32nd Annual INCOSE international symposium
hybrid event
Detroit, MI, USA
June 25 - 30, 2022

Enabling the Systems Engineering Education Ecosystem (SEEE)

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Entering Industry 4.0

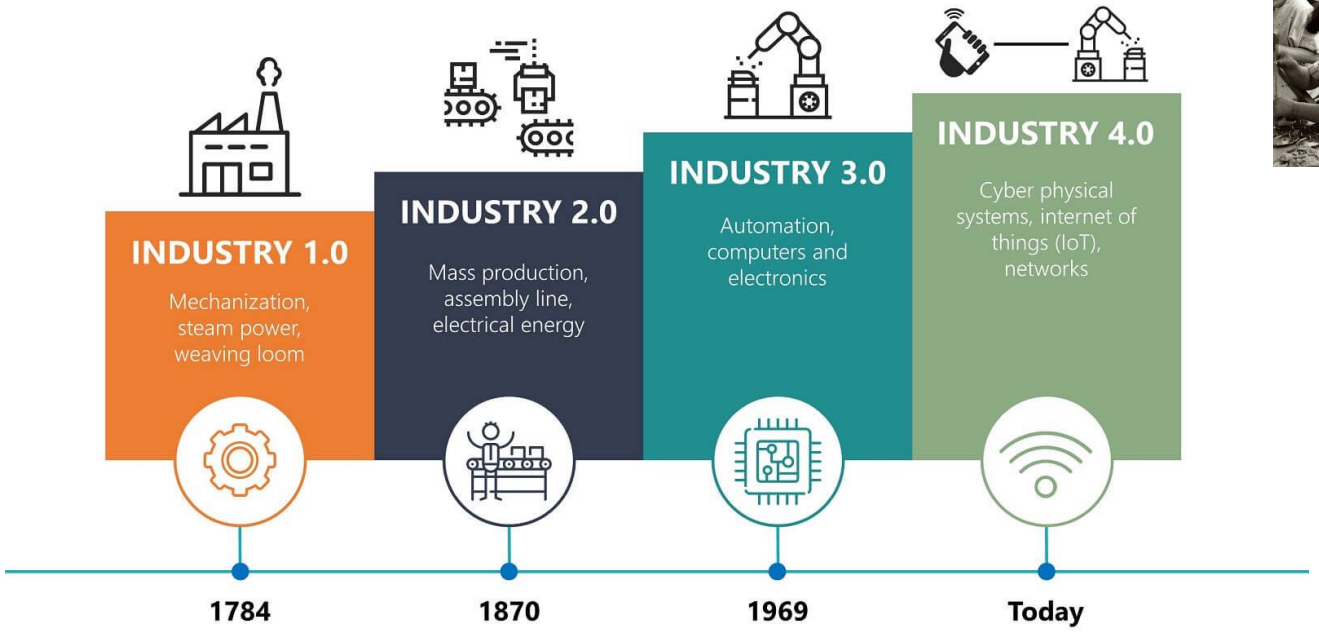


Image Credit: International Business Times

Moving from Education 2.0

To Education 4.0

The Power of Digitalization: extracting value from data

Exploiting the digital power of
computation, AI/ML, visualization and communication
to take better, faster actions

- **Simulated world**
- **Experimental data**
- **Observed world**

Dynamic System Validation

Virtual

Physical

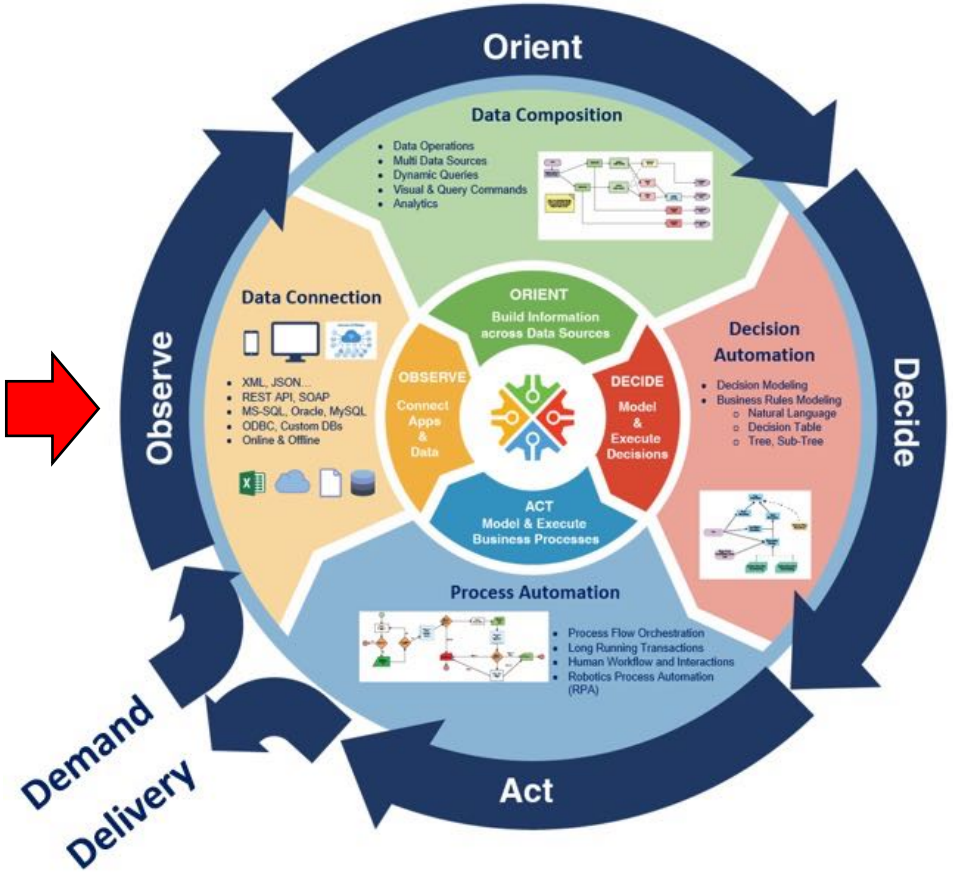


Image Credit: Flexrule ™

Collaborative Intelligence

I reached the formulation that a weak human player plus machine plus a better process is superior, not only to a very powerful machine, but most remarkably, to a strong human player plus machine plus an inferior process.

– Garry Kasparov

IBM's Deep Blue

World Champion Garry Kasparov

Imagine a world…

- In which program and course outcomes are driven by the needs of a sustainable planet
- Where the “classroom” is a social real-time experience in which the instructor and student work together to achieve their learning outcome, with experiences optimized for individual
- And students have a personal assistant which can accompany their life-time learning journey.

Dynamically Adaptive Education

Systems Engineering Education Ecosystem

UC San Diego JACOBS SCHOOL OF ENGINEERING

Missouri S&T

Denver CU IN THE CITY

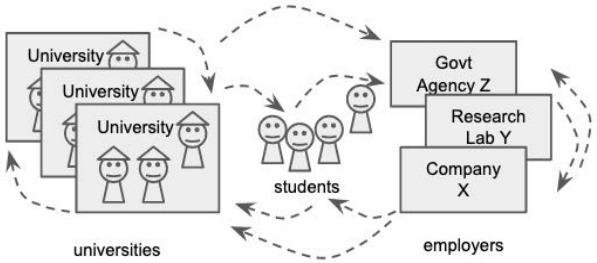
	Program & Course Design	Classroom Experience	Individual Learning
Graduate Students	- Institution application & enrollment - Degree/major selection - Course selection - Class/instructor selection	- Determination of when and how to study - Selection of learning materials (lectures, reading, videos, etc.) - Determination of where to work to use skills	- Determination of personal interests - Development of knowledge production skills (e.g., Web search) - Selection of online resources for knowledge acquisition

	Program & Course Design	Classroom Experience
Academic Institution & Instructors	- Program topic and target student selection - Program learning outcomes and objectives specification - Course topic: outcomes and objectives specification - Course design: curricula, pedagogy, and assessment - Determination of which educational applications to provide to instructors - Determination of whom to admit into programs and classes - Allocation of resources, including assignment of instructors to classes, room assignments, lab, funding of TA's, tutors, graders - Determination of tuition and other educational costs	- Determination of how to present materials - Determination of which educational applications to use in instruction - Determination of how to answer questions and interact with students - Determination of how to update and add to course materials - Determination of how to assess students and provide feedback - Determination and application of grading policy

	Program & Course Design
Employers	- Determination of necessary skills for employees in the workplace - Determination of which schools to support with partnerships and funding - Determination of which schools to actively recruit students - Determination of which students to interview - Determination of which students to hire as interns, coops and permanent employees - Determination of which programs are eligible for professional education reimbursement - Determination of which employees to reimburse for professional education

PROGRAMS

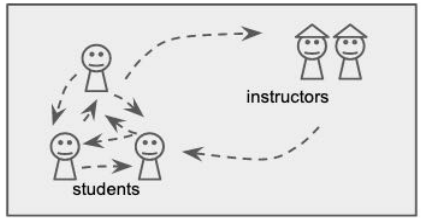
Educational Program Evolution (EPE)



Diversifying and expediting feedback exchange between students, universities, and employers to accelerate the evolution of educational programs.

CLASSROOMS

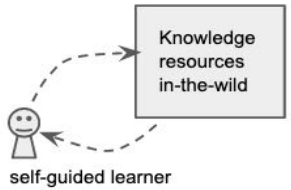
Social Real-time Learning (SLR)



Making the feedback loop b/n students and instructors more relevant, timely, automated and actionable

INDIVIDUALS

Personalized Knowledge Discovery (PKD)



Creating and testing new feedback mechanisms to support self-guided learning by graduate students

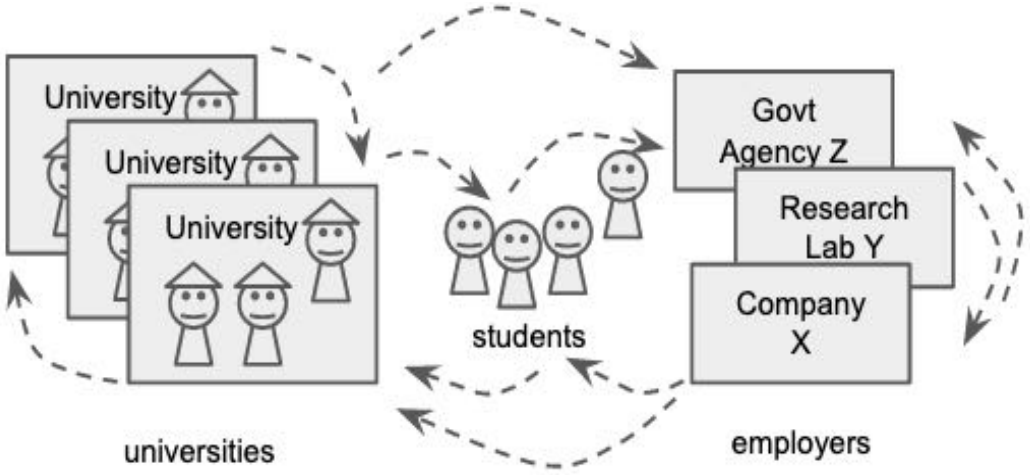
Educational Program Evolution

Objective: Create the feedback loops by which educators, students and employers can communicate their specific educational capabilities, desires and needs, to provide the dynamic feedback necessary to accelerate the evolution of educational programs.

Hypothesis: A non-profit website can be developed that presents specific graduate engineering program information which, accompanied with analytic tools, can assist students, educators, and employers to efficiently and effectively make education, program and employment decisions.

Systems Engineering Education Ecosystem

Systems Engineering Education Ecosystem (SEEE)



Diversifying and expediting feedback exchange between students, universities, and employers to accelerate the evolution of educational programs.

Our Values

- ***Preserve the uniqueness of SE programs*** that speak to particular varieties of students and professions
- ***Promote commonality*** among programs where it is beneficial
- ***Provide support for program evolution*** *to adapt to changing needs*, and thereby
- ***Enhance the value of all of our programs***.

Competency Framework Requirements

- Focus is on systems graduate education
- Structure should reflect academic classifications
- Need to capture competencies across multiple disciplines:
  - Systems Engineering
  - Industrial Engineering
  - Operations Research
  - Data analytics
  - Engineering Management
- Should provide balanced view of competencies
- Taxonomy should aid in easy navigation
- Language should be jargon free and clear to students/practitioners, employers and academics

INCOSE Competency Framework

Understand	Lead	Realize	Design

CORE COMPETENCIES

Core competencies underpin engineering as well as systems engineering.

Systems Thinking	The application of the fundamental concepts of systems thinking to systems engineering;
Lifecycles	Selection of the appropriate lifecycles in the realization of a system;
Capability Engineering	An appreciation of the role the system of interest plays in the system of which it is a part;
General Engineering	Foundational concepts in mathematics, science and engineering and their application;
Critical Thinking	The objective analysis and evaluation of a topic in order to form a judgement;
Systems Modeling and Analysis	Provision of rigorous data and information including the use of modeling to support technical understanding and decision making.

PROFESSIONAL COMPETENCIES

Behavioral competencies well-established within the Human Resources (HR) domain. To facilitate alignment with existing HR frameworks, where practicable, competency definitions have been taken from well-established, internationally-recognized definitions rather than partial or complete re-invention by INCOSE.

Communications	The dynamic process of transmitting or exchanging information;
Ethics and Professionalism	The personal, organizational, and corporate standards of behavior expected of systems engineers;
Technical Leadership	The application of technical knowledge and experience in systems engineering together with appropriate professional competencies;
Negotiation	Dialogue between two or more parties intended to reach a beneficial outcome where difference exist between them;
Team Dynamics	The unconscious, psychological forces that influence the direction of a team's behavior and performance;
Facilitation	The act of helping others to deal with a process, solve a problem, or reach a goal without getting directly getting involved;
Emotional Intelligence	The ability to monitor one's own and others' feelings and use this information to guide thinking and action;
Coaching and Mentoring	Development approaches based on the use of one-to-one conversations to enhance an individual's skills, knowledge or work performance.

MANAGEMENT COMPETENCIES

The ability to perform tasks associated with controlling and managing Systems Engineering activities. This includes tasks associated with the Management Processes identified in the INCOSE SE Handbook.

Planning	Producing, coordinating and maintaining effective and workable plans across multiple disciplines;
Monitoring and Control	Assessment of an ongoing project to see if the current plans are aligned and feasible;
Decision Management	The structured, analytical framework for objectively identifying, characterizing and evaluating a set of alternatives;
Concurrent Engineering	A work methodology based on the parallelization of tasks;
Business and Enterprise Integration	The consideration of needs and requirements of other internal stakeholders as part of the system development;
Acquisition and Supply	Obtaining or providing a product or service in accordance with requirements;
Information Management	Addresses activities associated with all aspects of information, to provide designated stakeholders with appropriate levels of timeliness, accuracy and security;
Configuration Management	Ensuring the overall coherence of system functional, performance and physical characteristics throughout its lifecycle;
Risk and Opportunity Management	The identification and reduction in the probability of uncertain events, or maximizing the potential of opportunities provided by them,

TECHNICAL COMPETENCIES

The ability to perform tasks associated primarily with the suite of Technical Processes identified in the INCOSE SE Handbook.

Requirements Definition	To analyze the stakeholder needs and expectations to establish the requirements for a system;
System Architecting	The definition of the system structure, interfaces and associated derived requirements to produce a solution that can be implemented;
Design for...	Ensuring that the requirements of all lifecycle stages are addressed at the correct point in the system design;
Integration	The logical process for assembling a set of system elements and aggregates into the realized system, product or service;
Interfaces	The identification, definition and control of interactions across system or system element boundaries;
Verification	A formal process of obtaining objective evidence that a system fulfils its specified requirements and characteristics;
Validation	A formal process of obtaining objective evidence that the system achieves its intended use in its intended operational environment;
Transition	Integration of a verified system into its operational environment including the wider system of which it forms a part;
Operation and Support	When the system is used to deliver its capabilities, and is sustained over its lifetime.

INTEGRATING COMPETENCIES

This competency group recognizes Systems Engineering as an integrating discipline, joining activities and thinking from specialists in other disciplines to create a coherent whole.

Project Management	Identification, planning and coordinating activities to deliver a satisfactory system, product, service of appropriate quality;
Finance	Estimating and tracking costs associated with the project;
Logistics	The support and sustainment of a product once it is transitioned to the end user;
Quality	Achieving customer satisfaction through the control of key product characteristics.

Competency Areas

Lead – Personal and interpersonal competencies related to emotional IQ, ethics and professionalism, critical thinking, teamship and communication skills. These capabilities serve to amplify the impact of the other competencies. This is traditionally the domain of the Arts and Humanities.

Design – Synthesis competencies that enable system design through the lifecycle of conceptualization, architecture, implementation and sustainment. These competencies support the creative design process including design thinking, engineering design, and systems engineering. This is traditionally the domain of Engineering.

Understand – Analytical competencies relating to understanding, creating and using systems models, including systems thinking, modeling and simulation, experimentation, and analysis and decision making. These competencies provide support for decision making. This is traditionally the domain of the Sciences.

Realize – Management and control competencies that support the actual realization of systems including business fundamentals, lifecycle management, monitoring and control, and operations. These competencies enable the realization and execution of the engineering of systems. This is traditionally the domain of Business and Management

INCOSE to SEEE Translation

	INCOSE Area	INCOSE Competency	SubArea
LEAD	Professional	Emotional Intelligence	Self-ethics
	Professional	Ethics & Professionalism	Self-ethics
	Professional	Technical Leadership	Vision & How
	Core	Critical Thinking	Vision & How
	Professional	Team Dynamics	Team
	Professional	Facilitation	Team
	Professional	Communications	Communication
	Professional	Negotiation	Communication
	Professional	Coaching and Mentoring	Communication

INCOSE to SEEE Translation (cont.)

	INCOSE Area	INCOSE Competency	SubArea
UNDERSTAND	Core	Systems Thinking	Abstraction
	Core	***Systems Modeling*** & Analysis	Model
		??? Missing area	Experiment
	Core	Systems Modeling & ***Analysis***	Analysis & Decision Making
	Management	Decision Management	Analysis & Decision Making
	Core	General Engineering	Foundation: Pre Graduate School

Very few competencies in systems thinking, modeling and simulation and analysis. Missing Experimentation.

U1 Systems Thinking (pg. 39)
U1.1 Conceptual models & abstractions
U1.2 Complex Adaptive Systems
U1.3 System Identification & Relationships
U1.4 System Dynamics
U2 Experimentation
U2.1 Designing Experiments
U2.2 Single Factor Experiments
U2.3 Factorial Designs
U2.4 Fractional Factorial Designs
U3 Modeling & Simulation (pg. 44)
U3.1 System Computational Modeling Principles
U3.2 Continuous & Discrete Simulations
U3.3 Decision making: central & distributed, fixed vs. runtime
U3.4 Evaluation of Capability, Effectiveness & Efficiency
U4 Analysis & Decision Making (pg. 65)
U4.1 Decision-Making Principles
U4.2 Data Analytics & Visualization
U4.3 H/M Interaction, AI & ML techniques
U4.4 Uncertainty & Risk Assessment

INCOSE to SEEE Translation (cont.)

	INCOSE Area	INCOSE Competency	SubArea
DESIGN	Core	Capability Engineering	Conceive
	Technical	Requirements Definition	Conceive
	Technical	System Architecting	Architect & Design
	Technical	Design for…	Architect & Design
	Technical	Interfaces	Architect & Design
	Technical	Integration	Implement
	Technical	Verification	Implement
	Technical	Validation	Implement
	Technical	Transition	Operate
	Technical	Operation and Support	Operate

INCOSE to SEEE Translation (cont.)

	INCOSE Area	SubArea	INCOSE Competencies
REALIZE	Management	Business Fundamentals	Business and Enterprise Integration
	Integrating	Business Fundamentals	Finance
	Core	Lifecycle Management	Lifecycles
	Integrating	Lifecycle Management	Project Management
	Management	Lifecycle Management	Planning
	Management	Lifecycle Management	Concurrent Engineering
	Management	Monitoring & Control	Risk and Opportunity Management
	Management	Monitoring & Control	Monitoring and Control
	Integrating	Monitoring & Control	Quality
	Management	Operations	Acquisition and Supply
	Management	Operations	Information Management
	Management	Operations	Configuration Management
	Integrating	Operations	Logistics

Systems Engineering Competencies

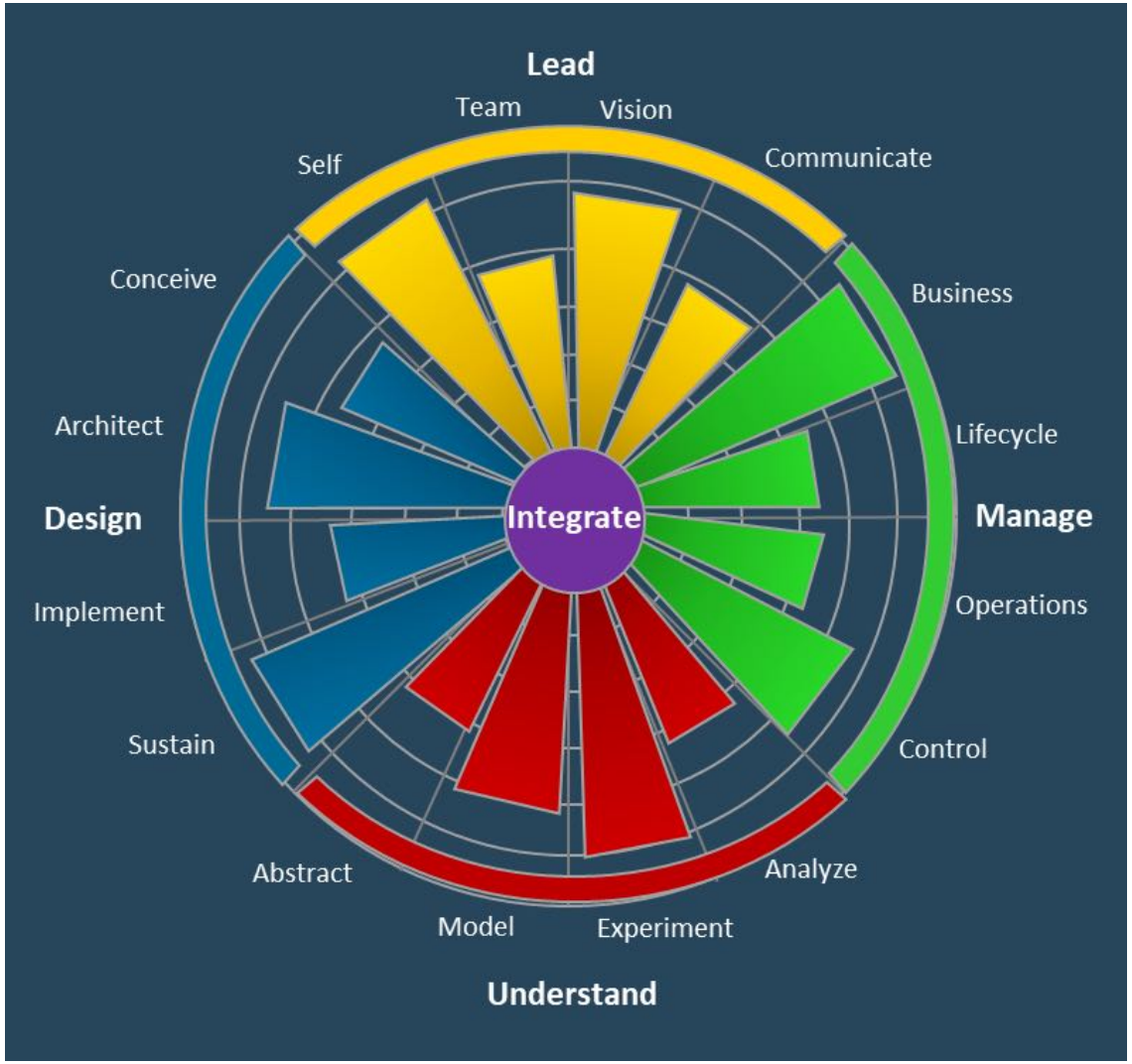
	SubArea	ID	INCOSE Competencies	NCG (Mean) D	NCG (Mean) A	NCG (Mean) G	MCE (Mean) D	MCE (Mean) A	MCE (Mean) G
LEAD	Self/Ethics	L1.1	Emotional Intelligence	2.11	1.53	0.65	3.44	2.76	0.76
	Self/Ethics	L1.2	Ethics & Professionalism	2.78	1.82	1.00	3.94	3.18	0.82
	Vision/Strategy	L2.1	Technical Leadership	1.72	1.18	0.53	3.59	2.75	0.88
	Vision/Strategy	L2.2	Critical Thinking	2.50	1.82	0.65	3.71	3.13	0.56
	Team	L3.1	Team Dynamics	2.33	1.82	0.47	3.47	2.63	0.81
	Team	L3.2	Facilitation	1.67	1.18	0.47	3.35	2.38	0.94
	Communication	L4.1	Communications	2.39	1.41	1.00	3.65	2.75	0.94
	Communication	L4.2	Negotiation	1.44	0.94	0.53	3.12	2.31	0.81
	Communication	L4.3	Coaching and Mentoring	1.17	0.88	0.29	3.12	2.38	0.81
			Mean	2.01	1.40	0.62	3.49	2.69	0.82
			Std Dev	0.54	0.38	0.24	0.27	0.31	0.11

	SubArea	ID	INCOSE Competencies	NCG (Mean) D	NCG (Mean) A	NCG (Mean) G	MCE (Mean) D	MCE (Mean) A	MCE (Mean) G
UNDERSTAND	Abstraction	U1.1	Systems Thinking	2.28	1.00	1.24	3.76	2.75	1.00
	Experimentation	U2.1	*Design of Experiments**	2.06	1.29	0.76	3.53	2.69	0.81
	Modeling	U3.1	Systems Modeling & Analysis	1.89	1.24	0.65	3.65	2.44	1.19
	Analysis & Decisi	U4.1	Decision Management	1.83	1.12	0.65	3.53	2.56	0.94
	General Engineer	N/A	General Engineering	2.28	1.82	0.41	3.76	3.19	0.56
			Mean	2.07	1.29	0.74	3.65	2.73	0.90
			Std Dev	0.21	0.32	0.30	0.12	0.29	0.23

	SubArea	ID	INCOSE Competencies	NCG (Mean) D	NCG (Mean) A	NCG (Mean) G	MCE (Mean) D	MCE (Mean) A	MCE (Mean) G
DESIGN	Conceive	D1.1	Capability Engineering	1.25	0.80	0.40	3.25	2.33	0.87
	Conceive	D1.2	Requirements Definition	1.75	1.13	0.60	3.88	3.27	0.60
	Architect & Desig	D2.1	System Architecting	1.38	0.87	0.47	3.44	2.40	1.00
	Architect & Desig	D2.2	Design for…	1.38	0.73	0.60	3.19	2.53	0.67
	Architect & Desig	D2.3	Interfaces	1.63	1.20	0.40	3.50	2.87	0.67
	Implement	D3.1	Integration	1.50	1.07	0.40	3.50	3.00	0.53
	Implement	D3.2	Verification	1.56	1.00	0.53	3.56	3.00	0.53
	Implement	D3.3	Validation	1.50	0.93	0.53	3.50	2.80	0.67
	Operate	D4.1	Transition	1.25	0.79	0.43	3.19	2.71	0.50
	Operate	D4.2	Operation and Support	1.25	0.71	0.50	3.19	2.64	0.57
			Mean	1.44	0.92	0.49	3.42	2.76	0.66
			Std Dev	0.17	0.17	0.08	0.22	0.29	0.16

	SubArea	ID	INCOSE Competencies	NCG (Mean) D	NCG (Mean) A	NCG (Mean) G	MCE (Mean) D	MCE (Mean) A	MCE (Mean) G
REALIZE	Business Fundam	R1.1	Business and Enterprise Int.	1.06	0.43	0.64	2.94	2.07	0.86
	Business Fundam	R1.2	Finance	1.00	0.50	0.50	2.69	1.86	0.79
	Lifecycle Manage	R2.1	Lifecycles	1.25	0.71	0.57	3.19	2.43	0.79
	Lifecycle Manage	R2.2	Project Management	1.25	0.57	0.64	2.88	2.40	0.40
	Lifecycle Manage	R2.3	Planning	1.63	0.93	0.71	3.38	2.71	0.71
	Lifecycle Manage	M2.4	Concurrent Engineering	1.50	0.64	0.79	3.31	2.71	0.64
	Monitoring & Co	R3.1	Risk and Opportunity Mgmt	1.44	0.86	0.57	3.38	2.57	0.86
	Monitoring & Co	R3.2	Monitoring and Control	1.44	0.79	0.64	3.25	2.43	0.86
	Monitoring & Co	R3.3	Quality	1.56	1.00	0.50	3.44	2.57	0.86
	Operations	R4.1	Acquisition and Supply	0.88	0.50	0.29	2.88	2.27	0.67
	Operations	R4.2	Information Management	1.40	0.77	0.62	3.25	2.71	0.64
	Operations	R4.3	Configuration Management	1.31	0.71	0.57	3.50	2.79	0.79
	Operations	R4.4	Logistics	1.00	0.50	0.43	2.69	2.14	0.57
			Mean	1.29	0.69	0.57	3.13	2.44	0.72
			Std Dev	0.24	0.18	0.13	0.29	0.29	0.14

SE Competency Framework



Focus on the discipline of Systems Engineering (SE) which in its nascence is extremely broad, ill-defined, and rapidly changing.

- Superset of INCOSE framework
- Consists of 37 base competencies
- Five proficiency levels:
  - Awareness
  - Supervised Practitioner
  - Practitioner
  - Lead Practitioner
  - Expert
- Reviewed with employers, academia, and practitioners

Use Cases: Students/Practitioners

Case 1: Student/Practitioners - SE Masters Program Selection

1. Creates account
2. Select employers & position of interest
3. Reviews competencies
4. Compares competencies between employers & positions
5. Saves/builds reference competency
6. Enters their current competency
7. Creates deficit/gaps profile
8. Searches for university programs that fill the gaps or for materials from **INCOSE Professional Development Portal**
9. Finds programs and interest and navigates to their home pages
10. Finds all the information needed to make an education decision

Use Cases: Students/Practitioners

Case 2A: Student/Practitioner - Program Request

1. Does not find SE program of interest on SEEE site.
2. Clicks on are request for the program to be entered into system
3. Notification is emailed to the institution of interest and/or to the SEEE administrator

Case 2B: Current SE Student - Program Feedback

1. Navigates to current SE program
2. Checks out the competencies taught in a course he/she has taken
3. Clicks on various competencies to see how they trace back to the course
4. Notes some competences that are missing or greatly lacking in course that was taken
5. Clicks on evaluation button and notes approval or disapproval of the competency
6. Information is sent anonymously to the university in question and is also sent to the SEEE administrative staff. If competencies receive significant disapproval, the SEEE administration contacts the university program POC to discuss the issue.

Use Cases: Students/Practitioners

Case 3: Graduating SE Student/Practitioner – Job Selection

1. Creates profile with personal information, completed program, pointer to CV
2. Searches for positions for matches and ones of interest
3. Selects which ones can have access to his/her information
4. Information is sent to employer who may contact the student/practioner and email is sent to student/practitioner notifying him/her of the action.

Use Cases: Employer

Case 1: Employer in Student/Practitioner Recruiting - Entering Position Information

1. Creates account with corporate information as the contact point and submits this for approval.
2. SEEE administrative staff contacts the employer via email and confirms that she/he is authorized to represent her/his organization
3. Email is sent to employer informing of this decision
4. Enters website, goes to his employer's profile page and completes the competency details and other information for the open positions.
5. Once SEEE reviews and approves, these profiles are made available on the website

Case 2: Employer in Student/Practitioner Recruiting – Student/Practitioner selection

1. Logs into previously created account
2. Searches for competency matches of the students/practitioners who have submitted accessible profiles
3. Contacts students/practioners of interest via means specified on their profile (outside of SEEE site)

Use Cases: University

Case 1: University Program Director - Entering Program Information <very similar to employer Case #1>

1. Creates account with university information as the contact point and submits this for approval.
2. SEEE administrative staff contacts the university representative via email and confirms that he/she is authorized to represent her/his organization
3. Email is sent to informing of this decision
4. Enters website, goes to university's profile page and completes the competency details and other information for the selected degree programs.
5. Once SEEE reviews and approves, these profiles are made available on the website

Use Cases: University

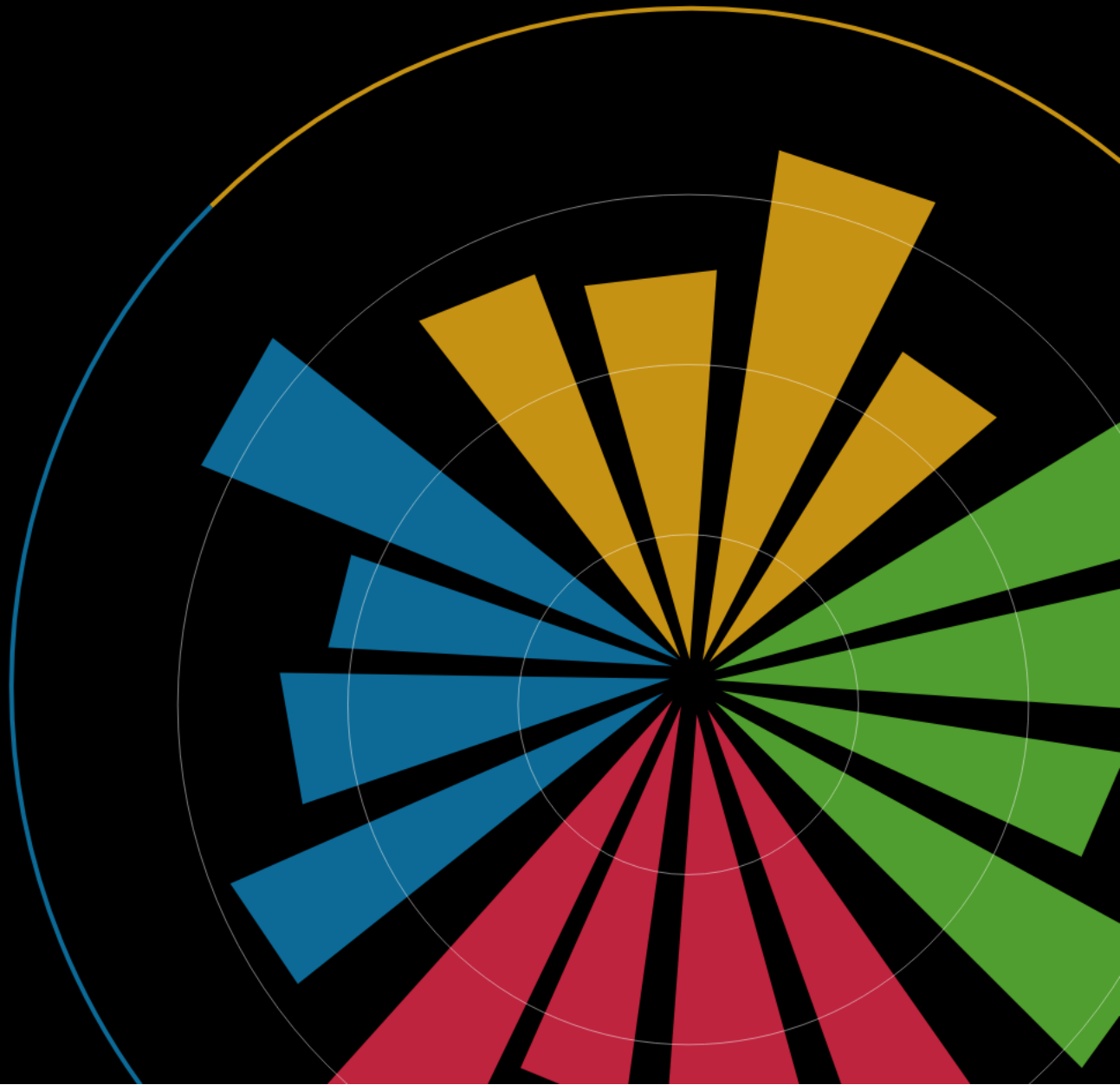
Case 2: – University Academics - SE Program/Course Development <very similar to STUDENT/PRACTIONER Case #1>

1. Creates a personal account
2. Navigates to Views page and selects employer's specific positions
3. Finds matching university programs (including her/his own)
4. Finds how well these programs match the position's needs
5. Looks are relative advantages of each program, checking on individual competencies and how courses and curriculum is structured to support them
6. Compares this with his/her program competencies
7. Determines what program and courses might need improvement or change

SYSTEMS ENGINEERING EDUCATION ECOSYSTEM

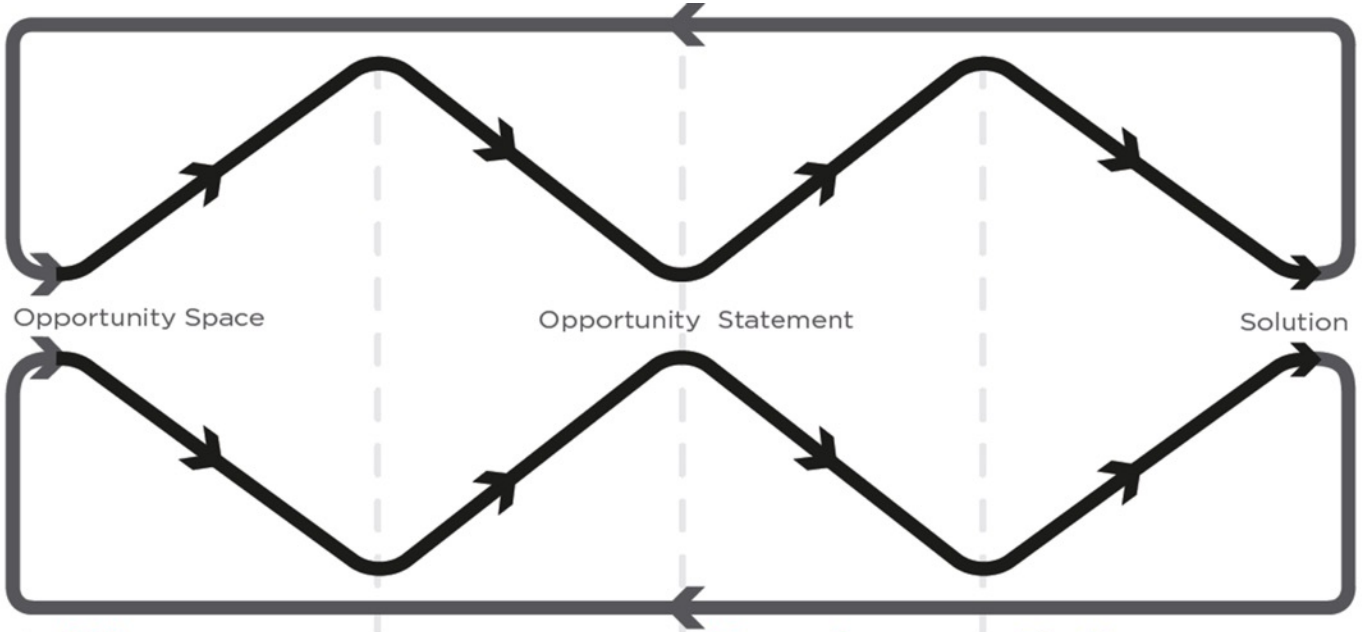
Creating an Ecosystem for Systems Engineering Education

CREATE A PROFILE



Design Innovation Process

The 4 D's
Discover
Define
Develop
Deliver



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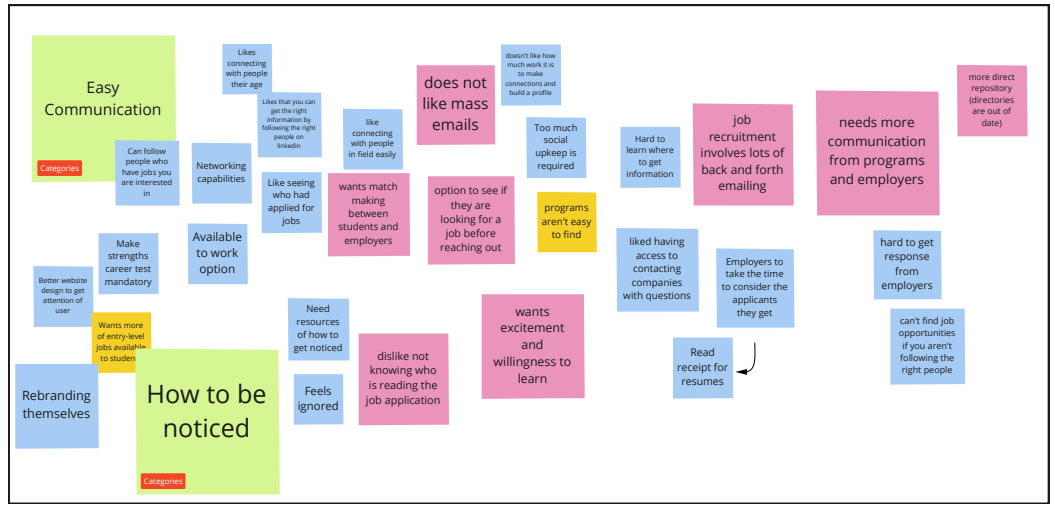
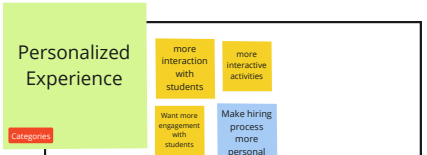
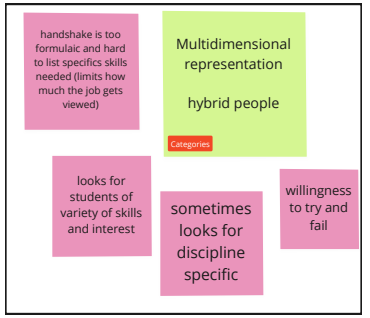
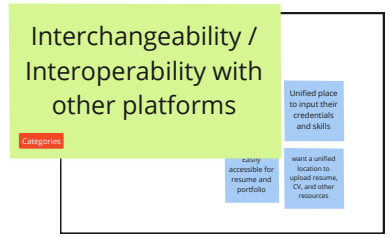
Discover: Uncovering User Needs

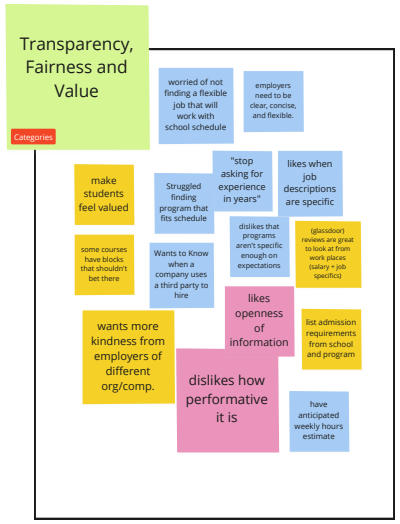
User interviews and affinity analysis (collaborative clustering) uncovers emergent themes and latent needs to be addressed by the SEEE Portal.

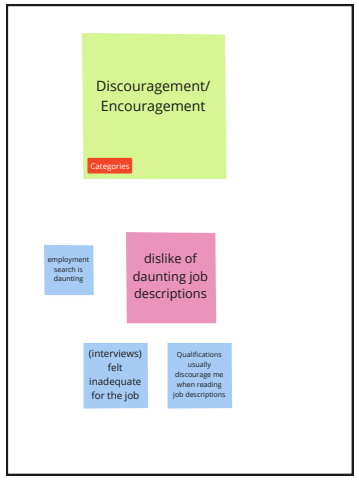


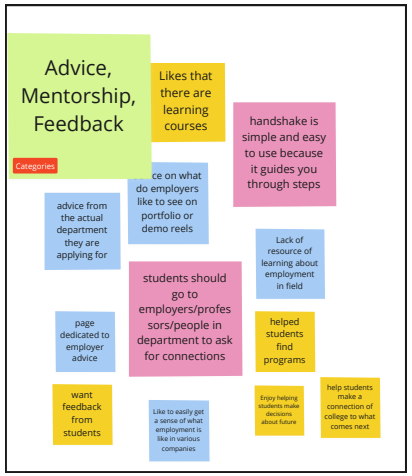


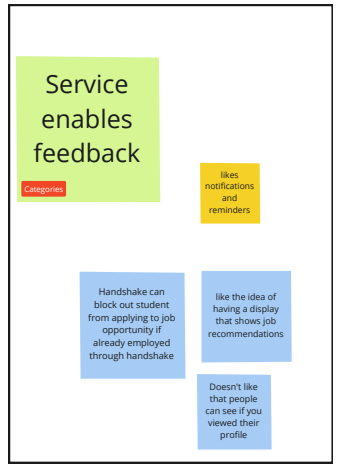


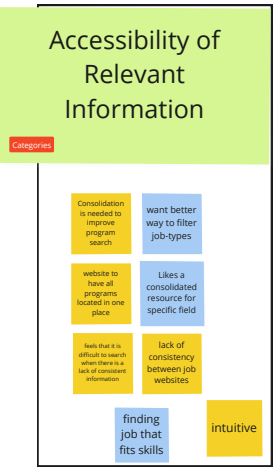






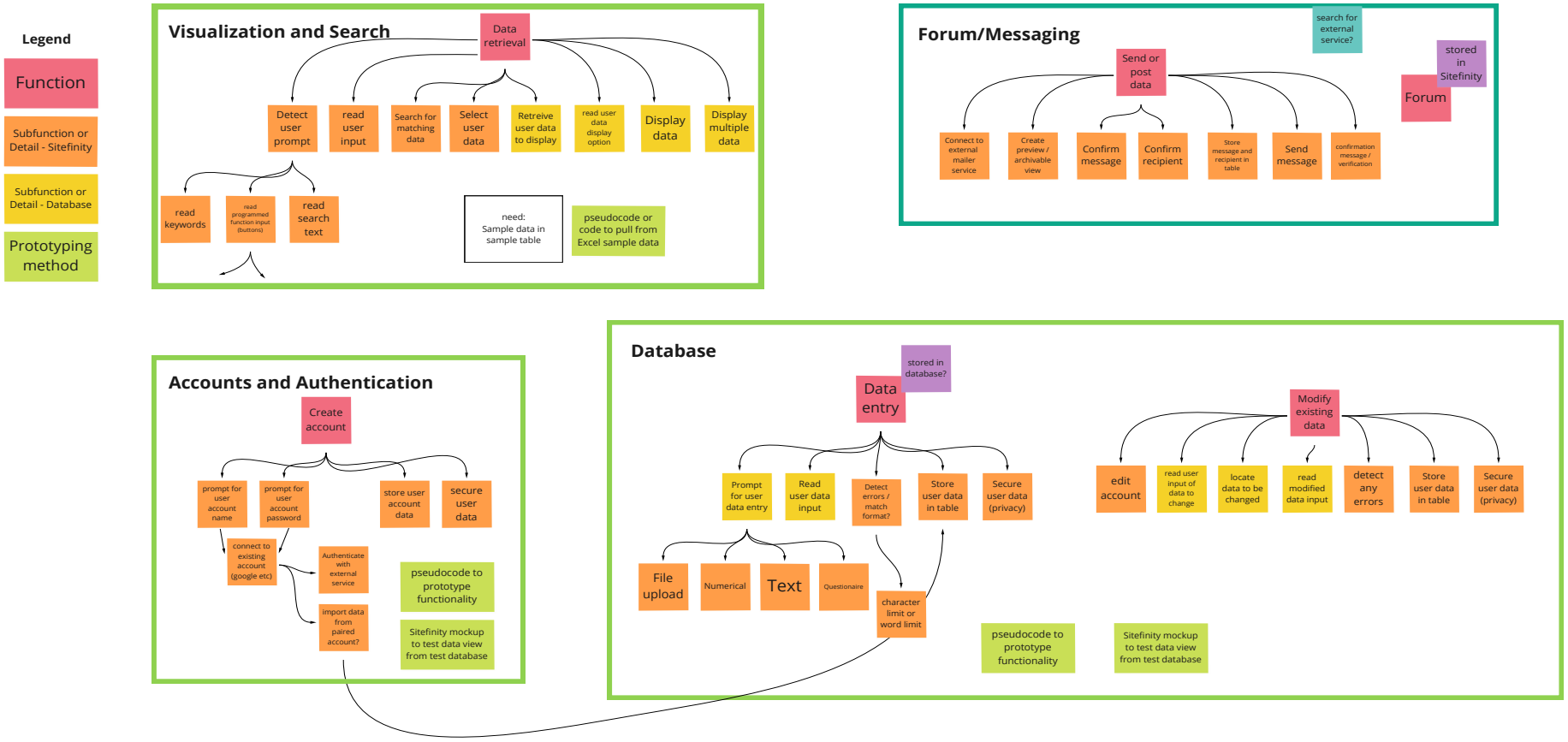






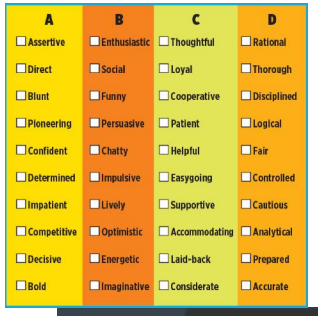
Define: Reframing Needs into System Design

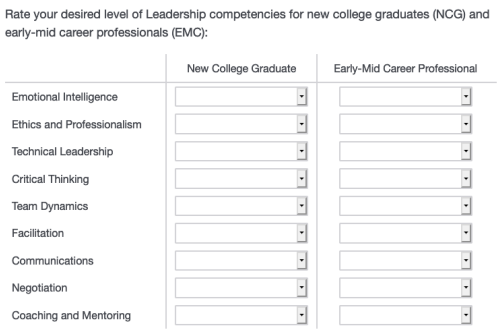
Journey maps and system function mapping reformulates needs into a succinct statement of functional and experience requirements.

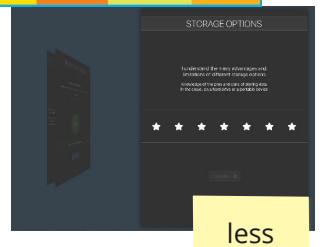


Develop: Concept Ideation and Selection

Ideation allows exploration of many sources of inspiration around focused “how might we?” statements.







less reading

HMW: make data entry easy?

intuitive interface

avatars for each competency?

cartoons?

silly things

confetti

HMW: make data entry fun?

fun!

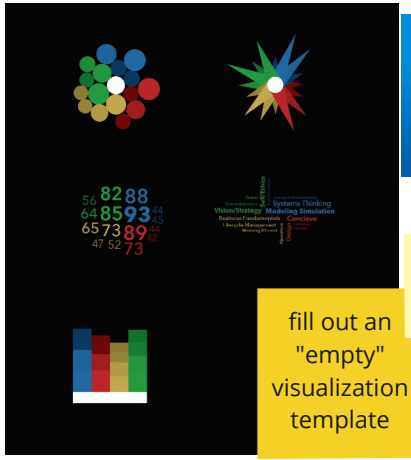
facts

motion

motion motivators i.e confetti, silly, progress

colors

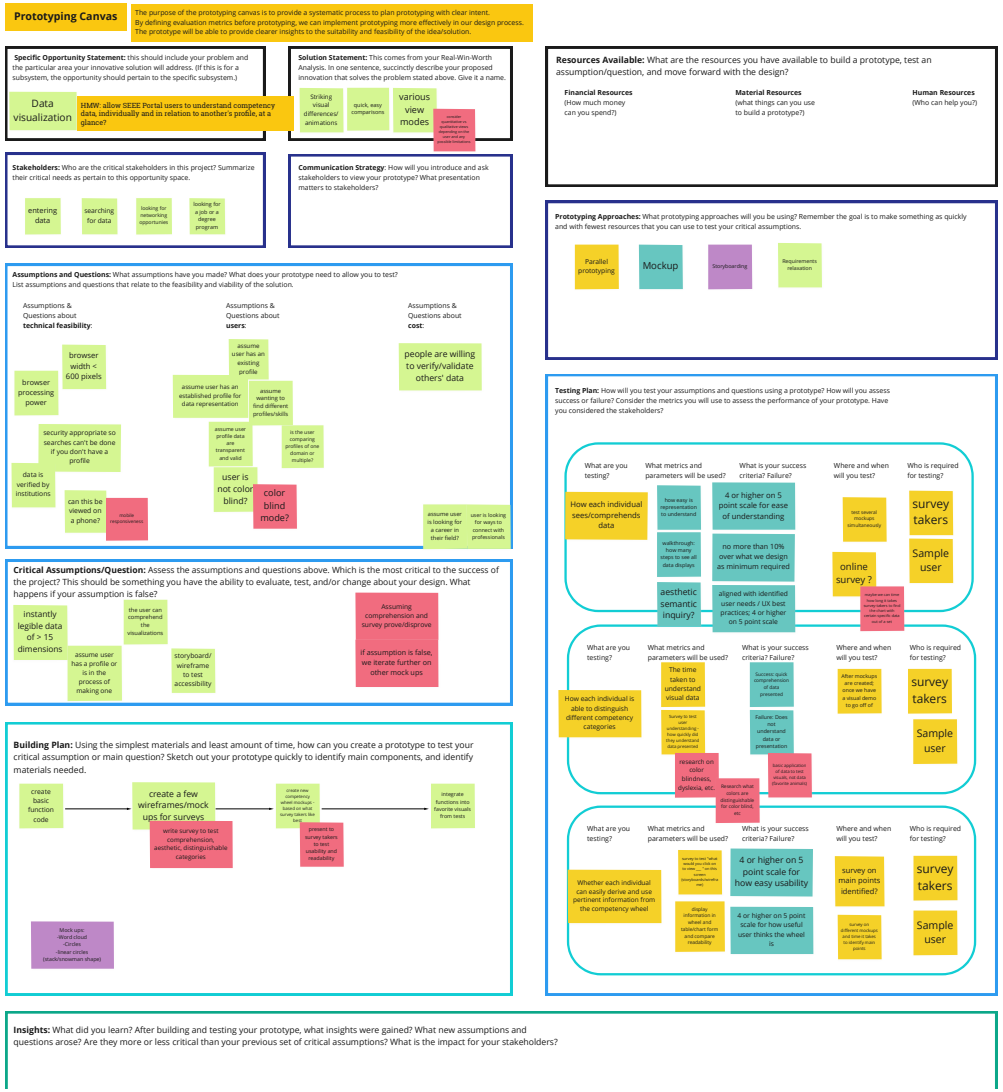
HMW: make progress tangible?



radial progress bar

fill out an "empty" visualization template

Deliver: Prototyping and Testing Concepts



Prototyping Canvas approach connects:

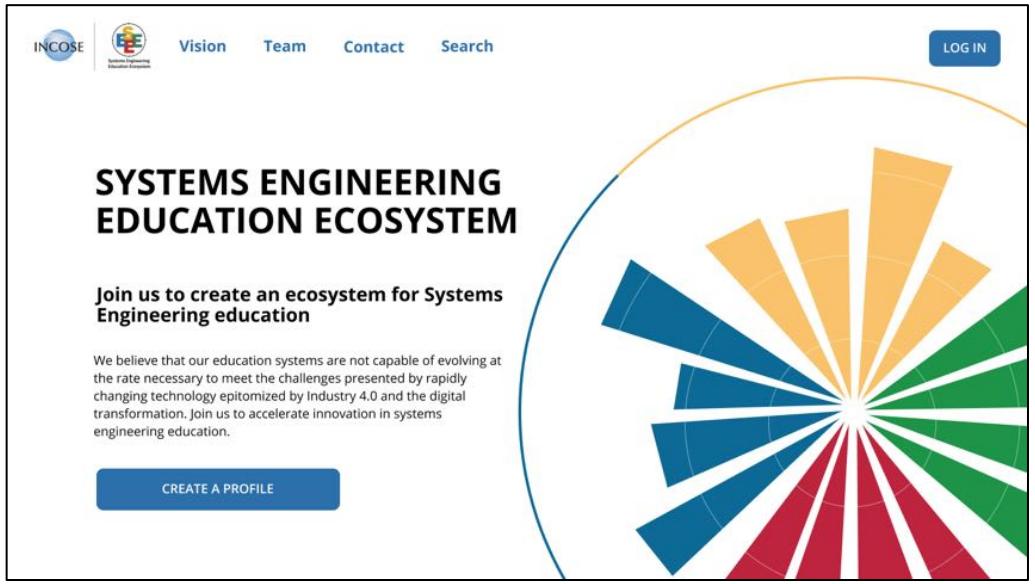
- Key assumptions that need testing
- Selection of the right kind of prototypes to communicate relevant aspects of the design concept.

You will have the chance today to experience our system prototype. Your input allows us to co-create with you the final realization of the SEEE experience!

Lauff, C., Menold, J., Wood, K.L., 2019. Prototyping Canvas: Design Tool for Planning Purposeful Prototypes. Proc. Int. Conf. Eng. Des. 1, 1563–1572. https://doi.org/10.1017/dsi.2019.162

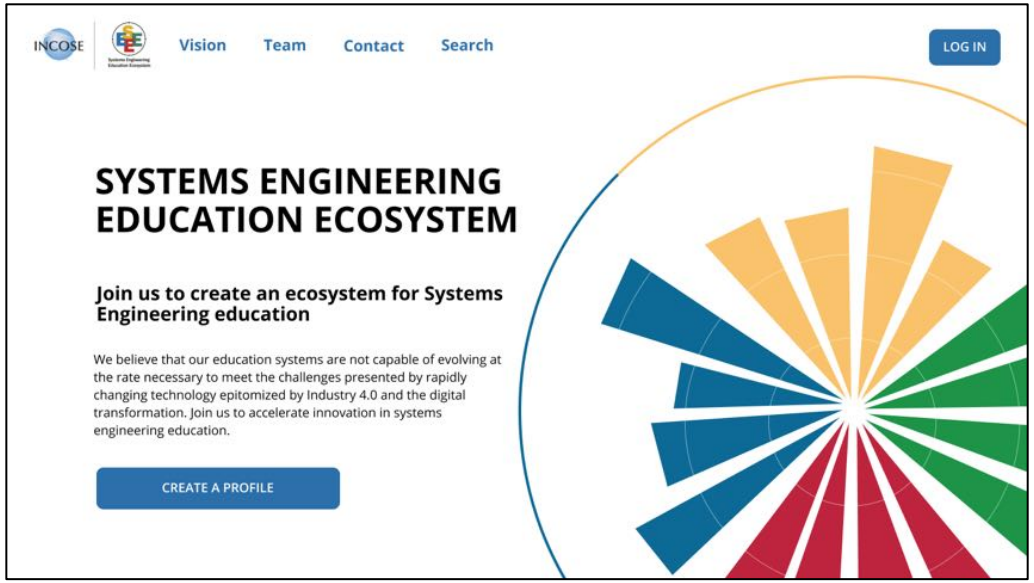
The SEEE portal

- Central to SEEE is a web portal, seee.org, which will be used by students/practitioners, universities and employers
- Every user has a data profile to describe themselves:
  - **Students/practitioners:** present data to determine their competencies and present themselves to prospective employers..
  - **Universities:** present their programs to students/practitioners and employers.
  - **Employers:** present their employment opportunities.



The SEEE portal

- Every user can learn from the portal and up their own game
  - **Students/practitioners**: determine their competency gaps and choose a SE program that matches their needs
  - **Employers:** find the best places to recruit students/practitioners that meet their job needs
  - **Universities:** compare their SE program to other programs, and determine how they support the needs of selected employers



INCOSE | Vision | Team | Contact | Search | LOG IN

SYSTEMS ENGINEERING EDUCATION ECOSYSTEM

Join us to create an ecosystem for Systems Engineering education

We believe that our education systems are not capable of evolving at the rate necessary to meet the challenges presented by rapidly changing technology epitomized by Industry 4.0 and the digital transformation. Join us to accelerate innovation in systems engineering education.

CREATE A PROFILE

CREATE A PROFILE

Select a user group to get started.

I am a student or practitioner in systems engineering.

A student/practitioner profile can help you find universities to reach your desired competencies, or find employers that are a good match for you.

INDIVIDUAL PROFILE

I represent an organization that has systems engineering positions.

An employer position profile can help you find ideal employees who match your competency preferences, and universities that train graduates in competencies important to you.

EMPLOYER POSITION

I represent a university that offers systems engineering (or related) programs.

A University Program profile can attract future students to help them reach their competency goals, and compare to industry profiles to learn from industry needs.

UNIVERSITY PROGRAM

STUDENT/PRACTITIONER COMPETENCY QUESTIONNAIRE

COMPETENCY AREA:

L E A D

This area focuses primarily on Systems Engineering lead competencies.

Rate yourself on these Lead competencies.

Respect: Competencies related to the ability to be considerate towards oneself, others, society, and the environment and to use that awareness to inform systems engineering decisions.

	Unaware	Awareness	Supervised Practitioner	Practitioner	Lead Practitioner	Expert
Emotional Intelligence	○	○	○	○	○	○
Ethics and Professionalism	○	○	○	○	○	○

INCOSE | Systems Engineering Education Ecosystem

Vision Team Contact Search

Log In

MY PROFILE

Click on the competency visualization above to see your visualization.

Name

First, Last

Location

City, State, Country

Bio

Share something about yourself with the SEEE community!

Degree Program

Degree Program(s)

Year Conferred

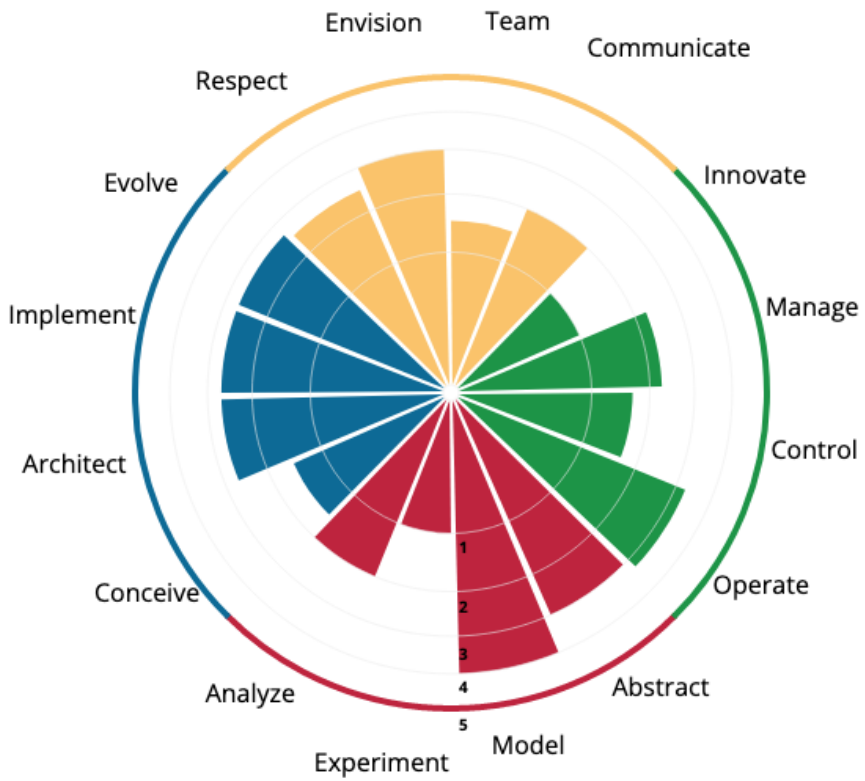
Year Conferred, e.g., 2001

University Affiliation

University Affiliation

YOUR COMPETENCY VISUALIZATION

Hover each bar in the visualization for detailed information. When you're ready, click on "Create a profile" to finish your profile.



Respect: The sub-area of Respect includes the INCOSE competencies of Emotional Intelligence and Ethics and Professionalism. The Respect sub-area competency score is an average of the included competencies.

Emotional Intelligence: 2
Ethics and Professionalism: 3
Respect Average: 2.5

Click on each competency name above for definitions.

Lead Competencies
Realize Competencies
Understand Competencies
Design Competencies

SEARCH (BY KEYWORD)

Choose from the three user groups, or enter a keyword and/or a location, and click “Search”.

VIEW SAVED SEARCHES | VIEW FAVORITE PROFILES | SAVE THIS SEARCH

Showing **11** out of **11** results

- [ ] **Student/Practitioners (5)**
- [ ] **Employers (2)**

Aviation Engineers

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam...

Raytheon Systems Engineer

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam

University of Colorado, Denver

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam

COMPARE VISUALIZATIONS (OVERLAY)

My Visualization

- Lead Competencies
- Realize Competencies
- Understand Competencies
- Design Competencies

Aviation Engineers Senior Web Developer

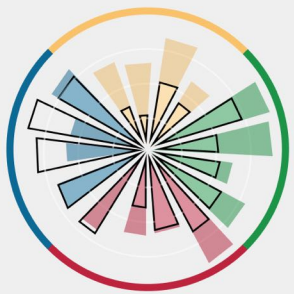
- ☐ Comparison Competencies

SEARCH (BY COMPETENCY)

Choose from the three user groups and click “Search”. If searching on difference, Best Match shows profiles with competencies strong in areas where there are large differences between profiles, i.e., profiles that best fill gaps identified from profile comparison.

NOTE: The page is pre-populated with all matching profiles.

Senior Web Developer



- [x] University Programs
- [ ] Employment Positions
- [ ] Students/ Practitioners
- [x] Universities
- [ ] Employers

SEARCH

VIEW SAVED SEARCHES

VIEW FAVORITE PROFILES

SAVE THIS SEARCH

Success Metrics

- **SEEE Portal:**
  - Ability to communicate university program content: *the number and percentage of posted Systems Engineering academic programs.*
  - Ability to communicate range of SE positions: *the number of employer-posted position profiles.*
  - Ability to self-assess student and practitioner competencies: *the number of student and practitioner profiles entered into the system.*
  - Search effectiveness: *the number of users using searches, and the number of searches per user.*
  - Impact on SE Competency Framework: feedback from users entering their profiles in the system

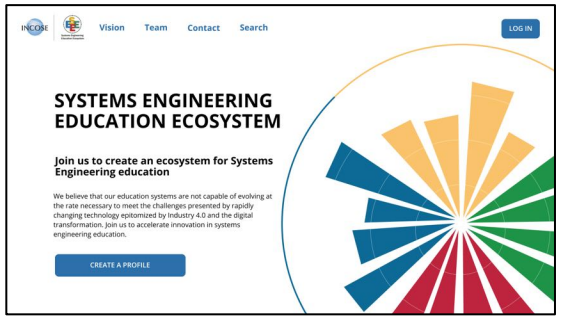
- **Employers:**
  - Impact on selection of academic institutions: *number of employers searching academic institutions, and number of academic institutions accessed.*
  - Impact on hiring: *number of students and practitioners contacted by employer, number of students and practitioners contacting employer*.

- **Academic Institutions:**
  - Impact on academic programs: *number of academic users conducting searches, number of searches conducted per academic user, changes made in educational program profiles*.
  - Impact on selection of educational materials: *number of academic users entering PDP from SEEE, and their subsequent access of educational reference materials*

- **Students and Practitioners:**
  - Impact on selection of academic programs and educational materials: *number of users referencing academic programs from website, number of academic programs referenced per user, number of users entering PDP and their subsequent access of educational reference materials*.
  - Impact on selection of employers: number of employment positions entered from website, feedback from employers on hiring results

SEEE Future Work

- **Website:**
  - Deploy beta website by summer 2022



- **Recruitment:**
  - Recruit employers and universities to create site profiles
  - Use INCOSE advertising, social media, etc. to increase student/professional site use

- **Operation:**
  - Institute governance model for site operation and competency update
  - Collect usage data and continuously improve site

Get Involved!

If you interested in getting involved in the SEEE project contact:

Jon Wade – jpwade@ucsd.edu

Cihan Dagli - dagli@mst.edu

32nd Annual INCOSE international symposium

hybrid event

Detroit, MI, USA

June 25 - 30, 2022

www.incose.org/symp2022