CSER 2023
conference on systems engineering research
March 16-17, 2023

Leveraging Adoption Research to Assess Implementation Frameworks for Digital Transformation and Digital Engineering

Interactive Session

Joseph Campagna, WPI PhD Candidate, Systems Engineering

March 17, 2023

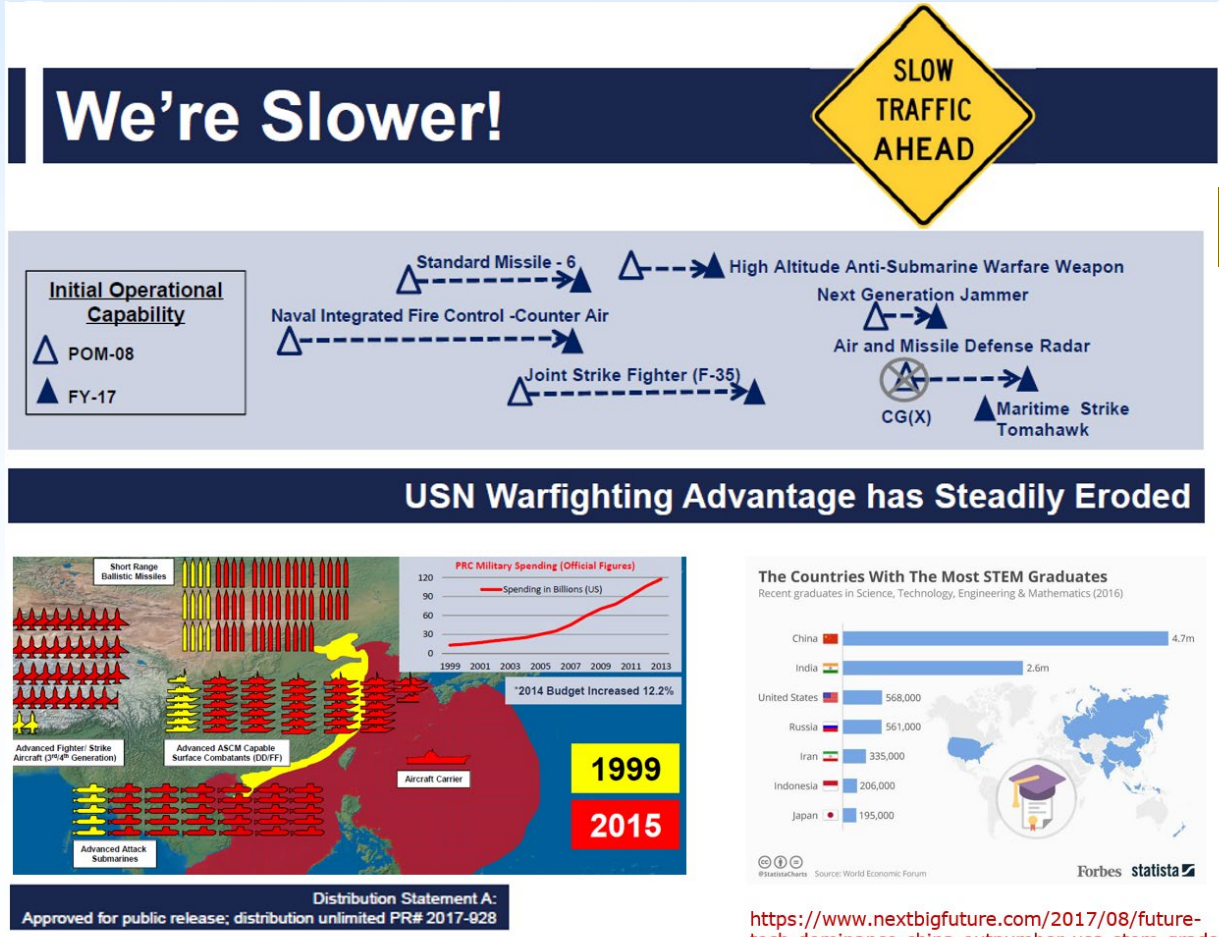
The US Defense Industry's Digital Transformation Imperative

- "The US defense industry is not transforming at the scale that we need to", to address global competition, such as the threat posed by China

Michael Brown,
Director of the Defense Innovation Unit

Terri Moon Cronk, Tech Advantage Critical to Prevail in Strategic Competition With China, DOD, NOV. 5, 2021

The DoD has embraced a Digital Transformation strategy to maintain global competitiveness in capabilities



NAVAIR, Systems Engineering Transformation, Industry Day, Southern Maryland Higher Education Center, 8 March 2018

Global Competition is growing rapidly

https://www.nextbigfuture.com/2017/08/future-tech-dominance-china-outnumber-usa-stem-grads-8-to-1-and-by-2030-15-to-1.html

Problem Statement

Despite having clear digital transformation strategy[1], the defense industry is haphazard and slow in **adopting**[2] digital innovations that support digital engineering and digital transformation

1. Department of Defense (DoD), Digital Engineering Strategy 2018

1. Department of Defense (DoD), DoD Digital Modernization Strategy 2019

1. Army Digital Transformation Strategy, Department of the Army, 12 October 2021,

1. Roper, W., Bending the Spoon, Guidebook for Digital Engineering and e-Series, 01/19/2021

2. Wang, G., Implementing a Model-Based, Digital Engineering Enterprise for a Defense Systems Integrator – an Ongoing Journey, 30th Annual INCOSE International Symposium, July 20-22, 2020

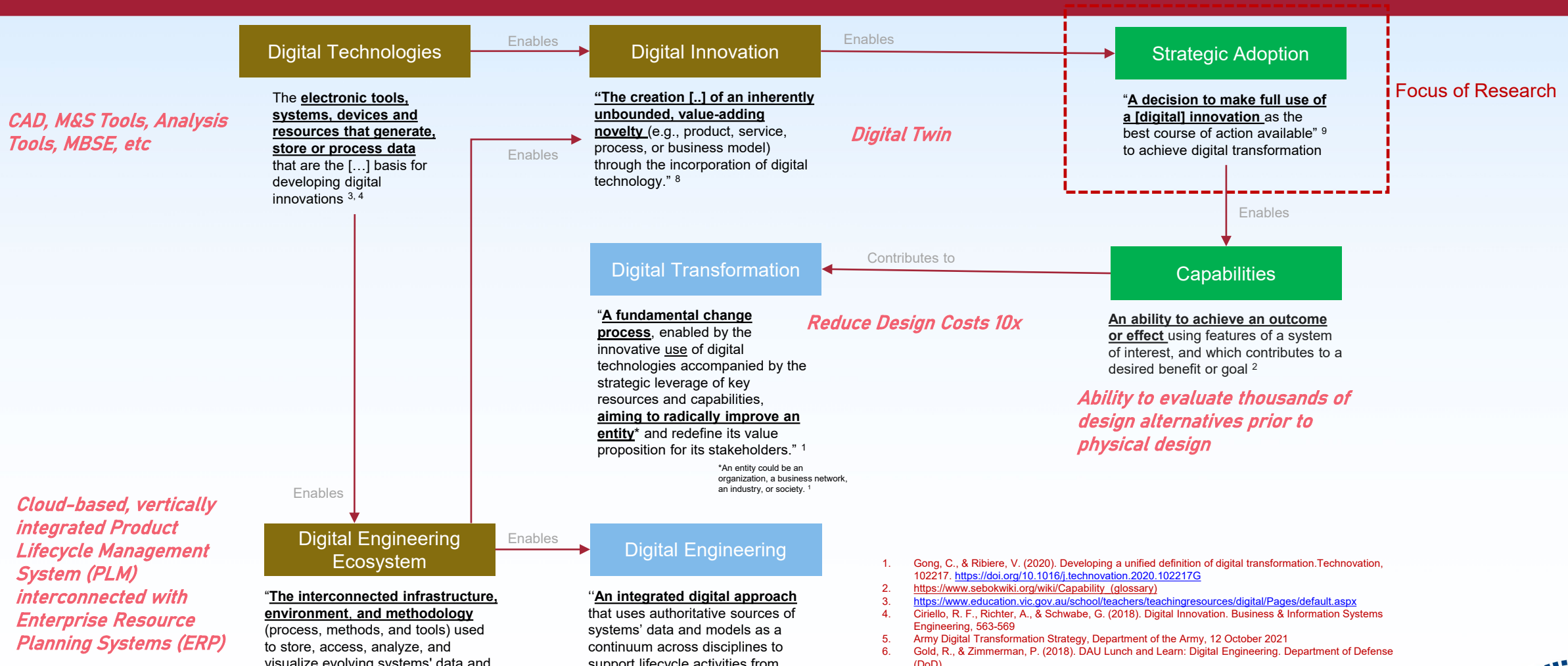
2. Chami, M., Bruel, J-M., A Survey on MBSE Adoption Challenges, OATAO, http://oatao.univ-toulouse.fr/226437

2. Zimmerman, P., DoD Digital Engineering Implementation Challenges and Recommendations, 21st Annual National Defense Industrial Association Systems and Mission Engineering Conference, October 24, 2018

2. Deloitte, Model Based Enterprise, Jan 2021

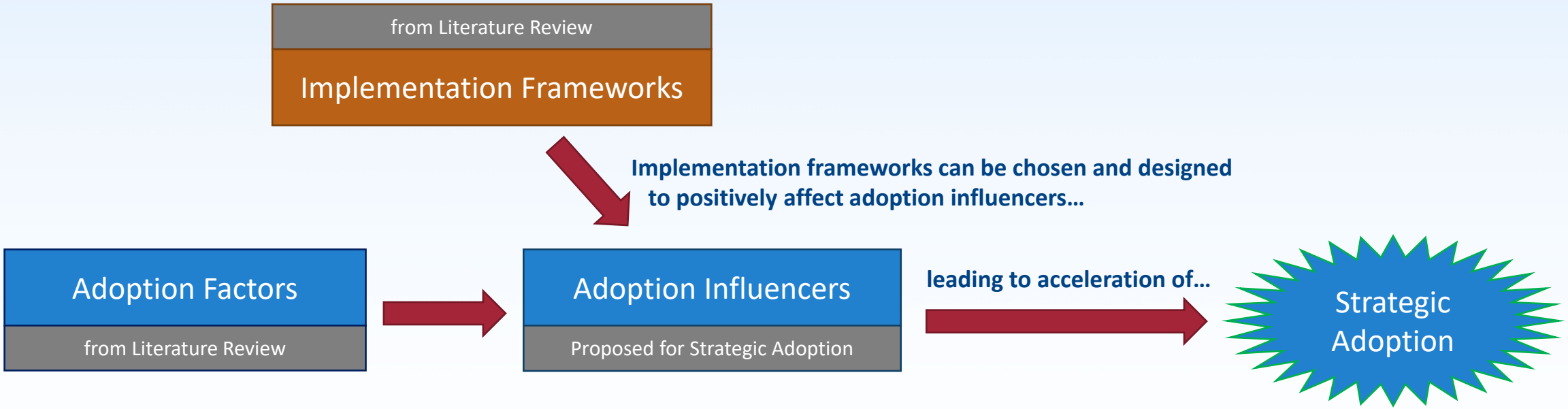
Definitions pertaining to Digital Transformation and Digital Engineering

Campagna, J., Bhada, S., **Enterprise Adoption of Digital Engineering: A Literature Review and Recommendations**, submitted to Systems Engineering Journal Special Edition, Wiley, 2022 (under review)



1. Gong, C., & Ribiere, V. (2020). Developing a unified definition of digital transformation.Technovation, 102217. https://doi.org/10.1016/j.technovation.2020.102217G
2. https://www.sebokwiki.org/wiki/Capability_(glossary)
3. https://www.education.vic.gov.au/school/teachers/teachingresources/digital/Pages/default.aspx
4. Ciriello, R. F., Richter, A., & Schwabe, G. (2018). Digital Innovation. Business & Information Systems Engineering, 563-569
5. Army Digital Transformation Strategy, Department of the Army, 12 October 2021
6. Gold, R., & Zimmerman, P. (2018). DAU Lunch and Learn: Digital Engineering. Department of Defense (DoD).
7. Defense Acquisition University, DAU Glossary, 2021 https://www.dau.edu/glossary/Pages/Glossary.aspx#!both|D|27346 [Accessed January 24, 2021]
8. Axel Hund, Heinz-Theo Wagner, Daniel Beimborn, Tim Weitzel, Digital innovation: Review and novel perspective, The Journal of Strategic Information Systems, Volume 30, Issue 4, 2021, 101695, https://doi.org/10.1016/j.jsis.2021.101695
9. Rogers, E. (2003). Diffusion of innovations - 5th Edition. New York: Free Press Simon & Schuster.

Investigation Plan



Literature Review on Adoption Factors

Examined 24 adoption theories relevant to Technology or innovation adoption

Identified 144 unique adoption factors and identified definitions for each

Also looked at hundreds of studies involving these models and developed standard ontology for organizing them

Adoption Theory or Model	Date of First Appearance in the Literature	Common Acronym	Adoption Factors	Citation
Diffusion of Innovations Theory	1962	DOI	Communication channels, Compatibility, Complexity, Felt needs/problems of the decision-making unit, Image, Image visibility, Innovativeness of the decision-making unit, Norms of the social system, Observability, Perceived ease of use, Relative advantage, Socioeconomic characteristics of the decision-making unit, Time, Trialability, Voluntariness of use	Rogers, 1962 (1st Edition), 1995 (4th), 2003 (5th)
Theory of Reasoned Action	1967	TRA	Attitude toward behavior, Behavioral beliefs and outcome evaluations, Behavioral intention, Normative beliefs and motivation to comply, Relative importance of attitudinal and normative considerations, Subjective norms	Fishbein, 1967; Fishbein & Ajzen, 1975; Ajzen, Fishbein, 1980
Social Cognitive Theory	1977	SCT	Behavioral intention, Environmental factors, Goals, Outcome Expectancies, Perceived behavioral control, Personal factors, Socio-structural factors, Time	Bandura, 1977, 1978, 1982, 1986
Theory of Attitude and Behavior	1980	TAB	Affect (joy or displeasure), Behavioral intention, Facilitating Conditions, Perceived consequences, Social Factors	Triandis, 1980
Theory of Planned Behavior	1985	TPB	Attitude toward behavior, Behavioral beliefs and outcome evaluations, Behavioral intention, Control beliefs and perceived facilitation, Normative beliefs and motivation to comply, Perceived behavioral control, Subjective norms	Ajzen, 1985, 1987, 1991
Structuration Theory & Adaptive Structuration Theory	1986	ST AST	Appropriation of structures, Atmosphere, Conflict Management, Decision processes, Efficiency, Emergent sources of structure, Group's internal system, Knowledge and experience, Leadership, New social structures, Perceptions, Resources, Rules, Social interaction, Structure of advanced information technology, Styles of interacting, Time	Giddens, 1986; DeSanctis & Poole 1994
Technology Acceptance Model	1989	TAM TAM2 TAM3	Anxiety, Attitude toward behavior, Behavioral intention, Enjoyment/perceived enjoyment, Experience, External variables, Image, Image visibility, Job relevance, Job fit, Output quality, Perceived ease of use, Perceived usefulness, Perceptions of external control, Playfulness, Result demonstrability, Self-efficacy, Subjective norms, Usability, Voluntariness of use	Davis, 1989; Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Technology-Organization - Environment Model	1990	TOE	Adaptable innovations, Availability, Championship, Communication processes, Compatibility, Competitive pressures, Complexity, Firm size, Formal and informal linking [illegible]	Tornatzky & Fleicher, 1990

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Strategic Adoption Influencers (SAI)

Organized adoption factors using affinity diagramming technique

Identified twelve **strategic adoption influencers (SAI)**

Identified a general question for each SAI

	Adoption Influencers		Relationship to Entity			
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
1	Facilitating Conditions	Do conditions exist within the entity that facilitate adoption of DI/DT?		✔		Championship, Change instruments, Change strategies, Coercive forces, Communication channels, Communication processes, Conflict management, Decision processes, Extrinsic motivation, Facilitating conditions, Innovativeness of the decision-making unit, Interactivity, Leadership, Managerial innovativeness, Network centrality, Network density, Owner/family influence, Performance gap, Presence of champions, Resources, Risk-taking culture, Superior's influence, Time, Timeliness, Top management support, Voluntariness of use
2	Perceived Outcome & Value	Do I expect positive outcomes and value from my performance or the capabilities of the entity by adopting DI/DT?	✔	✔		Behavioral beliefs and outcome evaluations, Control beliefs and perceived facilitation, Cost benefit, Data quality, Efficiency, Funding requirement, Job relevance, Job fit, Outcome expectancies, Output quality, Perceived direct benefits, Perceived fee, Perceived financial cost, Perceived usefulness, Perceived value, Performance expectancy, Price value, Relative advantage, Result demonstrability, Task outputs, Time to positive cash flow, Total expected discounted benefits, Value network centrality, Value network density
3	External Pressure & Influence	Do conditions exist outside the entity (in the environment) that influence me or the entity to adopt DI/DT?			✔	Competitive pressures, Consumer readiness, Contracts and agreements, Environmental factors, External variables, Government championship, Government policy, Government regulation, Regulatory environment, Industry adoption, Industry characteristics and market structure, Market structure, Market uncertainty, Market value potential, Maturity of the environment, Mimetic forces, Perceived government pressure, Perceived industry pressure, Regulations and legislations, Regulatory support, Trading partners' readiness
4	Operational Alignment	Does the DI/DT align with the entity's infrastructure, capabilities, initiatives, processes, and operational requirements?		✔		Alignment with core capabilities, Alignment with other company initiatives, Appropriation of structures, Business processes, Emergent sources of structure, Fit with organizational structure, Functional tracks, Governance, Groups internal system, Information searching behavior, Perceived service quality, Role of IT, Rules, Scope of business operation, Serviceability, Shared infrastructure, Slack, Work pattern
5	Social Influence & Status	Is there social influence to adopt DI/DT and do I expect my social status within the entity or environment to improve by adopting DI/DT?	✔	✔		Atmosphere, Formal and informal linking structures, Image, Image visibility, New social structures, Normative beliefs and motivation to comply, Participation, Perceived social influences, Relationship, Relative importance of attitudinal and normative considerations, Social factors, Social interaction, Social or peer influence, Styles of interacting, Subjective norms
6	Technology Requirements and Ecosystem	Will the DI/DT under consideration meet the technology requirements for the entity and integrate with the Digital Ecosystem?		✔		Accessibility, Adaptable innovations, Authorization, Availability, Ecosystem, Information exchange, Interoperability, Locatability, Observability, Reliability, Structure of advanced information technology, Technicality, Technology characteristics, Technology integration, Technology support infrastructure, Trialability
7	Belief Alignment	Is adopting DI/DT congruent with the beliefs, norms, values, and needs of the individual or entity?	✔	✔		Cognitive based values, Compatibility, Computer self-efficacy, Felt needs/problems of the decision-making unit, Fit with company's culture and values, Normative forces, Norms and cultures, Norms of the social system, Organization mission, Perceived indispensability, Perceptions of external control, Satisfaction with existing systems, Self-efficacy
8	Demographic Characteristics	Do the individual's or the entity's demographics support adoption of DI/DT (i.e. age, gender, education level, years of experience, job grade, socio-economic, experience with DT/DE, etc.)?	✔	✔		Age, Education, Financial position, Firm size, Gender/gender sensitivity, Group characteristics, Group homogeneity, Knowledge and experience, Other career experiences, Personal factors, Socioeconomic characteristics of the decision-making unit, Socioeconomic roots, Socio-structural factors
9	Effort Expectancy	Do I expect the effort associated with adopting DI/DT for me and the entity to be acceptable?	✔	✔		Complexity, Ease of technical implementation, Ease of use, Effort expectancy, Experience, Habit (from experience), Perceived behavioral control, Perceived ease of use, Personnel requirements, Technology competence, Usability, User's ability
10	Perceived Risk	Do I trust that the risk to myself or the entity by adopting DI/DT is acceptable?	✔	✔		Long term consequences, Management risk position, Organizational readiness, Perceived barriers, Perceived consequences, Technological readiness, Technology readiness, Trust, Trust in digital operations
11	Behavioral Affect & Intent	Do I have or expect to improve positive feelings toward adopting DI/DT?	✔			Affect, Anxiety, Attitude toward behavior, Behavioral intention, Enjoyment/perceived enjoyment, Hedonic motivation, Perceptions, Playfulness, User's willingness
12	Strategic Alignment	Does the DI/DT align with the entity's stated strategic goals and objectives?		✔		Goals, Strategic fit, Strategic planning

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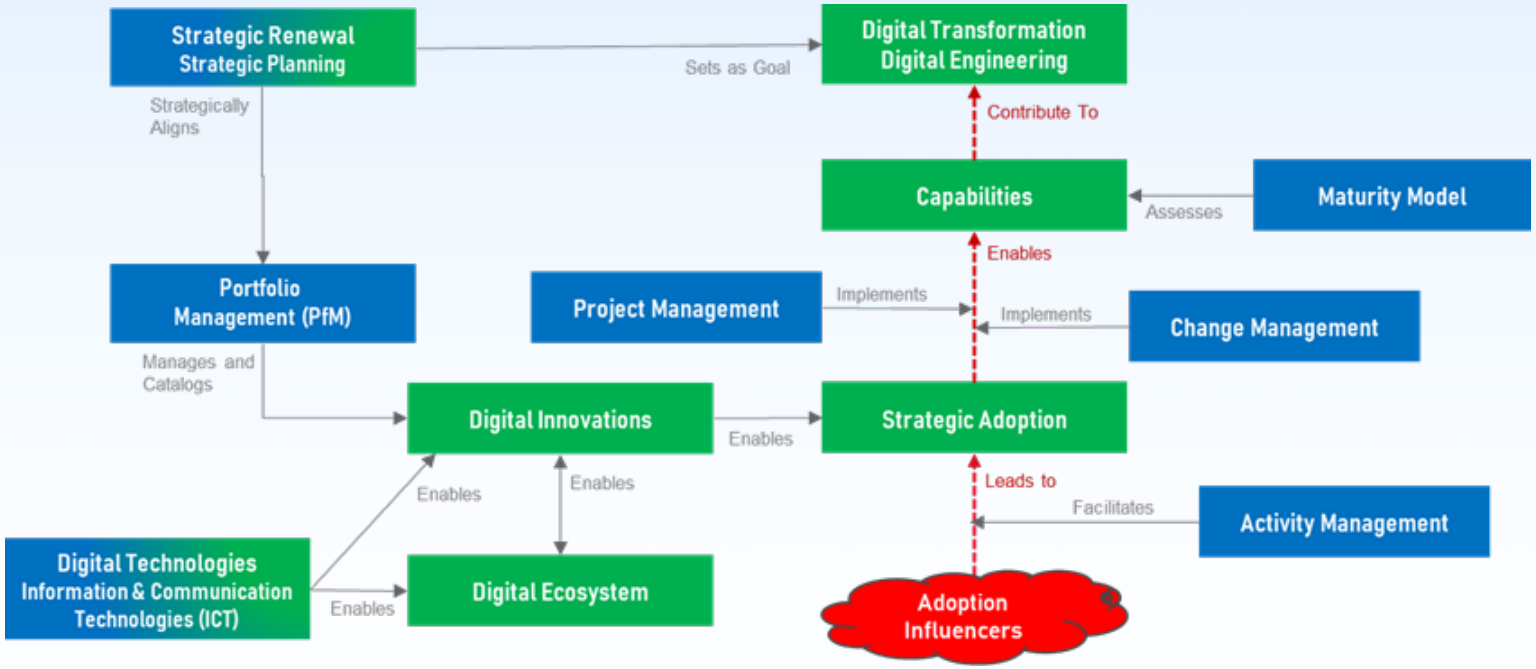
Implementation Frameworks



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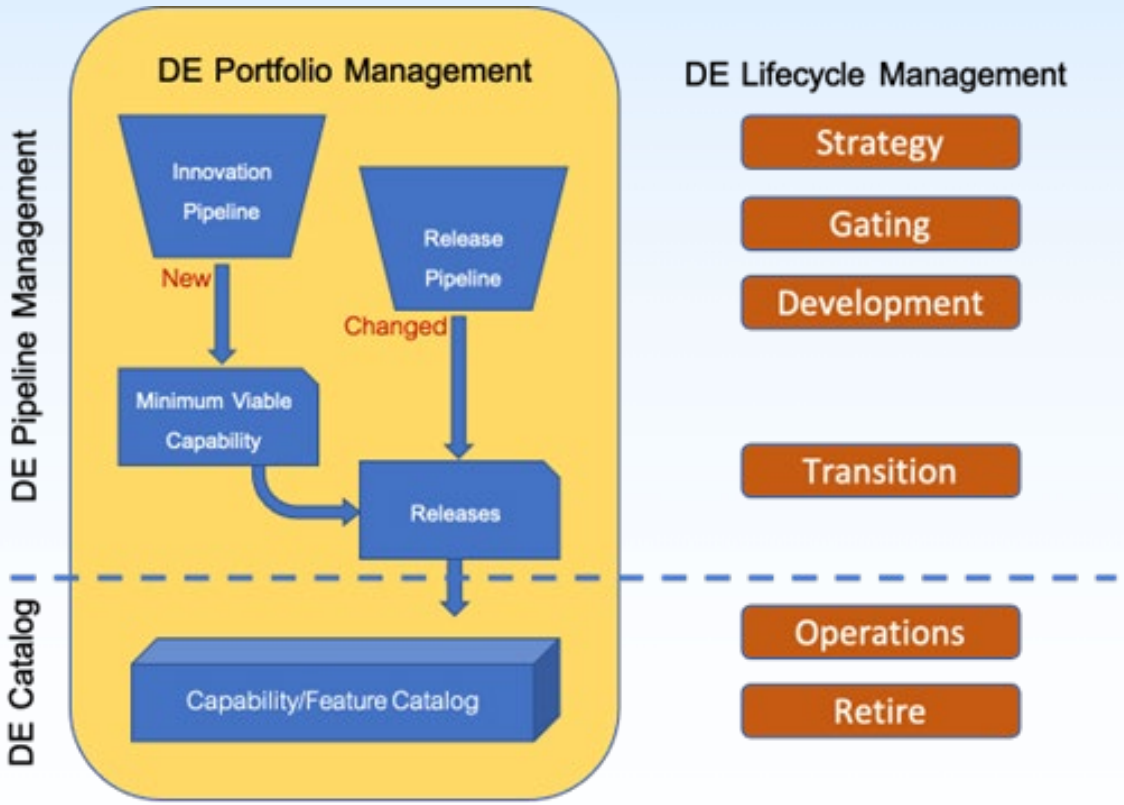
Key relationships of adoption influencers and implementation frameworks contributing to DE/DT

Implementation Frameworks (in blue):

- Strategic Planning
- **Portfolio Management**
- Project Management
- Information and Communication Technology
- Activity Management
- Change Management
- Maturity Model
- Etc.

Portfolio Management (PfM)



- **A methodology for evaluating and managing investments in innovations that enhance capabilities and achieve strategic alignment with stated goals**
- **Portfolio Management manages the lifecycle of those innovations from concept to end of life**
- **Portfolio Management includes a catalog of available capabilities and the innovations that enable them**

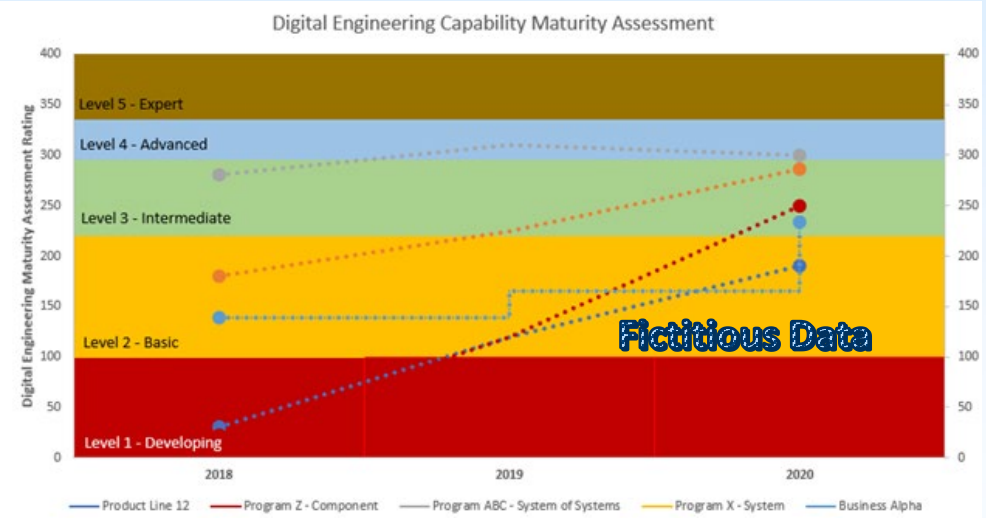
J. M. Campagna and S. V. Bhada, "A Capability Maturity Assessment Framework for Creating High Value Digital Engineering Opportunities," 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC), Melbourne, Australia, 2021, pp. 2542-2548, doi: 10.1109/SMC52423.2021.9659037.

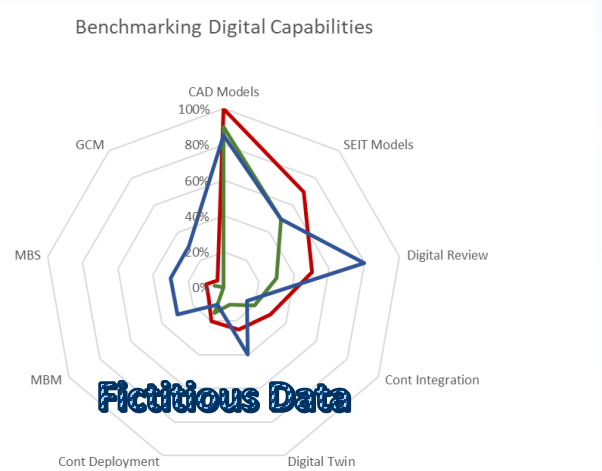
Maturity Model

"A structured collection of elements that describe the characteristics of [capabilities] at different stages of development [i.e. maturity]. It also suggests points of demarcation between stages and methods of transitioning from one stage to another" [1]

Assess maturity against the digital strategy/ goals implemented in the enterprise catalog as a function of adoption

Assess maturity against the industry (the capabilities and the level of adoption) by benchmarking the enterprise catalog against state of industry





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[1] Wendler, R., The maturity of maturity model research: A systemic mapping study, Information and Software Technology 54, 2012, 1317-1339

Developing Survey

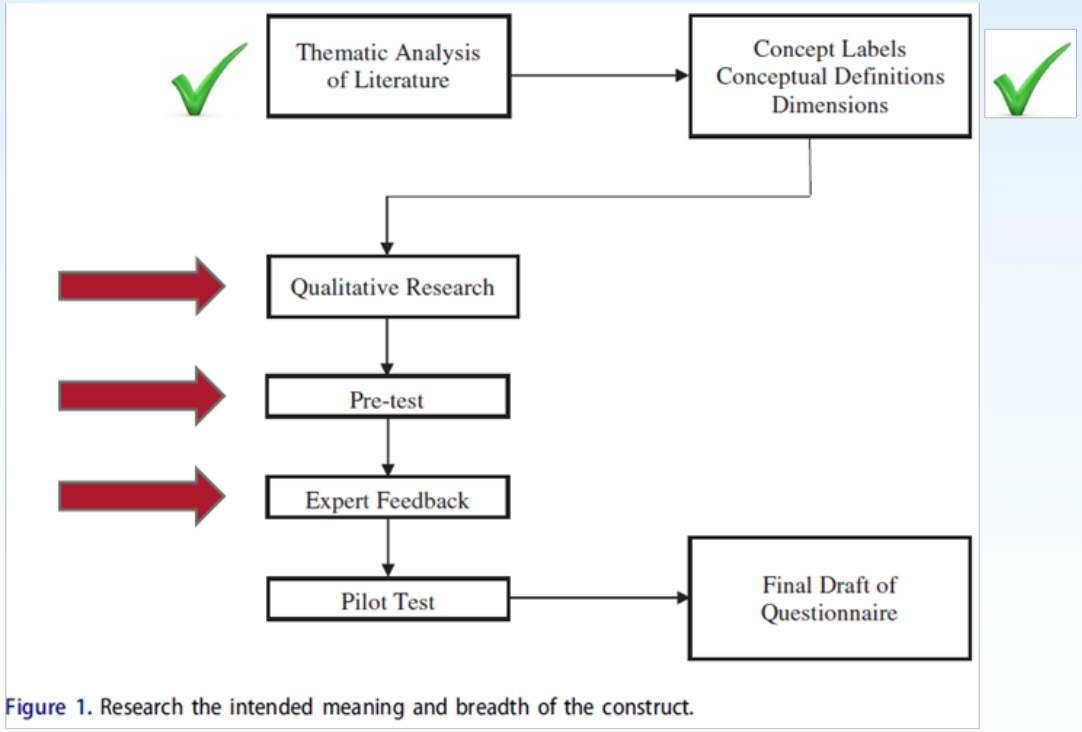


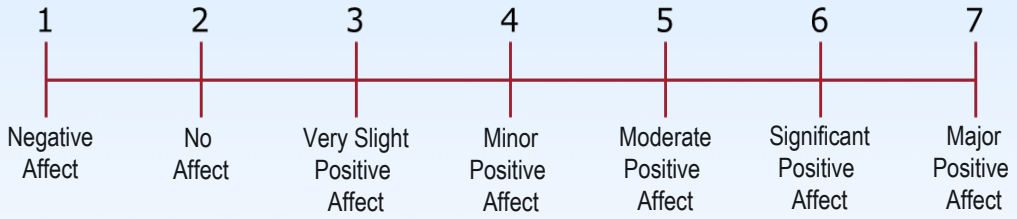
Figure 1. Research the intended meaning and breadth of the construct.

Carpenter, S., **Ten Steps in Scale Development and Reporting: A Guide for Researchers, Communication Methods and Measures**, 12:1, 25-44, 2018
DOI: 10.1080/19312458.2017.1396583

Null Hypothesis 1:
Implementation Framework has no positive affect on each individual strategic adoption influencer

Null Hypothesis 2:
Implementation Framework has no positive affect on strategic adoption

PfM's affect as a FACILITATING CONDITIONS (FC) leading to strategic adoption of DE/DT?



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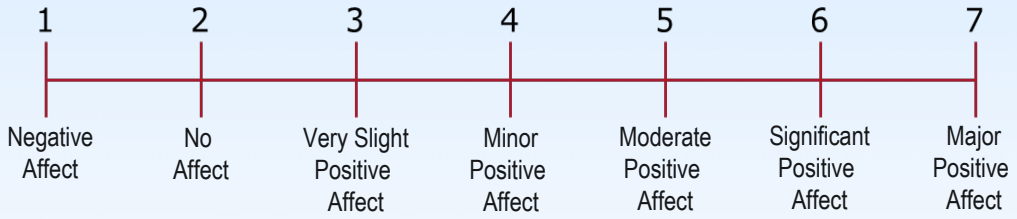
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
1	**Facilitating Conditions**	Do conditions exist within the entity that facilitate adoption of DI/DT?		✔		Championship, Change instruments, Change strategies, Coercive forces, Communication channels, Communication processes, Conflict management, Decision processes, Extrinsic motivation, Facilitating conditions, Innovativeness of the decision-making unit, Interactivity, Leadership, Managerial innovativeness, Network centrality, Network density, Owner/family influence, Performance gap, Presence of champions, Resources, Risk-taking culture, Superior's influence, Time, Timeliness, Top management support, Voluntariness of use

- **Suggested Ways PfM can affect Facilitating Conditions leading to strategic adoption :**
  - PfM catalog of digital innovations/technologies supports VOLUNTARINESS OF USE
  - PfM pipeline demonstrates TOP MANAGEMENT SUPPORT towards funding digital innovation and digital capabilities
  - PfM ensures and demonstrates RESOURCES being applied to digital innovation
  - PfM establishes COMMUNICATION PROCESSES for digital priorities and investments over time
  - PfM can provide COMMUNICATION CHANNELS for experiences, news, information, etc with digital solutions
  - PfM establishes DECISION and CONFLICT MANAGEMENT processes for digital investment priorities
  - PfM establishes CHAMPIONSHIP for digital innovation projects over their lifecycle
  - PfM communicates and supports INNOVATIVENESS OF THE DECISION-MAKING UNIT in the projects selected

PfM's affect on PERCEIVED OUTCOME AND VALUE (POV) leading to strategic adoption of DE/DT?



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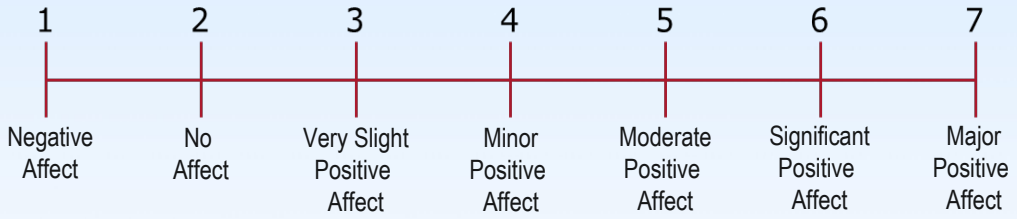
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
2	**Perceived Outcome & Value**	Do I expect positive outcomes and value from my performance or the capabilities of the entity by adopting DI/DT?	✔	✔		Behavioral beliefs and outcome evaluations, Control beliefs and perceived facilitation, Cost benefit, Data quality, Efficiency, Funding requirement, Job relevance, Job fit, Outcome expectancies, Output quality, Perceived direct benefits, Perceived fee, Perceived financial cost, Perceived usefulness, Perceived value, Performance expectancy, Price value, Relative advantage, Result demonstrability, Task outputs, Time to positive cash flow, Total expected discounted benefits, Value network centrality, Value network density

- **Suggested Ways PfM can affect POV leading to strategic adoption :**
  - PfM estimates COST BENEFIT of digital innovation projects as evaluation criteria in Stage-Gate process
  - PfM estimates TIME TO POSITIVE CASH FLOW on digital innovation investments
  - PfM establishes RELATIVE ADVANTAGE over other investments and current practices
  - PfM Catalog can influence OUTCOME EXPECTANCIES, PERCEIVED DIRECT BENEFITS, PERCEIVED USEFULNESS with descriptions and feedback from real users
  - PfM Catalog can influence PERCEIVED BELIEFS AND OUTCOME EVALUATIONS with feedback from real users

PfM's affect on EXTERNAL PRESSURE AND INFLUENCE (EPI) leading to strategic adoption of DE/DT?



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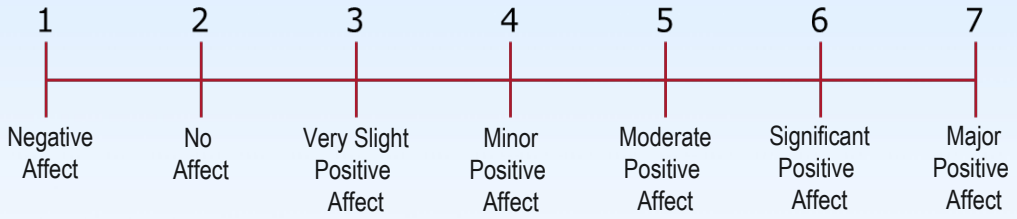
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
3	**External Pressure & Influence**	Do conditions exist outside the entity (in the environment) that influence me or the entity to adopt DI/DT?			✔	Competitive pressures, Consumer readiness, Contracts and agreements, Environmental factors, External variables, Government championship, Government policy, Government regulation, Regulatory environment, Industry adoption, Industry characteristics and market structure, Market structure, Market uncertainty, Market value potential, Maturity of the environment, Mimetic forces, Perceived government pressure, Perceived industry pressure, Regulations and legislations, Regulatory support, Trading partners' readiness

- **Suggested Ways PfM can affect EPI leading to strategic adoption:**
  - PfM can assess EPI factors and make investment decisions based on them
  - PfM can influence GOVERNMENT CHAMPIONSHIP, GOVERNMENT POLICY, GOVERNMENT REGULATION, INDUSTRY ADOPTION if it engages in digital innovation collaboration with the Government
  - PfM can assess MARKET VALUE POTENTIAL and MARKET UNCERTAINTY in its investment decisions

PfM's affect on Operational Alignment (OA) leading to strategic adoption of DE/DT?



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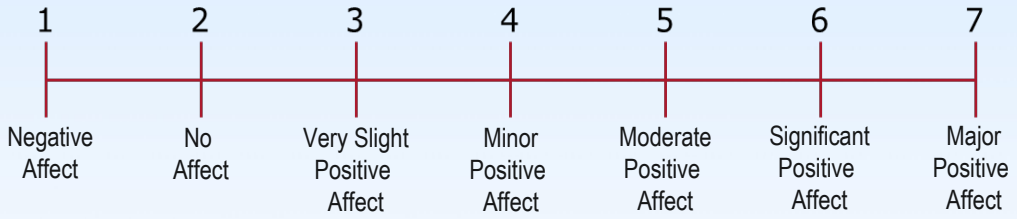
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
4	**Operational Alignment**	Does the DI/DT align with the entity's infrastructure, capabilities, initiatives, processes, and operational requirements?		✔		Alignment with core capabilities, Alignment with other company initiatives, Appropriation of structures, Business processes, Emergent sources of structure, Fit with organizational structure, Functional tracks, Governance, Groups internal system, Information searching behavior, Perceived service quality, Role of IT, Rules, Scope of business operation, Serviceability, Shared infrastructure, Slack, Work pattern

- **Suggested Ways PfM can affect OA leading to strategic adoption:**
  - PfM can ensure digital innovation investment is in ALIGNMENT WITH CORE CAPBILITIES and ALIGNMENT WITH OTHER COMPANY INITIATIVES
  - PfM can ensure proper GOVERNANCE is in place to identify, select, develop, transition, communication, and operate digital innovations
  - PfM can ensure ROLE OF IT supports digital investment

PfM's affect on Social Influence & Status (SIS) leading to strategic adoption of DE/DT?



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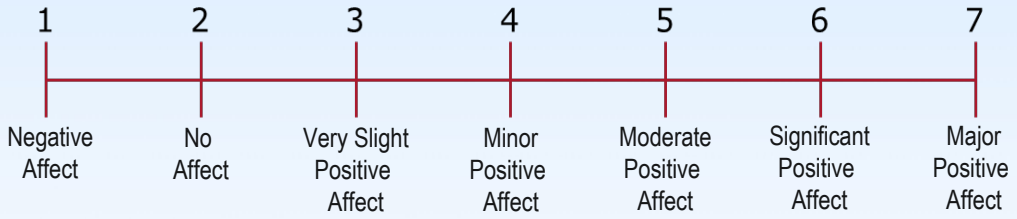
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
5	**Social Influence & Status**	Is there social influence to adopt DI/DT and do I expect my social status within the entity or environment to improve by adopting DI/DT?	✔	✔		Atmosphere, Formal and informal linking structures, Image, Image visibility, New social structures, Normative beliefs and motivation to comply, Participation, Perceived social influences, Relationship, Relative importance of attitudinal and normative considerations, Social factors, Social interaction, Social or peer influence, Styles of interacting, Subjective norms

- **Suggested Ways PfM can affect SIS leading to strategic adoption:**
  - PfM Online Catalog can be utilized as a social media platform for programs to demonstrate PARTICIPATION, obtain IMAGE VISIBILITY, and conduct SOCIAL INTERACTION about their digital innovation usage and experiences
  - Rewards and recognition can be made based on program's use of the digital solutions in the catalog raising their PEER INFLUENCE, IMAGE, and MOTIVATION TO COMPLY

PfM's affect on Technology Requirements and Ecosystem (TRE) leading to strategic adoption of DE/DT?



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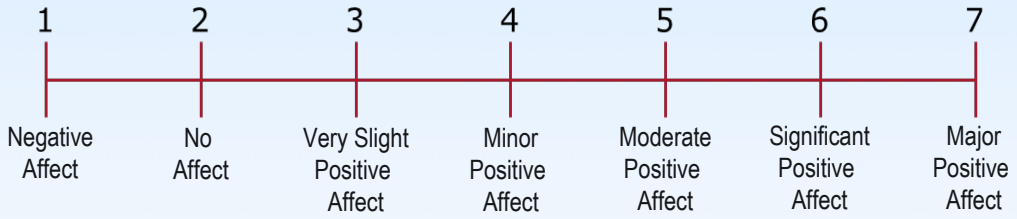
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
6	**Technology Requirements and Ecosystem**	Will the DI/DT under consideration meet the technology requirements for the entity and integrate with the Digital Ecosystem?		✔		Accessibility, Adaptable innovations, Authorization, Availability, Ecosystem, Information exchange, Interoperability, Locatability, Observability, Reliability, Structure of advanced information technology, Technicality, Technology characteristics, Technology integration, Technology support infrastructure, Trialability

- **Suggested Ways PfM can affect TRE leading to strategic adoption:**
  - PfM can ensure technology requirements are considered in the selection and funding of digital innovations – including requirements around ACCESSIBILITY, AVAILABILITY, INTEGRATION, INFORMATION EXCHANGE, LOCATABILITY, RELIABILITY, ADAPTABILITY, SUPPORT, TRIALABILITY, etc.

PfM's affect on Belief Alignment (BA) leading to strategic adoption of DE/DT?



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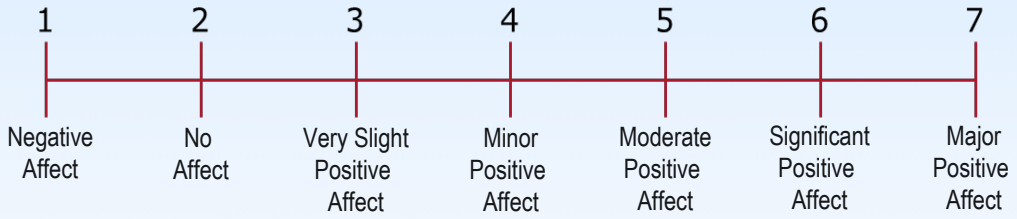
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
7	**Belief Alignment**	Is adopting DI/DT congruent with the beliefs, norms, values, and needs of the individual or entity?	✔	✔		Cognitive based values, Compatibility, Computer self-efficacy, Felt needs/problems of the decision-making unit, Fit with company's culture and values, Normative forces, Norms and cultures, Norms of the social system, Organization mission, Perceived indispensability, Perceptions of external control, Satisfaction with existing systems, Self-efficacy

- **Suggested Ways PfM can affect BA leading to strategic adoption:**
  - PfM can help improve SELF-EFFICACY through related experiences of others in the catalog
  - PfM can help shape NORMATIVE FORCES around the use of digital innovations by promoting and rewarding through the catalog
  - PfM can help execute the ORGANIZATION MISSION

PfM's affect on Demographic Characteristics (DC) leading to strategic adoption of DE/DT?

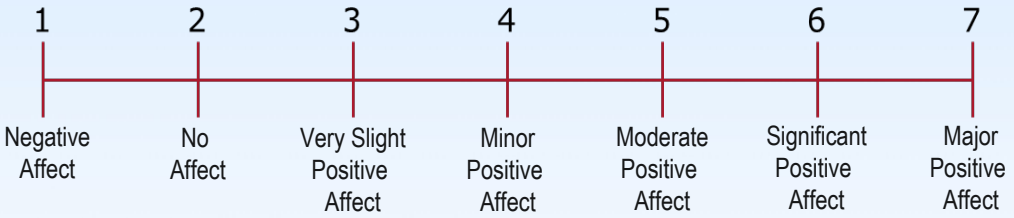


Campagna, J., Bhada, S., **Enterprise Adoption of Digital Engineering: A Literature Review and Recommendations**, submitted to Systems Engineering Journal Special Edition, Wiley, 2023 (under review)

#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
8	**Demographic Characteristics**	Do the individual's or the entity's demographics support adoption of DI/DT (i.e. age, gender, education level, years of experience, job grade, socio-economic, experience with DT/DE, etc.)?	✔	✔		Age, Education, Financial position, Firm size, Gender/gender sensitivity, Group characteristics, Group homogeneity, Knowledge and experience, Other career experiences, Personal factors, Socioeconomic characteristics of the decision-making unit, Socioeconomic roots, Socio-structural factors

- **Suggested Ways PfM can affect DC leading to strategic adoption:**
  - PfM can ensure demographics of resources applied to digital solution lifecycle support strategic adoption including having the appropriate EDUCATION and KNOWLEDGE AND EXPERIENCE, and OTHER CAREER EXPERIENCES

PfM's affect on Effort Expectancy (EE) leading to strategic adoption of DE/DT?



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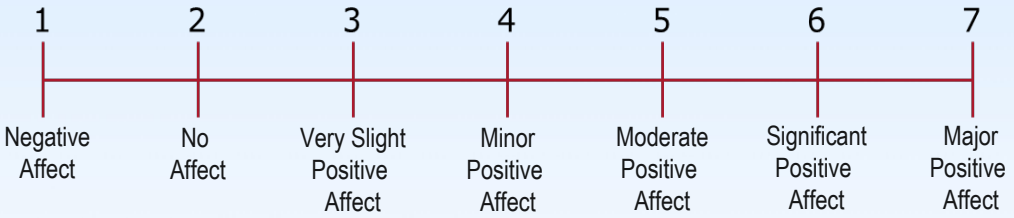
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
9	**Effort Expectancy**	Do I expect the effort associated with adopting DI/DT for me and the entity to be acceptable?	✔	✔		Complexity, Ease of technical implementation, Ease of use, Effort expectancy, Experience, Habit (from experience), Perceived behavioral control, Perceived ease of use, Personnel requirements, Technology competence, Usability, User's ability

- **Suggested Ways PfM can affect EE leading to strategic adoption:**
  - PfM can directly influence the EFFORT EXPECTANCY and PERCEIVED EASE OF USE through a catalog that allows users of digital innovations to share their experiences
  - PfM can communicate PERSONNEL REQUIREMENTS, TECHNOLOGY COMPETENCE requirements, and COMPLEXITY of digital innovation solutions in the catalog

PfM's affect on Perceived Risk (PR) leading to strategic adoption of DE/DT?



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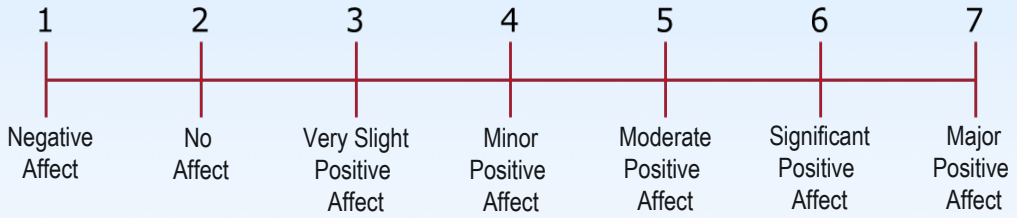
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
10	**Perceived Risk**	Do I trust that the risk to myself or the entity by adopting DI/DT is acceptable?	✔	✔		Long term consequences, Management risk position, Organizational readiness, Perceived barriers, Perceived consequences, Technological readiness, Trust, Trust in digital operations

- **Suggested Ways PfM can affect PR leading to strategic adoption:**
  - PfM pipeline can ensure MANAGEMENT RISK POSITION and LONG-TERM CONSEQUENCES are identified and understood when making investment decisions
  - PfM catalog can communicate TECHNOLOGICAL READINESS for new digital innovations to be adopted
  - PfM can build TRUST in digital solutions offered in the catalog and TRUST IN DIGITAL OPERATIONS that the solutions work as a social media platform within the entity

PfM's affect on Behavioral Affect & Intent (BAI) leading to strategic adoption of DE/DT?



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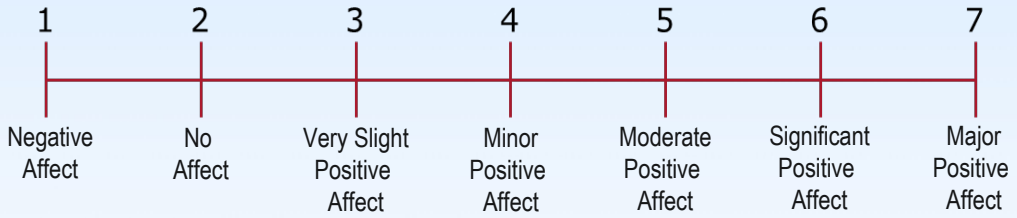
#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
11	**Behavioral Affect & Intent**	Do I have or expect to have positive feelings toward adopting DI/DT?	✔			Affect, Anxiety, Attitude toward behavior, Behavioral intention, Enjoyment/perceived enjoyment, Hedonic motivation, Perceptions, Playfulness, User's willingness

- **Suggested Ways PfM can affect BAI leading to strategic adoption:**
  - PfM catalog can AFFECT BEHAVIORAL INTENTION and USER'S WILLINGNESS, and reduce ANXIETY around adoption by demonstrating digital solutions are available and working

PfM's affect on Strategic Alignment (SA) leading to strategic adoption of DE/DT?



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#	Affinitized Adoption Factor Category	General question to be answered for each affinitized category	Individual within entity	Entity	Environment external to Entity	Affinitized Adoption Factors
12	**Strategic Alignment**	Does the DI/DT align with the entity's stated strategic goals and objectives?		✔		Goals, Strategic fit, Strategic planning

- **Suggested Ways PfM can affect SA leading to strategic adoption:**
  - PfM can ensure STRATEGIC PLANNING, GOALS and STRATEGIC FIT are used to drive digital investment

Path Forward

- Online Survey
  - Likert-type data is how an implementation framework affects each of 12 SAIs
  - Likert-scale data is how an implementation framework affects strategic adoption overall (considering all 12 SAIs)
  - Seeking databases of engineers and managers in defense-related engineering entities
- Collect and Analyze Results
- Publish

Table 3.
Suggested Data Analysis Procedures for Likert-Type and Likert Scale Data

	Likert-Type Data	Likert Scale Data
Central Tendency	Median or mode	Mean
Variability	Frequencies	Standard deviation
Associations	Kendall tau B or C	Pearson's *r*
Other Statistics	Chi-square	ANOVA, t-test, regression

Boone, H.N., Boone, D.A., Analyzing Likert Data, Journal of Extension, Volume 50, Number 2, April 2012; http://www.joe.org/joe/2012april/tt2p.shtml

How this can help

- **Benefits**
  - Method for applying existing and robust adoption research to DE/DT
  - Practical implementation guidance based on sound research to address problems of haphazard and slow adoption
  - Select and design strategic adoption plans with greater confidence
  - Self Assessment model for Enterprises with respect to Strategic Adoption of DE/DT
- **Limitations/Further Research**
  - Relative importance of SAI's is not understood (no weighting to them)
  - Research will focus on one or two implementation frameworks (e.g., PfM, MM)

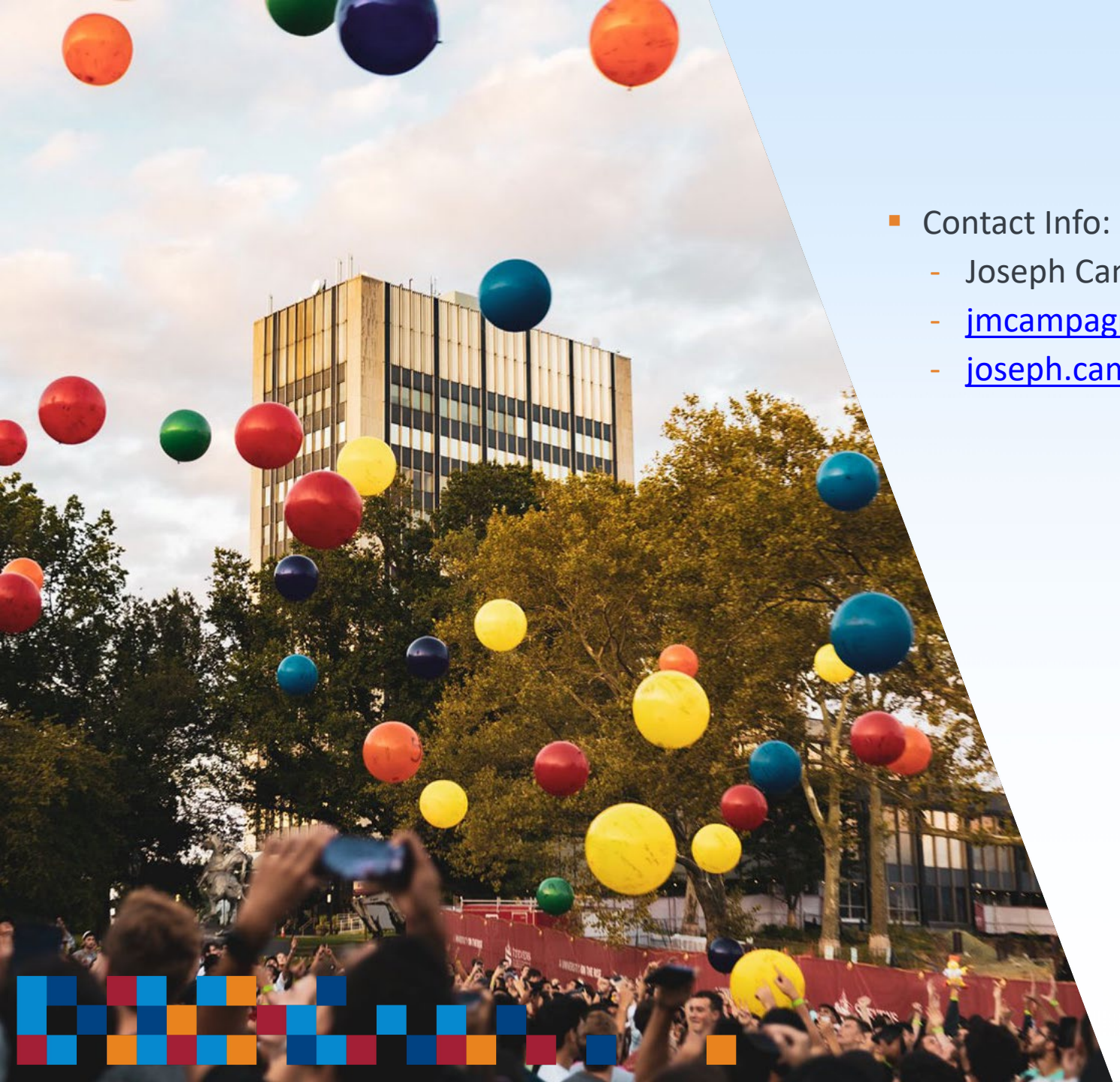
Designing an enterprise DE/DT plan to accelerate adoption

Strategic Adoption Influencer (SAI)	PfM	MM	AM	SPR	PrM	CM	DSM
Facilitating Conditions (FC)	+++	+++	+++	++	+++	++	+++
Perceived Outcome and Value (POV)	++	+	++	+	++	+	++
External Pressure and Influence (EPI)	-	+	-	+	-	+	-
Operational Alignment (OA)	++	+++	++	+++	+++	+++	+++
Social Influence & Status (SIS)	+++	++	+++	++	+	+++	+++
Technology Requirements & Ecosystem (TRE)	++	+				+	++
Belief Alignment (BA)	-						-
Demographic Characteristics (DC)	++	+++	++	+++	+++	+	++
Effort Expectancy (EE)	++	+	++	+	++	+	++
Perceived Risk (PR)	-	+	-	+	-	+	++
Behavioral Affect & Intent (BAI)	+++	+++	++	++	+++	+++	-
Strategic Alignment (SA)	++	+	++	+	++	+	++

Fictitious Data for Illustrative Purposes Only

Legend:
- **AM**: Activity Management
- **CM**: Change Management
- **DSM**: Digital Service Model
- **MM**: Maturity Model
- **PfM**: Portfolio Management
- **PrM**: Project Management
- **SPR**: Strategic Planning & Renewal

Legend:
- **+++**: Strong Affect
- **++**: Moderate Affect
- **+**: Little Affect
- **-**: No affect or negative affect



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THANK YOU

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