

Full Life Cycle Attention by System Developers

Day 1 Intro Workshop

Facilitator: Ann Hodges, Sandia National Labs

Assistant: Emily Allen, NMT Student

Participants:

- **John Brtis** MITRE Corp
- **Krishnan Iyer** UTEP Student
- **Joe Marvin** Prime Solutions Group
- **Paul McGoey** Retired Boeing
- **Tabatha Oria** UTEP Student
- **Eric Smith** UTEP Professor
- **Neale Smith** UTEP Student
- **Mark Timms** Sandia National Labs
- **Tim Wiseley** Sandia National Labs
- **Sharissa Young** Sandia National Labs



Full Life Cycle Attention by System Developers

Ann Hodges, SNL Distinguished Member of Technical Staff, CSEP, SAFe SPC4

Agenda

- Summit summary
- Introductions
- Definitions
- Topic discussion

Summit Summary: Event Objectives

- Give participants a valued experience of collaborative teaming on a mission
- Expand participant's knowledge of selected systems engineering issues
- Provide participants the opportunity to expand personal networks

Summit Summary: Workshop as Collaborative Knowledge Development

Mission:

- Articulate a bounded unresolved problem concisely.
- Identify the Customer(s) that would support a solution
- Identify multi-perspective organizational and cultural impediments to recognizing the problem as one in need of attention and solution.
- Converge on broadly acceptable requirements for an embraceable solution.
- If appropriate, plans for subsequent solution collaborative action.

Culture:

- Everybody has a voice and perspective that is heard and appreciated.
- Welcoming to all levels of experience (students to elders).
- Everybody engages as a team on a mission.
- Facilitator is there to guide toward mission completion.

Summit Summary: Day-1 Single-Slide Posters

Three sections:

1. Articulate the unresolved problem need for resolution.
2. Identify the customer(s) for a solution (provides context).
3. Impediments within the problem area for Day-2 intended focus.

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This Poster will be displayed at the reception, with the intent of enticing participants to attend the Day-2 session.

At the start of the Day-1 intro session the facilitator might suggest a concisely articulated problem statement – for modification or replacement by Day-1 participants.

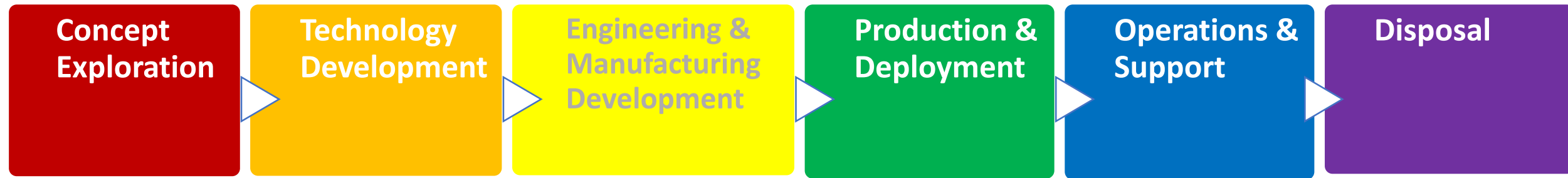
Introductions

- Who you are
- You (and your organization's) interest in the topic
- What topic issues you would like to see as a focus

Definitions

- Life cycle: “evolution of a system, product, service, project or other human-made entity from conception through retirement” [ISO15288]
- Developed products have a life cycle (may not be explicit)
- Purpose: establish a framework for meeting stakeholder needs and providing visibility into progress
 - Life cycle phases with “decision gates” to determine readiness to move from one phase to the next
 - Life cycle phases may iterate, overlap

Example Life Cycle



Adapted from [DAG]

Day 1 – Full Life Cycle Attention by System Developers

Need

- <need statement>

Customers

- <customer list>

Impediments to focus on

- <impediment list>

Additional notes

Needs discussion

- Need to be on the same page/have the same mental model across the life cycle
- Are we making it too complex?
- Disposal architecture needs to be streamlined and well throughout
- Design for disposal
- Need a cultural change in disposal
- Developers just focus on development – not the lifecycle, but someone needs to worry about that

Needs Discussion cont.

- How do we define the length of a lifecycle of a product?
- Shift to shorter lifecycle for a product
- Budgeting for an entire lifecycle
- Lifecycle depends on the cultural and per-capita income/knowledge of what country the product is being distributed to – may need to consider global
- Consumer/end user is part of the life cycle
- Socio, technical, economic, and cultural considerations
- Disposal needs to keep up with the pace of research

Who are the stakeholders?

- Consumer/end user
- Systems engineer on the project
- System developer
- Society as a whole (who holds the trashcan?)
- System/product owner
- Whoever can make a profit from picking through the trash?
(recyclers)
- Project management
- Investors/sponsors

References

[DAG] Defense Acquisition Guidebook, Department of Defense, accessed March 29, 2019 (available from <https://www.dau.mil/tools/t/Defense-Acquisition-Guidebook>).

[ISO15288] ISO/IEC 15288 Systems and software engineering – System life cycle processes. First edition 2015-05.

Full Life Cycle Attention by System Developers – Day 1

Reception Poster

1. Need: To provide clear objectives across the lifecycle that considers all socio, economic, technical, and global/cultural considerations at the right pace, and to ensure that developers have the necessary information to reflect the life cycle.
2. Stakeholders: consumer/end user, system engineer and developer, society, system/product owner, whoever makes the profit, project management, investors, sponsors
3. Issues: Developers mindset is focused on local optimization, timing (budget cycle myopia), disposal. Need for INCOSE leadership on feedback and connections of the life cycling basis. Why change? Not seeing the system level and incentives.

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Day 2 Workshop Results

Day 2 Participants:

- **Emily Allen** NMT Student
- **Heidi Hahn** Los Alamos National Lab
- **Ann Hodges** Sandia National Labs
- **Krishnan Iyer** UTEP Student
- **Julianna Khenaisser** UTEP Student
- **Eric Smith** UTEP Professor
- **Neale Smith** UTEP Student
- **Sharissa Young** Sandia National Labs

Full Life Cycle Attention by System Developers

- Day 2

1. Identify Organizational and Cultural Impediments to problem recognition
2. Consensus on Requirements
3. Plans for Solution Collaboration

Full Life Cycle Attention by System Developers

–Day 1

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Organization and Cultural Impediments

- U.S. doesn't culturally recognize recycling in the life cycle
 - Lack of understanding of the value of recycling products across industries
 - It's been made more profitable to make things disposable as opposed to fixable
 - Designers are rewarded for early phases of Design
 - Lack of prestige and incentive placed on and for recycling companies
 - Lack of cooperation between Customer and Recycling Company and Developing Company leads to poor incentives for recycling
 - "plans for disposal are unnecessary, we'll invent ourselves out it." The mindset that we need to plan for disposal is limiting
 - Lack information transparency throughout the lifecycle

Organization and Cultural Impediments

- There can be silos in each phase of the life cycle, due to a lack of holistic thinking for the full life cycle
 - Lack of consideration for the global supply chain
 - Lack of tailorable guidance to industry on disposal not being the end
 - Recycling does not have a systems view, it is looked as an end, i.e. supply and execution
 - Systems engineering does not include sustainability requirements or guidelines (long term thinking), instead short term thinking is focused on the economic aspect and more prevalent

Requirement	Impediment
<ul style="list-style-type: none"> •Provide Education and Awareness for the general U.S. population concerning the importance of recycling throughout the life cycle •Provide Education and Awareness of opportunities to capture marginal intention into significant resource streams for sustainability/recycling efforts (e.g., ecosia.org) 	<ul style="list-style-type: none"> •U.S. doesn't culturally recognize recycling in the life cycle
<ul style="list-style-type: none"> •INCOSE shall emphasize the importance of each lifecycle phase including examples of reusability •INCOSE shall develop value recognition(rewards) for recycling •INCOSE will encourage addressing the importance of ALL phases of the lifecycle •INCOSE will encourage taking a holistic approach to development of artifacts(e.g. addressing recycling in requirements, architecture, design, production) • INCOSE will encourage considering upstream and downstream supply chain, to encourage sustainable growth and development •INCOSE should develop an additional life cycle map for post-consumer products which includes a recycling lifecycle 	<ul style="list-style-type: none"> •Designers are rewarded for early phases of Design •There can be silos in each phase of the life cycle, due to a lack of holistic thinking for the full life cycle •Lack of consideration for the global supply chain • "plans for disposal are unnecessary, we'll invent ourselves out it." The mindset that we need to plan for disposal is limiting •Recycling does not have a systems view, it is looked as an end, i.e. supply and execution
<ul style="list-style-type: none"> •Recycling and Developing companies should incentivize responsible recycling for the consumer •Customers should demand incentives from Developing and Recycling Companies and responsibly recycle and dispose 	<ul style="list-style-type: none"> •Lack of cooperation between Customer, Recycling Company and Developing Company leads to poor incentives for recycling
<ul style="list-style-type: none"> •Government should incentivize recycling with tax breaks 	<ul style="list-style-type: none"> •Lack of prestige and incentives placed on and for recycling companies
<ul style="list-style-type: none"> •Consumers and search engine should recognize and reward transparency 	<ul style="list-style-type: none"> •Lack information transparency throughout the lifecycle
<ul style="list-style-type: none"> •Industry standards should incorporate a graded approach to sustainability 	<ul style="list-style-type: none"> •Systems engineering does not include sustainability requirements or guidelines (long term thinking), instead short term thinking which is focused on the economic aspects and more prevalent •Lack of tailorable guidance to industry on disposal not being the end
<ul style="list-style-type: none"> •Consumers should reward product sustainability and modularity 	<ul style="list-style-type: none"> •It's been made more profitable to make things disposable as opposed to fixable

Plans for Solution Collaboration

- Provide input for ISO 15288 changes to address disposal/recycling
 - Provide input for the next revision of the INCOSE handbook, SEBOK systems engineering body of knowledge
- Lobby local & national government for increased and improved infrastructure for the effectiveness and capacity of recycling
- The disposal process should be reframed/redesigned as recycling process
- Consider having the next Systems Engineering Summit at UTEP