalability across projects, while enabling – and actually encouraging – more local or specific-project rapid and iterative design and development based on evolving project-specific user needs.

The User Experience Architect has overall responsibility for how many parts of the system work together: creating and maintaining the specifications of the collective of projects and or major systems. They're holistic thinkers, communicators, and leaders who interpret and create where people meet technology; advocate for the user and thoroughly understand their needs; effectively communicate and quantify ideas and concepts to senior management; communicate and coach teams and make sure that shared vision is carried through the project; provide viable starting points for other designers and developers to build upon. User Experience Architects establish direction for connected elements that will help cross-discipline teams to create highly functional, yet beautiful, user-centric experiences, incorporating design, engineering, human performance, and science.

Outcomes

- Leveragability, usability, and applicability of standards and other major frameworks across multiple design efforts
- Revenue and profit-driven business value through innovative designs that result in improved user experiences and productivity
- Innovation and efficiencies for customers and users via designs and experiences
- Optimized architecture efficiencies and effectiveness of an on-target, on-brand portfolio using emerging, new, and conventional technology solutions that directly solve user needs

Domain Profile

1. Digital Design
2. Digital Manufacturing
3. Digital Product
4. Digital Thread

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The User Experience Architect draws inspiration from many fields to direct and enable multiple projects to emerge on-brand, on-strategy, and on time. With the ever increasing commitment to a ‘design-thinking’ discipline and the need to differentiate on the ‘experience’ with digital technology, the User Experience Architect serves a lead role in the overall determination of organizational guideposts. They solve key problems and create opportunity while optimizing technology and process, creating guidelines that enable rapid work for development teams and others across the product life cycle. They empower and position ‘design’ as a key capability that drives purposeful innovation in products and experiences for customers and users.

Section 2: Key Responsibilities

Activities

1. Applies user experience expertise in multiple areas to conceive, articulate, and create an extensible and usable structural framework across existing and potential products and systems. This includes: overall concept development, interaction design that engages and optimizes ease of use, productivity and functionality, information architecture and domain modelling, data flow in and between systems, pathways and schemes or navigation, general subsystem boundaries, transition points between software layers, etc.
2. Improves and institutionalizes the user-centered creativity and design methodology; evaluates and recommends new tools, methods, standards, guidelines, reusable elements, etc. to support cross discipline teams; leads evaluation, selection, and design
3. Applies and coaches design thinking to the end-to-end customer experience, uncovering user needs, perceptions, and preferences as drivers of functionality and value, translating business and marketing goals into innovative solutions
4. Works closely with project teams across many/any domain, applying best-practice user-centered design and usability engineering techniques to new and existing insight-driven, and simply elegant, multichannel product designs and products whether for workstation, machine interface, desktop, web, or mobile
5. Directs approaches and connects user need with elements, including data sets, security, remote and autonomous control, connectivity, and sensors, and evangelizes for the positioning of user experience – thinking and deep practice of user-centered design approach
6. Sets guidelines for major initiatives and can create essential artifacts of user experience design: concept development, diagrams, domain models, pathways and schemes, navigational models, personas, prototypes, scenarios, sketched concepts, site maps, transactions flows, user journeys, user flows, use cases, wireframes and others
7. Participates and directs qualitative and quantitative design research, usability validation, and testing, leading to the improvement of designs and experiences
8. Promotes an environment of massive experimentation, while delivering the highest-quality of work, even under tight time constraints
9. Contributes to and stays aware of new developments, trends, and best practices in the user experience / usability and automation design domains and shares throughout the organization

Accountabilities & Decisions

1. **User and Brand Advocacy:** Am I an effective ambassador for meeting user needs and maintaining or advancing our brand?
2. **Valuable Experiences:** Have my resulting designs increased true value and made an improvement in the experience of the user? Are they creating engaging interactive systems with well thought out behaviors that meet our users' needs and preferences?
3. **Leveraged Connections that Accelerate Versus Delay:** Am I identifying opportunities to coordinate across efforts, providing related direction to multiple efforts, and leveraging best practices and cost efficiencies, but only as much as required for the iterative designs and development to begin? Are my efforts enabling sufficient "local" or specific design and development?

4. **Co-Architecting with IT:** Am I co-setting directions and standards (with other technical architects) that address the increasing complexity of IoT, and are applicable to the interconnectivity of how users connect, explore, collaborate, and interact with information between various systems and machines?

5. **Architectural Spikes:** Have I directed, completed and evaluated 'architectural spikes' to prove the viability of our approaches? Has this identified architectural gaps and technical risks that have an impact on performance and quality?

Interactions

1. **Users/Customers:** Understand strategic goals, business requirements, processes, needs, and preferences, relentlessly looking for the best way to solve business problems and improve the user/customer experience

2. **Senior-Level Business and Technology Decision Makers:** Succinctly translate user engagement into effective dialog with a focus on the development of customer business agility and business value

3. **Product Teams:** Designers, product managers, brand management, and product engineers to conceive, plan, and deliver. As a key enabler to other groups involved throughout the life cycle, represent passion for the customer with management, marketing, engineering, and quality teams to ensure innovative and brand-defining designs are fulfilled in products

4. **Sales and Account Teams:** Where the role has a strong focus on pre-sales activities: identify, pursue, and close strategic business development opportunities while continually driving add-on business within existing projects

5. **Creative and Development Teams:** Brings needs and designs to life with user experience design and software architecture teams and developers: collaborates with various project-level development teams and quality assurance roles to conceptualize, design, and prototype breakthrough designs and experiences that meet quality, safety, performance, aesthetic, and other standards and goals

Success: Mastering Situational Factors Business, Technical & Organizational	
	Parallel Short- and Long-Term Efforts
✓	**Data Compliance, Management, Privacy & Security**
✓	**Automation**
	Biomimicry & Sustainability
	Advanced Analysis
	Engaging Digital Twins
✓	**Customer Centrism**
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
	Workforce & Talent Platforms
	Culture & Leadership
✓	**Ties to Digital Thread**
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates	■		
	Drives Organization to Vision		■	
	Aligns/Influences/Localizes Vision			■
	Develops Plans	■		
	Operationalizes/Details/Directs Plans		■	
	Delivers Tasks Within Plans			■
	Direct Customer Contact		■	
	Indirect Customer Contact			■
Peer Context	Leadership/Management		■	
	Individual Body of Work/Specific Context		■	
	Functional Work Team Member			■
	Project Work Team Member		■	
	Implementer		■	
	Delivery Expert		■	
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach	■		
	Evaluator	■		
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation	■		
	Business Planning & Forecasting		■	
	Product Development & Research	■		
	Product Life Management	■		
	Product Design	■		
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain			■
	Product/Service Delivery & Support		■	
	Customer Experience	■		
	Org. Management & Optimization			■
	Talent Management & Optimization			■
	Tech Management & Optimization	■		
	Employee Engagement		■	
	Network Engagement		■	
	Product Quality Improvement		■	
	Process Quality Improvement		■	
	Financial Management		■	

Section 4: Competencies

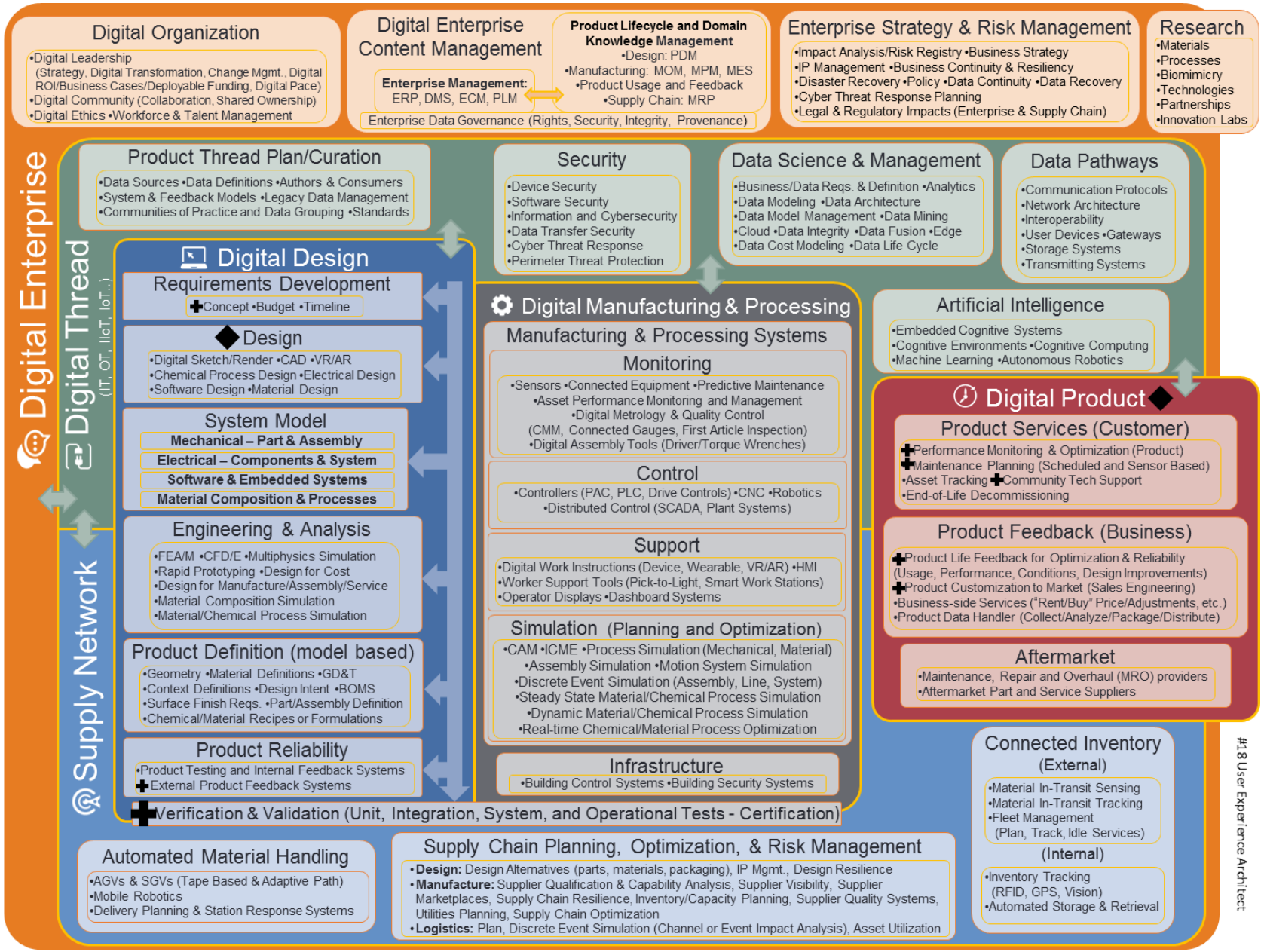
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



Section 5: Experience and Education

Education

Degrees

- BA/BS required in one or dual-degree areas, such as Information Systems and Sciences, Human-Computer Interaction/ Human Factors, Computer Science, Design, Cognitive/Behavioral Psychology, Interaction/User Experience Design, or related discipline required
- MS preferred in extended or larger applied areas

Experience Profile

- 5-10 or more years progressively responsible related experience as User Experience Analyst/ Systems Designer/Engineer, Information Architect, or similar role, with 3-plus years of experience on a dedicated user experience team
- Experience working with a variety of digital products and applications; strong understanding of the types of experiences made possible by current digital technologies, multi-modes, and multi/ omni-channels
- Experience with digital manufacturing automation and related industry products.
- Strong proficiency and previous experience with:
  - Axure, Photoshop, Illustrator, Acrobat, etc.
  - MS Visio
  - Adobe Creative Suite with modern JavaScript frameworks (such as Backbone, Angular, or Ember)
  - CSS pre-processing frameworks (such as Sass or Less)
  - HTML, DHTML
  - Scripting language, such as Python, Ruby, etc.
- Ability to succinctly and effectively present direction and outcomes to a group of multidisciplinary stakeholders; high tolerance for ambiguity and ability to embrace complexity and varied ideas; flexibility to change approaches yet maintain common guidelines.
- Expertise in:
  - User Research
  - Usability Evaluation
  - Accessibility
  - Project Management
  - Information Architecture
  - General Systems and Software Design and Development
  - User Interface Design
  - Interaction Design
  - Visual Design
  - Content Strategy
- Advanced technical selling required where sales and/or account management are part of the role

Section 6: Potential Progression

Role Cluster

4 Design Engineering

Associated DM&D Community Roles

- User Experience Analyst
- User Experience Designer
- Digital Design Analyst
- Digital Design Engineer
- Digital Design Specialist
- Intelligent Workspace Designer

Overview of Progression

The User Experience Architect is a senior role amongst the design, product, and integrated technology teams and role clusters. Often progressing from an analyst, designer, or engineering role, people in the User Experience Architect role have extensive multi-disciplinary experience on the business, user, design, and technical elements. Second to related researcher roles, the Architect position requires advanced skills acquired over several years of varying types of previous designs and build outs.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup® DMDII

#19 | Collaborative Robotics Specialist

Section 1: Job Role Identifier Section

Role Title: Collaborative Robotics Specialist

Role Impact: Pioneer

Summary Scope

Who can get a robot working safely side by side with a human? Who can get robotics systems to break free of their foundations and perform work throughout the manufacturing environment, releasing them from their cages? A Collaborative Robotics Specialist works to implement collaborative robotics platforms and train new operators in their use throughout the manufacturing environment. They design and implement collaborative automation systems to improve worker safety, increase production volume, and enhance precision, or replace repetitive manual tasks in areas that would still require human workers in close proximity. In their role, they work to assess, design, program, and integrate collaborative robotic systems into existing manufacturing or automation cells and tie into peripherals, such as vision systems, end-effectors, controllers, and additional support equipment. They are able to provide automation capability to manual tasks that are pseudo-repetitive and may not qualify for hard automation. The collaborative robotics systems they deploy unlock new productivity in the manufacturing space without the large investments typically associated with traditional automation and robotics efforts. These aren't the robots taking away jobs, rather these are the robots making even small manufacturers more productive and supporting workers in their daily tasks.

Outcomes

- Increased performance levels and capabilities of technical production staff
- Efficiency gains and improved safety potential derived from upgraded manufacturing or automation cells
- Increase in data connectivity via physical and digital integration with previously "offline" or "legacy" machines and production systems; increase in integrated collaborative robotics systems throughout the manufacturing environment
- Cost-effective evaluation, design, and selection of end of arm tooling (EOAT) and support systems, such as vision systems or sensors, for collaborative robotic applications
- Successful system integration of collaborative robots with peripherals, such as cell or system automation controllers, welders, fastener guns, material dispensers, or other equipment
- Increased knowledge capital of operations best practices, safety, and process improvement by creating documentation of collaborative robotics application setup, operation, and maintenance

Domain Profile

1. Digital Manufacturing
2. Digital Design
3. Digital Thread

Generation Knowledge Range

G1G2G3

Generation Work Focus

G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

A Collaborative Robotics Specialist delivers key time and cost savings results via systems designs and capability development focused on factory automation and worker productivity enhancement through collaborative robotics integration. Improved resource efficiencies, decreased costs over time, sustained process improvements and advancements, improved worker safety and ergonomics, and cost efficiencies through the enhancement of legacy equipment with collaborative robotics or new installations are all areas of tangible business value contribution.

Section 2: Key Responsibilities

Activities

1. Setup collaborative robotics systems to increase production cell volume and/or precision in high throughput or repetitive operations
2. Integrate collaborative robotics systems with peripheral equipment, such as vision systems, controllers, sensors, and other process support equipment
3. Provide technical support of collaborative robotic systems, including installation, calibration, test, operation, and maintenance
4. Investigate system failures or unexpected problems
5. Program and debug robotics and control system programs
6. Train and support production personnel in the operation of collaborative robotics systems
7. Document collaborative robotic system integration, application development, maintenance operations, and changes
8. Measure, process, and interpret sensor data in support of collaborative robotic system integration
9. Design end of arm tooling for material / part handling

Accountabilities & Decisions

1. **Safety with Innovation:** Have I maintained or enhanced safety and operation regulations as I accelerate innovation by deploying and supporting collaborative robotics systems?
2. **Business Case – Now and Next:** What effective short- and long-term business case do I contribute to when I estimate the cost and impact of collaborative robotics solutions?
3. **Collaboration of Work, Worker, and Equipment:** Have I effectively engaged with and applied the requirements and capabilities of the process, the people, and the machines?
4. **Engagement and Expertise:** How much employee engagement and increased capability am I contributing to? How well am I coordinating and enabling the engineering work and activities of others supporting or engaging with collaborative robotics systems?
5. **Leveraging Legacy Assets:** Am I developing strategies for long- and short-term adoption of collaborative robotics technologies in our environment including augmenting, supplementing, or enhancing legacy equipment ahead of full replacement or new installations?

Interactions

1. **Production:** Train and support production personnel in the operation of collaborative robotics systems
2. **Maintenance:** Support maintenance personnel in maintenance of collaborative robotics systems
3. **Designers:** Collaborate with designers to develop end-of-arm tooling and provide design feedback to optimize products for automation tasks
4. **Floor Coordinators/Supervisors:** Work with shop floor coordinators to determine what tasks are most suitable for automation or support from a collaborative robotics system
5. **Suppliers:** Work with control system, peripherals, and equipment suppliers to support integration of collaborative robotics systems and development of platform-based solutions
6. **Financial and Program Management:** Contribute to business case development and identify opportunities for cost-effective solution elements

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
	Data Compliance, Management, Privacy & Security
✓	**Automation**
✓	**Biomimicry & Sustainability**
	Advanced Analysis
	Engaging Digital Twins
	Customer Centrism
✓	**New Data Connectivity**
	Org. Business Ecosystem & Stakeholder Networks
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
	Ties to Digital Thread
	Bridge Building
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates			
	Drives Organization to Vision			
	Aligns/Influences/Localizes Vision			
	Develops Plans			
	Operationalizes/Details/Directs Plans			
	Delivers Tasks Within Plans			
	Direct Customer Contact			
	Indirect Customer Contact			
Peer Context	Leadership/Management			
	Individual Body of Work/Specific Context			
	Functional Work Team Member			
	Project Work Team Member			
	Implementer			
	Delivery Expert			
	Program Leader (Formal/Informal)			
	Integrator/Coordinator			
	Coach			
	Evaluator			
	Influencer			
	Networker			
	Thought Leader			
Life Cycle | Business Process	Strategy & Innovation			
	Business Planning & Forecasting			
	Product Development & Research			
	Product Life Management			
	Product Design			
	Product Engineering			
	Production			
	Connected Product			
	Supply Chain			
	Product/Service Delivery & Support			
	Customer Experience			
	Org. Management & Optimization			
	Talent Management & Optimization			
	Tech Management & Optimization			
	Employee Engagement			
	Network Engagement			
	Product Quality Improvement			
	Process Quality Improvement			
	Financial Management			

Section 4: Competencies

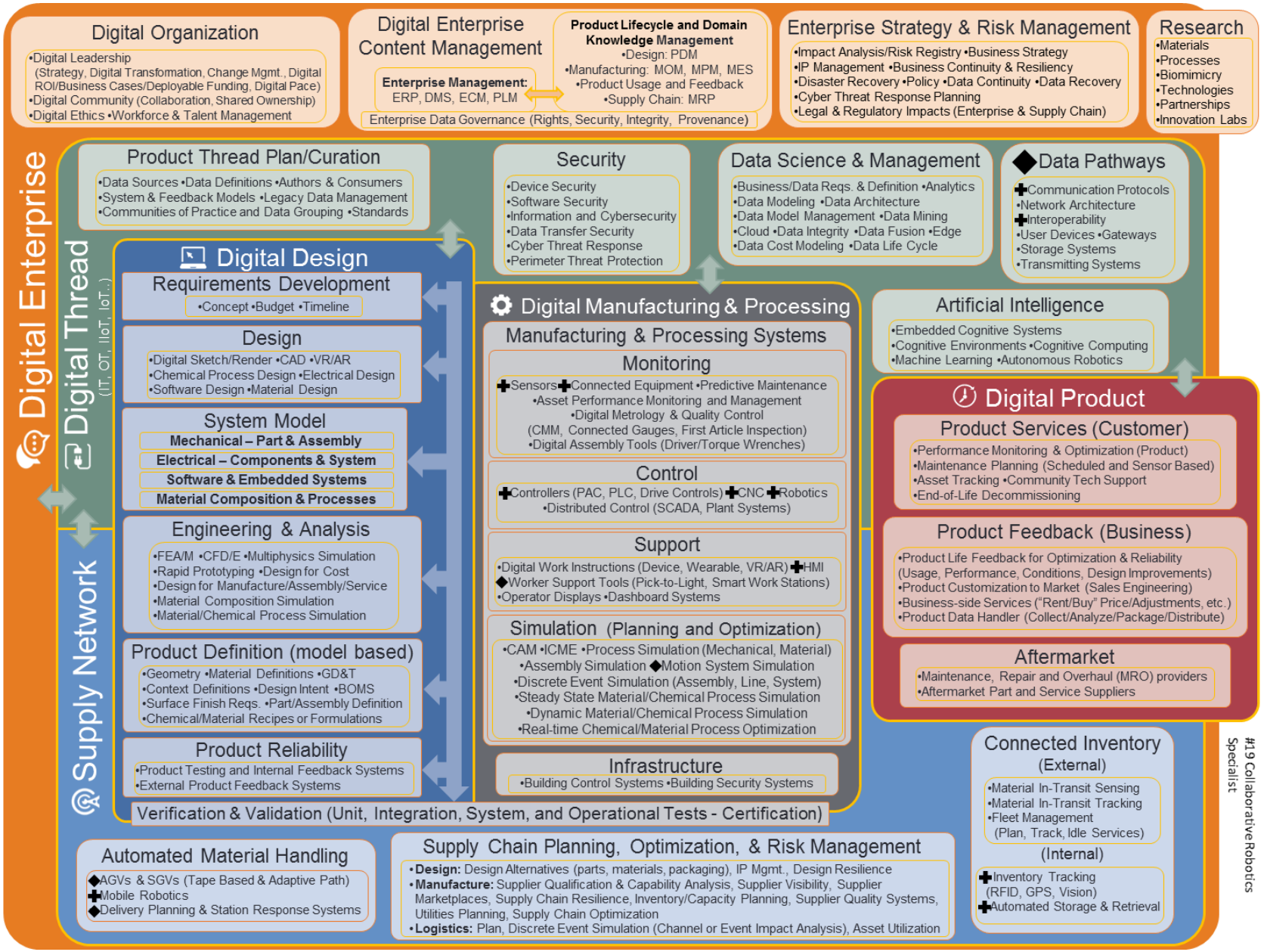
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



Section 5: Experience and Education

Education

Degrees

- AAS in Automation and Control Technology (Technician Level)
- AAS in Robotics Technology
- B.S. in Engineering (Mechanical/Electrical/Industrial) with courses in Robotics/Industrial Automation
- B.S. in Mechatronics

Certifications

- RIA – Robotics Industries Association

Experience Profile

- 5-7 years in progressively increasingly responsible production, maintenance, or systems-support related positions as lead operator, line leader, installation and repair, or other key production or systems roles
- Strong understanding and experience working with mechanical, electrical, and computer systems
- Experience in electro mechanics, electrical theory, electrical circuits, and wiring
- Experience with pneumatic actuators, valves, controls, and systems
- Previous experience with CAD, schematics, and diagrams
- Previous experience with assessing and designing process and performances, using or considering robotic systems, kinematics, sensor technologies, and feedback systems
- Previous experience in a related engineering or engineering-support area
- Knowledge of applicable regulations and standards including ISO/TS 15066, ISO 10218-1, ISO 10218-2, and ANSI/RIA R15.06
- Ability to translate and work with financial and business information to communicate application opportunity and return on investment

Section 6: Potential Progression

Role Cluster

12 Manufacturing Space Automation

Associated DM&D Community Roles

- Automated Guided Vehicle (AGV) Systems Specialist
- Collaborative Robotics Specialist
- Collaborative Robotics Technician
- Digital Factory Automation Analyst
- Digital Factory Automation Architect
- Digital Factory Automation Manager
- Digital Manufacturing Engineer
- Digital Manufacturing Safety Systems Specialist
- Factory Automation Engineer
- Instrumentation Engineer
- Inventory Systems Automation Specialist
- Machine Learning Scientist
- Machine Learning Specialist
- Self-Guided Vehicle (SGV) Systems Engineer

Progression Roles

Collaborative Robotics Technician

The Collaborative Robotics Technician works to setup and maintain collaborative robotics systems throughout the manufacturing environment. They are able to safely setup a collaborative robot to automate repetitive tasks, perform machine loading, improve process precision, or assist a worker. In their role they can successfully redeploy a collaborative robotics system to meet needs across different areas of the factory, driving system utilization and reducing production bottlenecks. To fully support the collaborative robot and system platforms they are capable of performing regularly prescribed maintenance and troubleshooting of the robot, end effectors, support platform and any additional critical peripherals.

Considered as a Transitional Role

PARTNERS IN CONNECTION

THE DIGITAL WORKFORCE SUCCESSION IN MANUFACTURING

DIGITAL MANUFACTURING & DESIGN SUCCESS PROFILES

ManpowerGroup

DMDII

#20 | Enterprise Digital Ethicist

Section 1: Job Role Identifier Section

Role Title: Enterprise Digital Ethicist

Role Impact: Keystone

Summary Scope

As digital technologies rocket forward – creating both intended and unintended opportunities, interactions, decisions, relationships, regulatory requirements, and social concerns in ways never previously encountered – who will mind the codes of conduct for organizations and businesses in an increasingly digital world? As more data is tracked, captured, used and shared, who will address the business ethics and professional practices of digital manufacturers? It's a complex web of ecosystems that needs guidance from a holistic set of perspectives. The Enterprise Digital Ethicist shines a light on the rules of business behavior, developed with and co-enforced by teams of ethics and compliance personnel, business strategists, key design thinkers, and communicators that will guide behaviors at all levels: personal, group, organization.

The Ethicists will also direct conversations about the way that digital products collect user or owner information and the practices of using or commercializing them. Call them the 'moral, legal, and social compass calibrator' or the 'pharaoh of fairness' for digitally related behavior and practices, the Enterprise Digital Ethicist guides the development, management, and effectiveness monitoring of the codes of conduct in an increasingly digital world. Interacting with most parts of the business, the Ethicist is a unifying source and voice of operational, cultural, legal, and ethical guideposts required for successful yet ethical digital transformation and operations. Connections to Corporate Social Responsibility are another layer of the possible scope of the Digital Ethicist.

Outcomes

- Increased revenue or customer capital through positive brand via ethical standing
- Increases in Ethics Program employee participation and on-the-job ethical behaviors
- Decreased employee and leader retention/turnover; improved morale of employees related to positive company ethics and social responsibility
- Manager effectiveness though openness, transparency, candor, and general ethical practices
- Minimized customer complaints, criminal charges, fines paid; lobbying expenses; legal expenses
- Availability of Hotline/ Whistleblower channels; increased appropriate usage and outcomes
- Increased brand equity and social impact via trusted business partner status, regulatory achievement, community involvement, environmental sustainability performance, and social responsibility

Domain Profile

1. Digital Enterprise
2. Omni

Generation Knowledge Range

G0G1G2G3

Generation Work Focus

G1G2G3

Generation 5-Year Work Focus

G3

Business Case Contribution

The Enterprise Digital Ethicist is chief advocate and coach for shaping and increasing the priceless value of a good business reputation, while decreasing costly missteps, conscious bad practices, and self-serving behavior through training and educating the organization. They make tangible both the short- and long-term impacts, risks, and opportunities of principled digital practices and relationships.

Section 2: Key Responsibilities

Activities

1. Leads and coordinates the business ethics and compliance program (policies, procedures, meetings, training and audits)
2. Researches compliance and ethics drivers and issues; educates leadership and the organization at large on influences to business practices. Representative topics and ethical concerns include automation and job takeover, intellectual property protection and violation, privacy and data ownership, security, information overload, digital access and discrimination, and censorship
3. Advises and coaches leaders and employees on planning, organizing, and managing plans of action to deal with ethics issues
4. Collects, analyzes, and interprets compliance data to identify trends and potential gaps; oversees and classifies investigations; assesses and classifies all incoming complaints; monitors issue/concern resolution; and recommends corrective measures as needed
5. Coordinates and directs “hotline” or channels for reporting concerns
6. Manages/implements the roll out of compliance-related training and certification
7. Provides updates to the leadership and counsel, and innovates the business ethics and compliance guidance with timely and proactive issue consideration

Accountabilities & Decisions

1. **Impact Behaviors:** Which digital strategy, product or process decisions, or operations pertaining to compliance and/or ethics matters will likely have an impact on the organization?
2. **Digital Data Responsibility:** What moral rules should guide our more continuous and increasingly digital engagement with customers and access to their data, preferences, and behaviors? With communities and the public at large?
3. **Ethical Supplier Management:** What responsibility do we have for the behavior of our supplier network? How does our supply network engage in fair trade and sustainable practices?
4. **Larger Social Role:** What role should we play in the larger commercial, social, workforce, environmental or political process?
5. **Automation-Human Tradeoffs:** How do we address the tradeoffs of increasing automation with productivity, safety, etc. and changes to employment and the nature and scope of work?
6. **More Tradeoffs and Boundaries:** What do we trust to technology and what do we leave to human performance? What are the ethical consequences of smart machines, augmented realities, and other forms of man-machine dependences on issues relating to human control and influence and the emotional characteristics that define human versus machine?
7. **Digital Leadership:** How do our hyper-connected or highly fused digital practices, digital products, and digital structures address organizational structures and leadership?
8. **Standards and IP Management:** How do we manage digital platform and data sharing, access, and standardization across geographies – especially in varying legal locales – including traceability of components and licenses, IP, and copyright issues in an increasing “open” business environment?
9. **Impact:** How do we do well as a business by doing good?

Interactions

1. **Business Leaders:** Engage in deep conversations on the risk/rewards of various practices, relationships, decisions and designs, maintaining a holistic and objective perspective of stakeholder interests and compliance needs
2. **Design Engineering Community:** Influence user, material, and other design decisions and practices in light of holistic ethical and regulatory considerations
3. **Production Community:** Co-consider production issues in light of technical, business, ethical, cultural, environmental, and legal factors
4. **Communications and Marketing; Enterprise Supply Network:** Guide ethical practices and decisions relating to external stakeholders (market, consumer and partner) messages, relationships, and decision guidelines in light of technical, business, ethical, cultural, environmental, and legal factors
5. **Legal:** Co-develop policies and implementation approaches; share risk management and opportunity analysis
6. **HR:** Inspire and co-shape ethical leadership, culture, and organizational practices

Success: Mastering Situational Factors Business, Technical & Organizational	
✓	**Parallel Short- and Long-Term Efforts**
✓	**Data Compliance, Management, Privacy & Security**
	Automation
	Biomimicry & Sustainability
✓	**Advanced Analysis**
	Engaging Digital Twins
✓	**Customer Centrism**
	New Data Connectivity
✓	**Org. Business Ecosystem & Stakeholder Networks**
✓	**Workforce & Talent Platforms**
✓	**Culture & Leadership**
	Ties to Digital Thread
✓	**Bridge Building**
✓	**New Capabilities & Frontiers**
✓	**Visibility & Innovations**

Section 3: Role Positioning

		More	Hybrid	Less
Line of Sight	Creates Vision/Innovates		■	
	Drives Organization to Vision	■		
	Aligns/Influences/Localizes Vision			■
	Develops Plans	■		
	Operationalizes/Details/Directs Plans	■		
	Delivers Tasks Within Plans		■	
	Direct Customer Contact			■
	Indirect Customer Contact	■		
Peer Context	Leadership/Management	■		
	Individual Body of Work/Specific Context			
	Functional Work Team Member			■
	Project Work Team Member		■	
	Implementer		■	
	Delivery Expert		■	
	Program Leader (Formal/Informal)	■		
	Integrator/Coordinator	■		
	Coach	■		
	Evaluator	■		
	Influencer	■		
	Networker	■		
	Thought Leader	■		
Life Cycle | Business Process	Strategy & Innovation	■		
	Business Planning & Forecasting			■
	Product Development & Research		■	
	Product Life Management		■	
	Product Design		■	
	Product Engineering		■	
	Production		■	
	Connected Product		■	
	Supply Chain		■	
	Product/Service Delivery & Support		■	
	Customer Experience		■	
	Org. Management & Optimization	■		
	Talent Management & Optimization		■	
	Tech Management & Optimization		■	
	Employee Engagement	■		
	Network Engagement	■		
	Product Quality Improvement			■
	Process Quality Improvement			■
	Financial Management			■

Section 4: Competencies

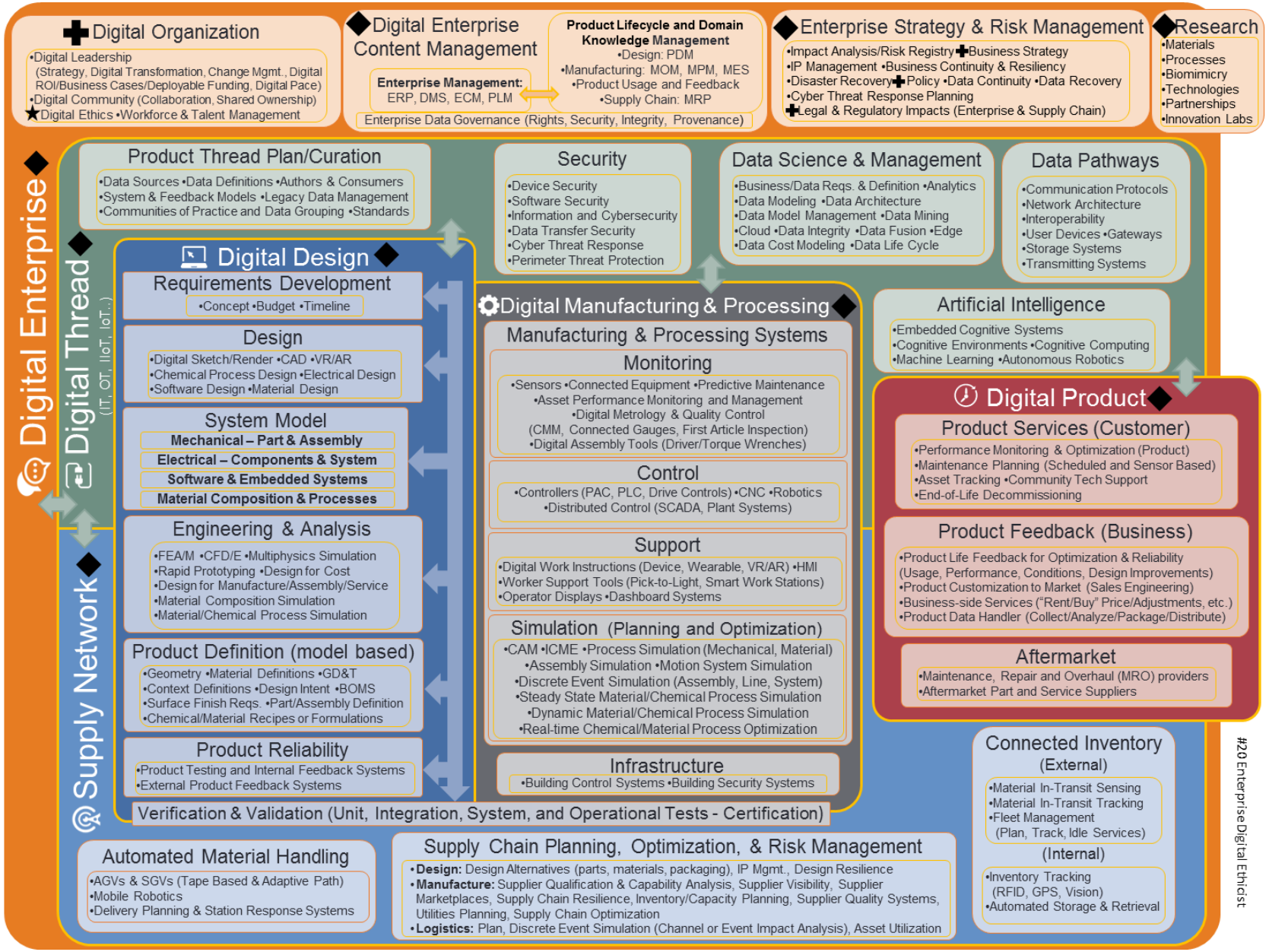
Essential Technical Competencies

The following DM&D Technical Domain Map shows the technology, tool, skill, or work areas desired for this role.

Key for Required Expertise Levels

Symbols shown at the domain level, sub-domain level, or individual level apply to that level and below:

- ◆ = **Deep comprehension** and/or comprehension of interactions (Level 1)
- ✚ = **Practiced engagement** and/or application (Level 2)
- ★ = **Direction setting** and/or expert application (Level 3)



Section 5: Experience and Education

Education

Degrees

- Bachelor's Degree with experience in related fields, including ethics, communications, regulatory compliance, philosophy, economics, psychology, law, and public policy
- Master's degree or J.D. preferred

Certifications

- Leading Professional in Ethics and Compliance (LPEC), from Ethics and Compliance Certification Institute
- Certified Compliance and Ethics Professional (CCEP), from Compliance Certification Board
- Or similar recognized compliance and ethics professional certification

Experience Profile

- 8-10 years of related professional experience
- Strong business acumen; ability to engage all levels of employees, leadership, and board members; and ability to work across functions and geographies
- Advanced knowledge and prior experience in conducting complex investigations of both mandatory and optional standards and regulations (SEC, FCPA and anti-bribery regulations; CSR best practices and other ethics frameworks); experience cooperating with national and local regulators on regulatory and compliance matters
- Experience in applying both structured and discretionary judgment
- Personal reputation for maturity, objectivity, and high standards of personal and business ethics and integrity
- Experience with broad issues of increasing digital use (from privacy, data security, to automation concerns, etc.)

Section 6: Potential Progression

Role Cluster

5 Ethics, Regulation & Compliance

Associated DM&D Community Roles

- Digital Product Safety Systems Engineer
- Digital Product Safety Systems Specialist
- Enterprise Risk Manager
- Enterprise Supply Network Manager
- Regulatory Analyst Digital Enterprise and Integrated Product Intellectual Property Senior Manager

Overview of Progression

The Digital Ethicist is a rather unique role in the digital manufacturing (or any) enterprise, yet one that can also help re-position manufacturing as the pivotal Omni economic, business, and social player. The Digital Ethicist as a key role benefits from a broad base of experience integrating complex and principled business issues that involve business, technical, cultural, leadership, legal, and social responsibility factors. While interacting with and relying on others (especially leadership, management, and strategists with their respective subject matter expertise), the ethicist maintains deep knowledge of ethical issues and trends, regulations, compliance, and broad stakeholder needs and rights. Roles and scopes of increasingly responsible duty that have a systems view with the appropriate ethical lenses and the ability to facilitate philosophical business conversations create talent pools and progression opportunities for this role.

Considered as a Transitional Role