

INCOSE NEW ENGLAND CHAPTER MEETING

Discipline Health Management (DHM)

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University of Connecticut

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Agenda

SECTION 1:

DHM Concepts
& Goals

SECTION 2:

DHM Assessment
Process at Otis

SECTION 3:

DHM Outcomes

SECTION 4:

Discussion &
Open Sharing



DHM Goals

01



DISCIPLINE HEALTH MANAGEMENT GOALS

Since the New York World's Fair, we have dedicated ourselves to a single goal: **moving the world.**

We help people make the most of every moment, every connection, and every opportunity — whether it's our passengers, our customers, or our colleagues.

Discipline Health Management

A process to effectively manage disciplines and adapt to emerging technologies to enable engineering to execute flawlessly and enhance innovation.

DISCIPLINE

A subset of competency areas deemed to be foundational enabling pillars for engineering defined by people skills, tools and processes.

OTIS



Discipline

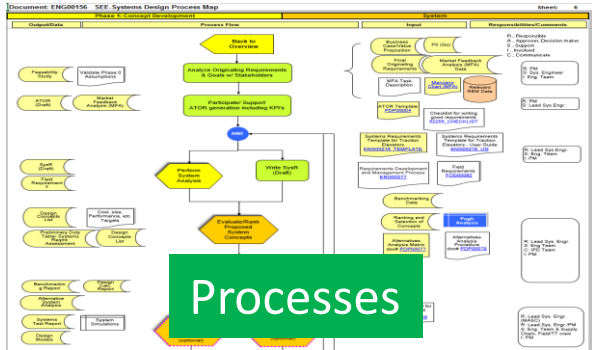
Discipline



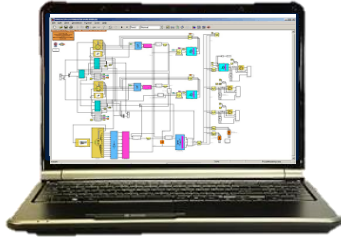
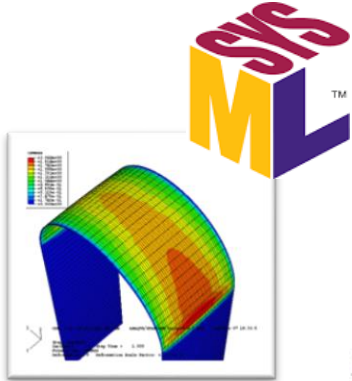
Competency



People



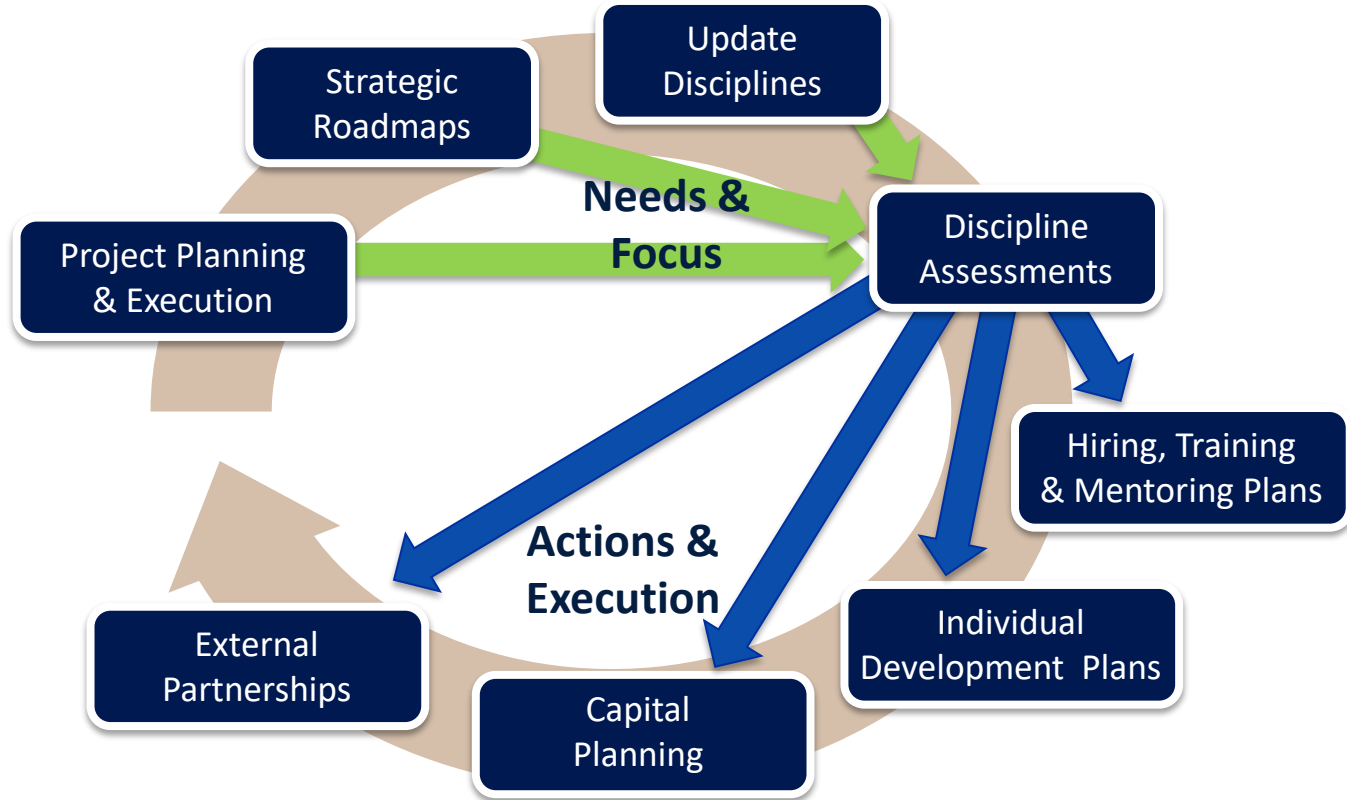
Processes



Tools



Discipline Health Management



Systems Engineering Competencies

Core Competencies:

- *Systems Thinking*
- *Lifecycles*
- *Capability Engineering*
- *General Engineering*
- *Critical Thinking*
- *Systems Modeling & Analysis*

Professional Competencies (8)

Management Competencies (9)

Integrating Competences (4)

Technical Competencies:

- *Requirements Definition*
- *System Architecting*
- *Design for...*
- *Integration*
- *Interfaces*
- *Verification*
- *Validation*
- *Transition*
- *Operation & Support*



Who Assesses?

- *Self*
- *Manager*
- *Independent*

Competency Levels (Effective Indicators of Knowledge & Experience):

- *L1 – Awareness*
- *L2 – Supervised Practitioner*
- *L3 – Practitioner*
- *L4 – Lead Practitioner*
- *L5 - Expert*

Model-Based Enterprise

INCOSE's Model-Based Enterprise Capabilities Matrix (MBECM)

Purpose: identify a comprehensive set of model-based capabilities, credibly sourced, that can be tailored and used by organizations to plan the improvement of their model-based enterprise capabilities.

The MBECM:

- is an excel-based spreadsheet composed of 46 descriptive model-based capability rows and columns that define the capability stage in one of 5 levels.
- describes how organizations may use the matrix as an input for planning, roadmaps, enterprise assessment, project planning and capability development.

3.7 ★★★★★

WORKFORCE CULTURE START 3.2 Rating

● MBSE APPROACH/OBJECTIVES	🔗
● MODEL-BASED TOOL USE	🔗
● SE-DRIVEN MODEL BUILDING	🔗
● LIFECYCLE MANAGEMENT	🔗
● INSTITUTIONAL ADOPTION	🔗
● ORGANIZATIONAL ADOPTION	🔗
● MODELING ROLES/RESPONSIBILITIES	🔗
● MODELING DEVELOPMENT SKILLS	🔗
● MODELING USE SKILLS	🔗
● MODELING RELATED TRAINING	🔗
✓ COMMON LANGUAGE	🔗

3.7 ★★★★★

SE PROCESSES START 3.5 Rating

● SE AGREEMENT PROCESS	🔗
● SE ORG PROCESS-ENABLING PROC	🔗
● SE TECHNICAL MANAGEMENT PROC	🔗
✓ SE TECHNICAL PROCESSES	🔗

3.7 ★★★★★

PROG PROCESS/METH START 3.0 Rating

● PROG REVIEWS & AUDITS	🔗
● ENTRY/EXIT CRITERIA & OTHER	🔗
● METHOD MODEL EXIT CRITERIA	🔗
● CONDUCT OF MB REVIEW/AUDIT	🔗

3.7 ★★★★★

MB EFFECTIVENESS START 3.0 Rating

● AUTH SOURCE OF TRUTH	🔗
● DIGITAL THREADS	🔗
● DIGITAL TWIN	🔗
● DIGITAL ARTIFACTS	🔗
● MODELING PROCESS QUALITY	🔗
● MODELING INTEGRATION	🔗
● MODELING ASSURANCE	🔗

3.7 ★★★★★

IT INFRASTRUCTURE START 3.0 Rating

● IT INFRASTRUCTURE MGMT PROCESS	🔗
● ENABLING TECHNOLOGIES	🔗
● MODELING TOOL ACCESS	🔗
● MB TOOL COVERAGE	🔗
● MB TOOL LICENSING & ACCESS	🔗
● COLLABORATION CAPABILITIES	🔗

3.7 ★★★★★

MODELING TOOL CONST START 3.3 Rating

● MB DATA/TOOL INDEPENDENCE	🔗
● DB/TOOL INTEROPERABILITY	🔗
● INTER-DB/TOOL DATA ITEM ASSOC	🔗
● USER IF, VIEWPOINT/VIEWS	🔗
● MODELING METHODS	🔗
● MODEL LANGUAGES	🔗
● MODEL LIBRARIES	🔗
● SIMULATION CAPABILITIES	🔗

3.7 ★★★★★

PROJECT USE START 3.3 Rating

● PROJECT TYPE	🔗
● ORGANIZATIONAL COORDINATION	🔗
● SIZE	🔗

3.7 ★★★★★

POLICY START 3.3 Rating

● PORTFOLIO USE	🔗
● TOOL GOVERNANCE	🔗
● INTELLECTUAL PROPERTY	🔗
● MB MGMT PROG REVIEWS	🔗



DHM Assessment

02

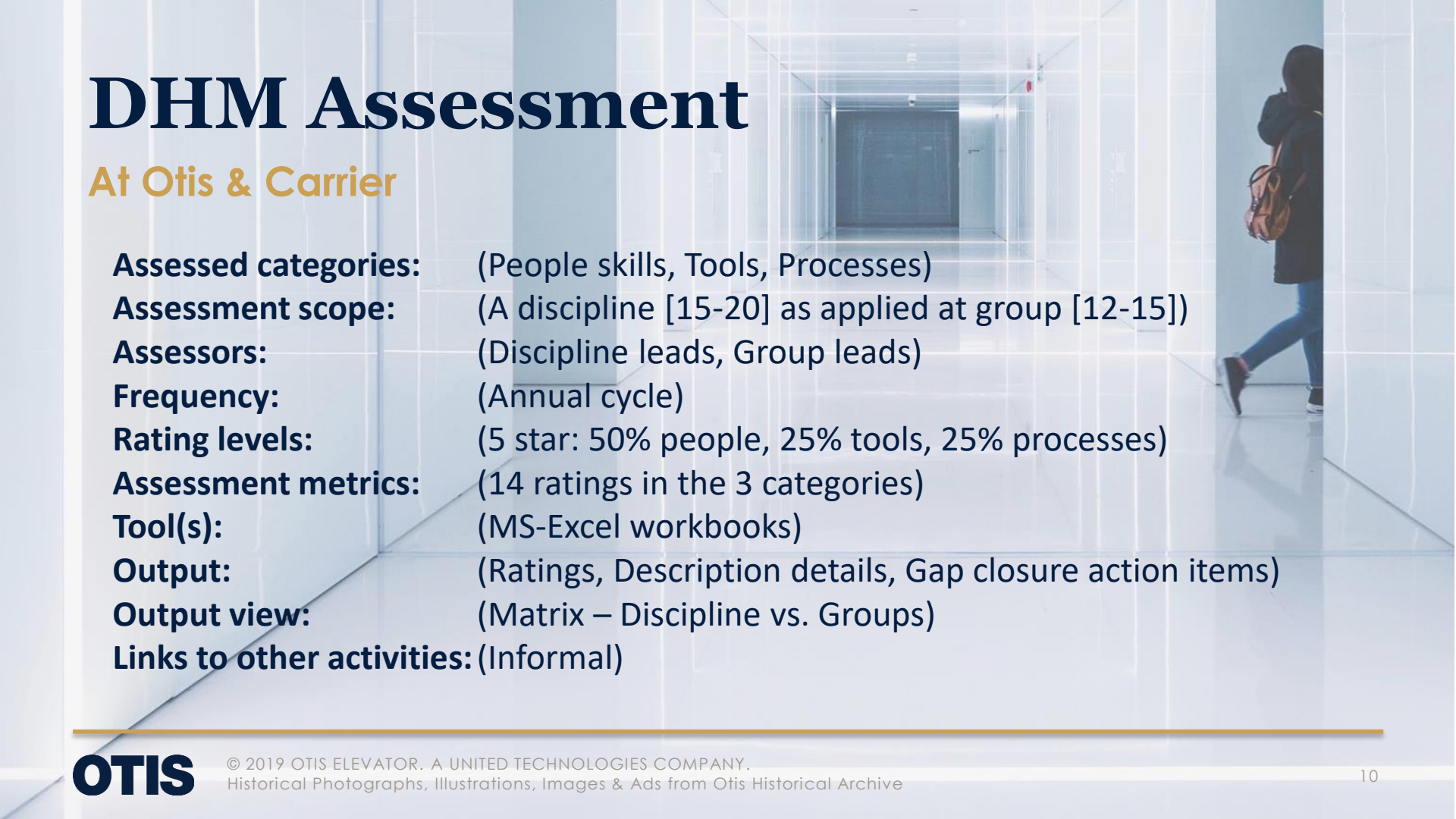
DISCIPLINE HEALTH ASSESSMENT @ OTIS & CARRIER

We roll-up our sleeves to get it done.

We thrive on solving the toughest challenges. And, by going beyond what people expect, we earn their trust and improve their lives.

DHM Assessment

At Otis & Carrier




Assessed categories:	(People skills, Tools, Processes)
Assessment scope:	(A discipline [15-20] as applied at group [12-15])
Assessors:	(Discipline leads, Group leads)
Frequency:	(Annual cycle)
Rating levels:	(5 star: 50% people, 25% tools, 25% processes)
Assessment metrics:	(14 ratings in the 3 categories)
Tool(s):	(MS-Excel workbooks)
Output:	(Ratings, Description details, Gap closure action items)
Output view:	(Matrix – Discipline vs. Groups)
Links to other activities:	(Informal)



DHM – Organizational View

	Discipline Health Assessment	Discipline Lead	Systems					Components								Model-Based Dev
			System #1	System #2	System #3	System #4	System #5	Component #1	Component #2	Component #3	Component #4	Component #5	Component #6	Component #7	Component #8	
			Segment Leader >	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	Ldr Name	
Traditional	Traditional Discipline #1	Disc Ldr #1	3.5	3.2	2.7	4.0	4.5	2.3	3.3			4.3	4.3	4.0		3.6
	Traditional Discipline #2	Disc Ldr #2										3.0	3.3	2.7		3.0
	Traditional Discipline #3	Disc Ldr #3									4.0	3.3				3.7
	Traditional Discipline #4	Disc Ldr #4	3.0	3.7	3.7	2.7	4.0				3.3			2.7		3.3
	Traditional Discipline #5	Disc Ldr #5		3.2						3.4						3.3
	Traditional Discipline #6	Disc Ldr #6										4.0				4.0
	Traditional Discipline #7	Disc Ldr #7	3.7	3.3	3.7	3.3	4.0	3.0			3.7		3.3			3.5
	Traditional Discipline #8	Disc Ldr #8						2.3					3.8	3.0		3.0
	Traditional Discipline #9	Disc Ldr #9	3.0		3.7		3.5	3.7		3.3						3.4
	Traditional Discipline #10	Disc Ldr #10	1.3	4.3		3.3		3.8	3.0	3.3						3.2
	Traditional Discipline #11	Disc Ldr #11						3.7	3.2					2.5		3.1
	Traditional Discipline #12	Disc Ldr #12						3.0								3.0
	Traditional Discipline #13	Disc Ldr #13	3.0	2.4	3.4	3.2	3.4				3.4	3.7		4.2		3.5
Emerging	Emerging Discipline #1	Disc Ldr #14		2.3											2.7	2.5
	Emerging Discipline #2	Disc Ldr #15						2.3	2.1	1.9				1.6	3.1	2.2
	Emerging Discipline #3	Disc Ldr #16		1.5					2.5						2.0	2.0
	Emerging Discipline #4	Disc Ldr #17						2.0				2.9				2.5
	Emerging Discipline #5	Disc Ldr #18							2.3						2.3	2.3

DHM – Assessment form




Discipline Health Management Plan (v2.7)







DISCIPLINE: **Otis-Discipline #1** 
 LOCATION: **Global component engineering**
 GROUP: **Otis-Elect & SW Components** 


3.9 ★★★★★

REVISION DATE: **5/29/2018**


DHM REVIEW TEAM
 Oliver North (Segment Lead)
 Derk Johnson (Discipline Lead)
 BV Smith (Site lead)
 Shari Suarez (Segment lead)
 Stephen Howard (Segment lead)
 Frank Miller (Director)





PEOPLE START 3.2 Rating 


- SKILLS DEFINED 
- DISCIPLINE EXPERTS 
- STAFFING RESOURCES 
- KNOWLEDGE DEVELOPMENT 
- PARTNERSHIPS 
- MBD CAPABILITIES/SKILLS 

Action plans: 


Training: TBD training in all center's groups
 - People Action: Active mentoring program
 - Hiring Action: need 2 engineerings in TBD Area
 - Outsource TBD work to TBD





TOOLS/FACILITIES START 4.5 Rating 


- ✓ TOOLS DEFINED 
- ✓ TOOL QUALITY & AVAILABILITY 
- ✓ LABS & FACILITIES 
- MBD TOOLS 

Action plans: 

Tools availability: Request it to improve TBD service
 - Purchase TBD Hardware to allow for TBD tests
 - Lease TBD SW for 6 months to allow for TBD development
 - Start planning for TBD facility improvement





PROCESSES START 4.8 Rating 

- ✓ PROCESS DEFINED 
- ✓ STANDARD WORK USAGE 
- ✓ EFFECTIVENESS & IMPACT 
- ✓ MBD WORKFLOWS 

Action plans: 

Developments: Update the following engineering standard work:
 - ENG000122 - TBD title
 - ENG000123 - TBD title
 - ENG001133 - TBD title

Revise/update the following ESW documents:
 - MASC00111 - TBD title & MASC00122 - TBD title

Enter Turnback 
Unlock Worksheet 
Historical Trend 
Tool Instructions 

MBD Health	Overall 3.5	Capabilities/Skills 3.0	Assets/Tools 3.0	MBD Workflows 5.0
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DHM – Assessment detail

Discipline Health Management Plan (v2.7) OTIS

DISCIPLINE: **OTIS-Discipline #1**
LOCATION: **Global Commercial Engineering**
GROUP: **OTIS-Elect & SW Components** 3.9 ★★★★★

REVISION DATE: 1/20/2016

TOOLS/FACILITIES: **0** + Define
- SKILLS DEFINED
- TOOL QUALITY & AVAILABILITY
- LABS & FACILITIES
- MBD FACILITIES

PEOPLE: **0** + Define
- SKILLS DEFINED
- STAFFING RESOURCES
- KNOWLEDGE DEVELOPMENT
- PARTNERSHIPS
- MBD CAPABILITIES/SKILLS

PROCESSES: **0** + Define
- PROCESS DEFINED
- STAFFED WORK LOAD
- EFFECTIVENESS & IMPACT
- MBD WORKFLOWS

HOME

BACK NEXT

Example

SKILLS DEFINED

Why is this important? A healthy discipline is where roles have been defined along with associated skills to implement it from basic to applied research, preliminary to detailed design, and product & technology qualification and verification. This discipline attribute (skills defined) is critical to ensuring your workforce is adequately trained and experienced to apply the discipline in the application area of interest. [NOTE: Computer modeling skills should be included here which will also be included later in the MBD Capabilities assessment category.]

STATUS

Pick the best answer that describes how well the roles and associated skills have been defined and documented for Otis-Discipline #1 discipline in this Otis-Elect & SW Components group.

- A) All roles and associated skills have been thoroughly defined and documented for the application of this discipline in this application area.
- B) Most roles and associated skills have been defined and documented for the application of this discipline in this application area.
- C) Some of roles and skills have been defined for the application of this discipline in this application area.
- D) A limited number of roles and skills have been defined for the application of this discipline in this application area.
- E) The roles and skills for this discipline applied in this application area have not been defined.

Answer

B

DETAILS/COMMENTS:

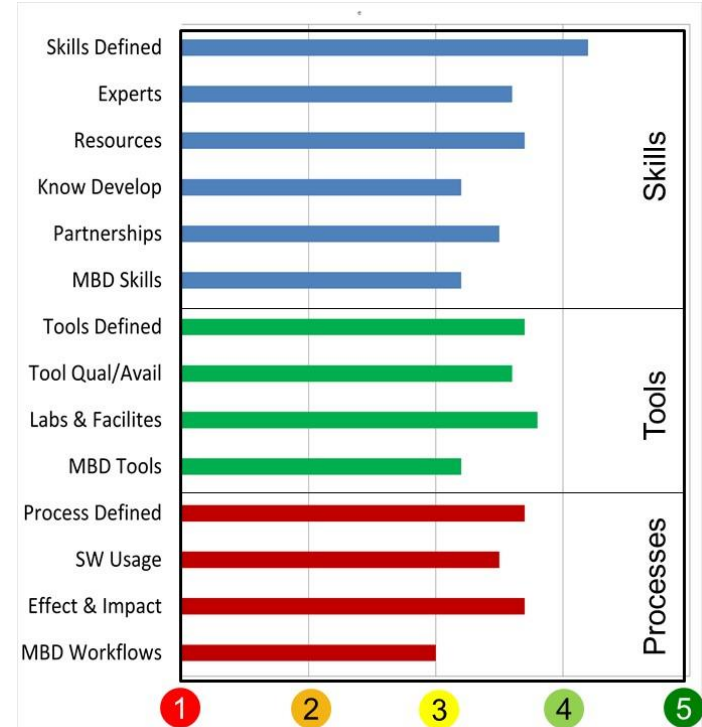
Listed below are many of the discipline skills that at design center, technology group, or commercialized product line might need. Not every group will need every skill. Nor is the list intended to be exhaustive.

1. Skill Number 1: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
2. Skill Number 2: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
3. Skill Number 3: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
4. Skill Number 4: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
5. Skill Number 5: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
6. Skill Number 6: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
7. Skill Number 7: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.
8. Skill Number 8: With the following brief description
The ability to do something useful within the listed Discipline, can apply to many different components or segment groups.

DHM – Output Views

Discipline Health Assessment		Discipline Lead	Assessments	Overall	People	Tools	Processes
Traditional	Traditional Discipline #1	Disc Ldr #1	10	4.0	4.0	4.0	4.0
	Traditional Discipline #2	Disc Ldr #2	3	3.8	3.9	3.6	3.8
	Traditional Discipline #3	Disc Ldr #3	2	3.7	3.6	4.3	3.4
	Traditional Discipline #4	Disc Ldr #4	7	3.7	3.8	3.7	3.5
	Traditional Discipline #6	Disc Ldr #6	1	4.0	3.8	4.0	4.3
	Traditional Discipline #7	Disc Ldr #7	8	3.8	3.8	3.8	3.8
	Traditional Discipline #8	Disc Ldr #8	3	3.6	3.6	3.6	3.6
	Traditional Discipline #9	Disc Ldr #9	6	3.5	3.6	3.5	3.3
	Traditional Discipline #10	Disc Ldr #10	6	3.4	3.5	3.3	3.3
	Traditional Discipline #11	Disc Ldr #11	3	3.1	3.1	3.7	2.8
	Traditional Discipline #12	Disc Ldr #12	1	3.8	3.7	3.8	4.0
	Traditional Discipline #13	Disc Ldr #13	8	4.0	4.0	3.7	4.2
	Emerging	Emerging Discipline #1	Disc Ldr #14	1	4.0	4.4	4.0
Emerging Discipline #2		Disc Ldr #15	5	2.7	2.8	2.6	2.7
Emerging Discipline #3		Disc Ldr #16	3	2.3	2.1	2.8	2.3
Emerging Discipline #4		Disc Ldr #17	1	2.4	2.5	2.3	2.5
Emerging Discipline #5		Disc Ldr #18	2	2.8	2.7	3.3	2.8

Discipline View



DHM Category View

DHM Outcomes



03

DHM OUTCOMES NEED TO DRIVE CONTINUOUS IMPROVEMENT

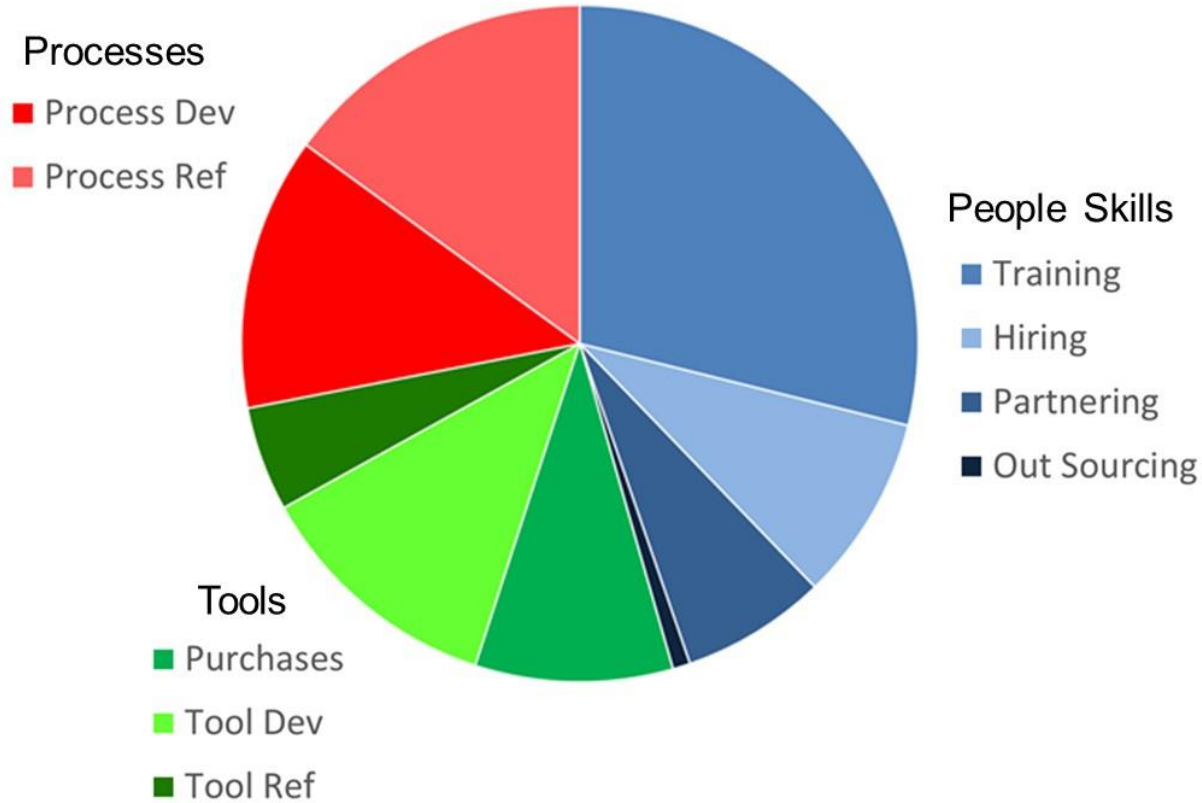
..to effectively manage disciplines and adapt to emerging technologies to enable engineering to execute flawlessly and enhance innovation.

DHM – Action Items

Hide Scores				DHM - 2018 Assessment Summary																											
BU	Segment Group	Discipline	Date Modified	Category	DHM Overall	People Overall	Defined	Experts	Resources	Knowledge Dev.	Partnerships	MBD Capabilities/Skills	Tools Overall	Defined	Quality & Availability	Labs & Facilities	MBD Tools	Processes Overall	Process Defined	Standard Work Usage	Effectiveness & Impact	MBD Workflows	MBD Overall	MBD Score	Actions	Action 1 Progress	Action 2 Progress	Priority	Status	Specific Action Item	

- Aggregate DHM scores & action items
- Formulate detailed action plans (with Discipline leads)
- Review progress & status on actions

DHM – Action Items



DHM – Group Ratings & Actions

	Discipline Health Assessment	Systems					Components								Average
		System #1	System #2	System #3	System #4	System #5	Component #1	Component #2	Component #3	Component #4	Component #5	Component #6	Component #7	Component #8	
		Ldr #1	Ldr #2	Ldr #3	Ldr #4	Ldr #5	Ldr #6	Ldr #7	Ldr #8	Ldr #9	Ldr #10	Ldr #11	Ldr #12	Ldr #13	
	Assessments	6	6	5	5	5	9	6	3	4	5	4	7	4	5
Ratings	Overall Score	3.5	3.7	3.9	3.5	3.9	3.2	3.2	3.3	3.9	3.8	4.1	3.4	2.9	3.6
	People Skills	3.4	3.8	4.1	3.5	3.9	3.3	3.2	3.4	3.9	3.8	4.3	3.4	2.9	3.6
	Tools	3.6	3.7	4.1	3.3	3.9	3.3	3.5	3.2	3.9	3.9	4.0	3.3	3.2	3.6
	Processes	3.5	3.7	3.6	3.5	4.0	3.1	3.0	3.3	4.1	3.8	3.8	3.5	2.8	3.5
Actions per Assessment	Training	1.5	1.8	1.2	1.8	2.0	1.6	2.0	1.0	1.0	1.4	1.8	1.3	1.8	1.5
	Hiring/Staffing	0.5	0.5	0.4	0.4	0.4	0.7	0.5	0.7	0.8	0.0	0.5	0.4	0.8	0.5
	Partnering	0.5	0.5	0.2	0.4	0.0	0.6	0.5	0.7	0.3	0.0	0.3	0.6	0.5	0.4
	Out-Sourcing	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1
	Purchases	0.5	0.3	0.6	0.4	0.4	0.9	0.7	0.7	0.3	0.2	0.3	0.6	0.5	0.5
	Tool Development	0.5	0.3	0.4	0.4	0.6	0.9	1.0	0.7	0.0	0.2	0.5	0.7	1.3	0.6
	Tool Refinement	0.0	0.3	0.4	0.0	0.6	0.2	0.2	0.3	0.0	0.8	0.3	0.0	0.5	0.3
	Process Development	1.3	0.2	0.6	0.4	0.8	0.7	1.5	0.3	0.5	0.0	1.0	0.7	1.3	0.7
	Process Refinement	0.3	1.8	0.6	1.0	0.6	0.9	0.7	1.0	0.8	0.8	0.3	1.0	0.5	0.8

DHM Success Factors

People



- Executive buy-in and sponsorship
- Clarify discipline's focus and scope
- Define roles & responsibilities
- Incentivize & reward effort

Tools

A screenshot of the Discipline Health Management Plan (v2.7) tool interface. The interface is divided into several sections: 'DISCIPLINE' (Discipline & Vision, 3.3 stars), 'REVISIONS' (with a table for tracking changes), 'TOOL FACILITIES' (listing various tool features like 'TOOLS SUPPORT' and 'TOOL QUALITY & AVAILABILITY'), 'PEOPLE' (listing roles like 'CHIEF EXPERTS' and 'STAFFING RESOURCES'), and 'PROCESSSES' (listing various process elements like 'PROCESS SUPPORT' and 'STANDARD WORK PROCEDURES'). The interface includes search bars, filters, and a 'Historical Trends' section at the bottom.

- Simple forms & provide adequate training
- Space for logging DHM details when indicated
- Allow for multiple views of DHM rollups
- Minimize year over year changes
- Automate rollups where possible

Process



- Focus on improvement opportunities more than scores
- Look for synergistic cross-cutting gap closure actions
- Use continuous improve process
- Explicitly link/bind assessment actions to other DHM-related events
- Make actions visible & follow up

Discussion

04

THANK YOU

Discipline Health Management: A process to effectively manage disciplines and adapt to emerging technologies to enable engineering to execute flawlessly and enhance innovation. What are our best practices for doing this?