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Systems Engineering Experience Accelerator

Experience Development Tools

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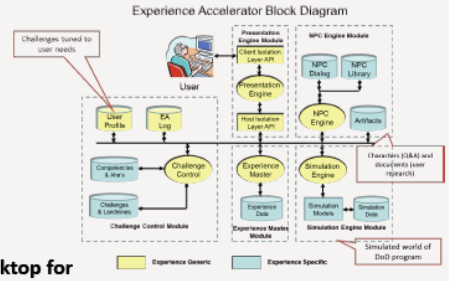
Introduction

- A widening gap in industry between the need and the availability of systems engineering practitioners with the necessary experience to address these challenges
- Systems engineering educators are struggling to meet the growing educational demands for a workforce able to solve problems driven by accelerating technology, rapidly evolving needs, and increasing systems complexity

Experience Acceleration

An Experience Simulator for Systems Engineers and Technical Teams – a safe Environment for Learning

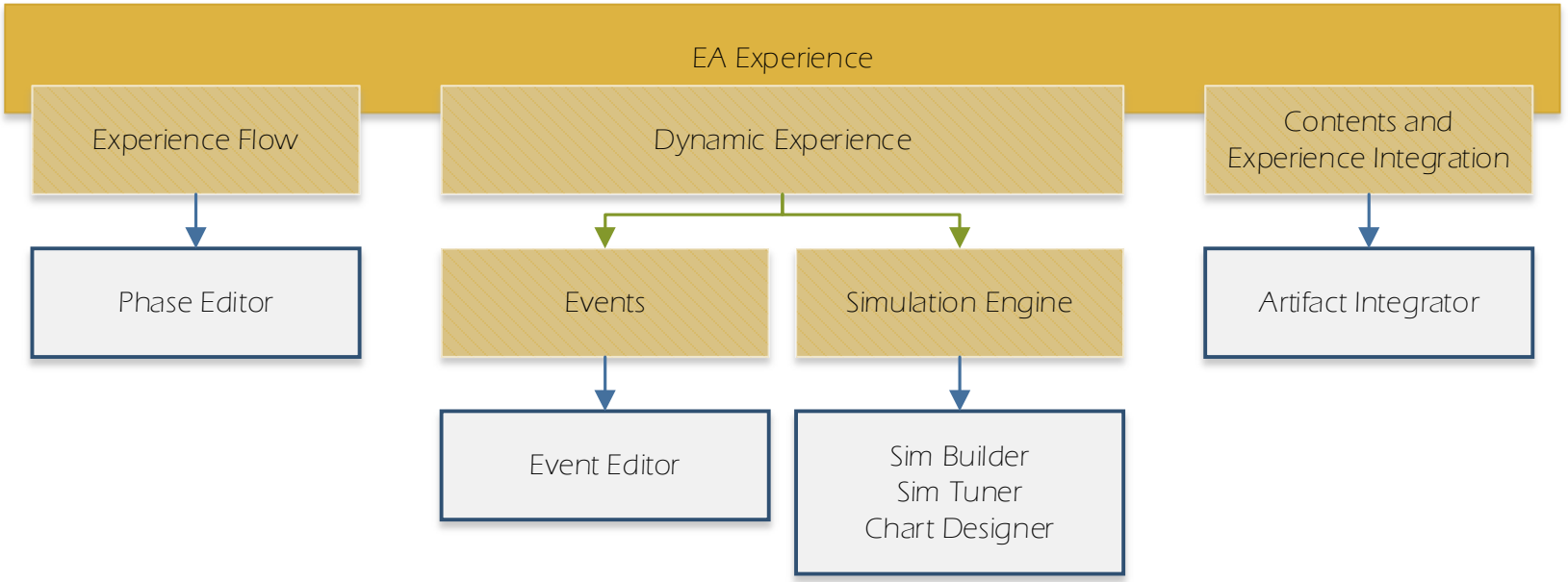


A virtual desktop for learning, No special client hardware or administrative needs

Utilizing an open architecture and open source software to build a open development community

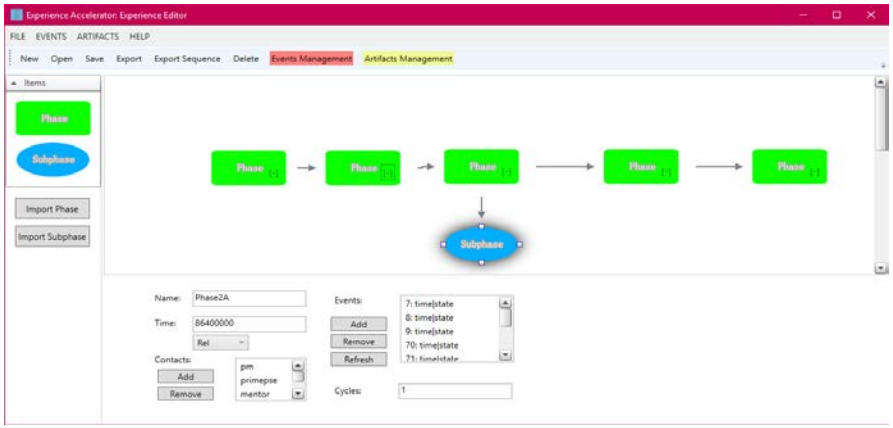
Using open source simulation technology and expert knowledge to safely and effectively build scar tissue in the new technical workforce

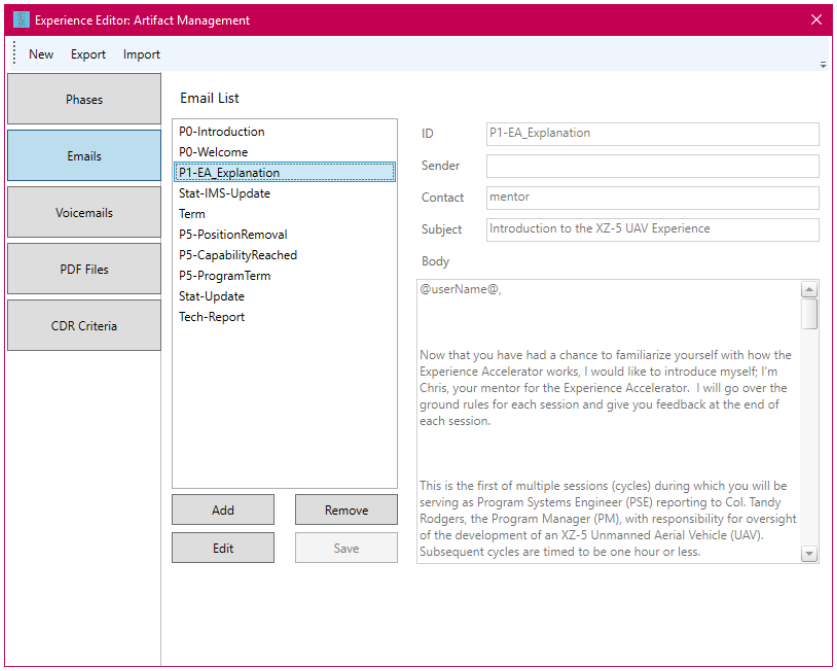
Experience Development Tool Suite



- Current UAV experience was developed largely from scratch
- This was an extensive effort
- Based on lessons learned, what tools can we provide to the emerging community interested in interactive SE learning environments to reduce initial investment and aid in on-going curation?

Previous Work – Experience Flow and Content





- Created Phase editor
  - —Number of phases
  - —Number of cycles within phase
  - —Rework cycles if needed
  - —Supports design of cycle-based learning based on Kolb's framework
- Created Artifact Integrator
  - —Background documents
  - —Recommendation form for learner decisions
  - —Active content such as reports generated during experience from learner decisions
  - —Supports insertion of static documents and templates for active content into an experience by the designer

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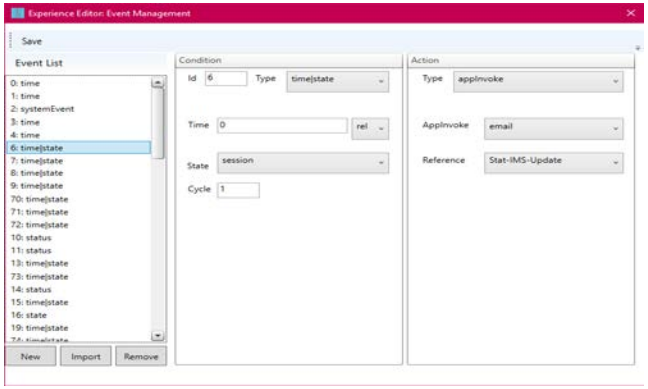
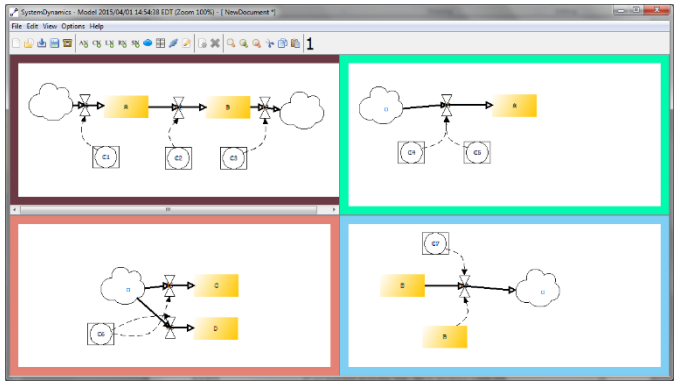
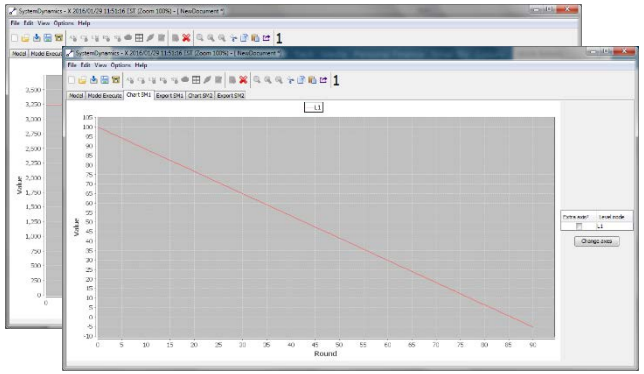
Previous Work – Experience Dynamics







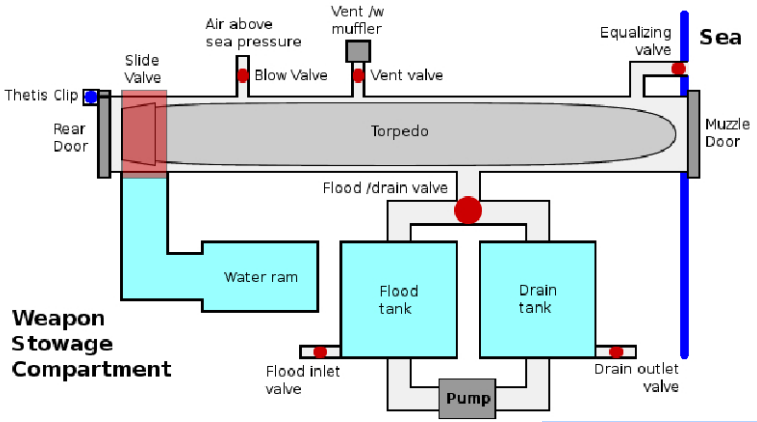
- Created Event Editor
  - —Specification of events that occur during cycles and phases
  - —Emails and phone calls from NPCs
- Created Sim Builder
  - —Specify simulation models for dynamic behavior of program
  - —Sub-model approach for modular development
  - —Library of reusable components
- Created Sim Tuner
  - —Tune models to achieve desired behavior (including response to learner decisions)
  - —Interactive chart output with multiple charts
  - —Supports experience designer

Summary of Current Priorities

- Experience Development
  - —Provide GUI tools for experience interface development
  - —Provide documentation on usage
- Sim Builder and Sim Tuner
  - —Populate initial sub-model library
  - —Refine Sim Tuner interactivity features
- Chart Designer
  - —Mature current prototype and add GUI
- Learning Assessor
  - —Provide toolset to assist experience designer in collecting assessment data and computing statistics of interest
- EA infrastructure
  - —Convert Flash-based implementation to HTML5
- Test and evaluate tools within DAU community
- Transition tools to use

The UK MOD HMS Tempest Experience

- An operational safety decision regarding routine maintenance and sail plans for a submarine
- Learner is forced into a role usually performed by their boss
- There is no data simulation involved; simply a matrix of information required for the decision
- Focuses on human relationships and investigation; time pressure means contacting the right people and getting information
- The experience tests the learner's ability to gather and analyze information from emails, standards and conversations, as well as confidence in their decisions.



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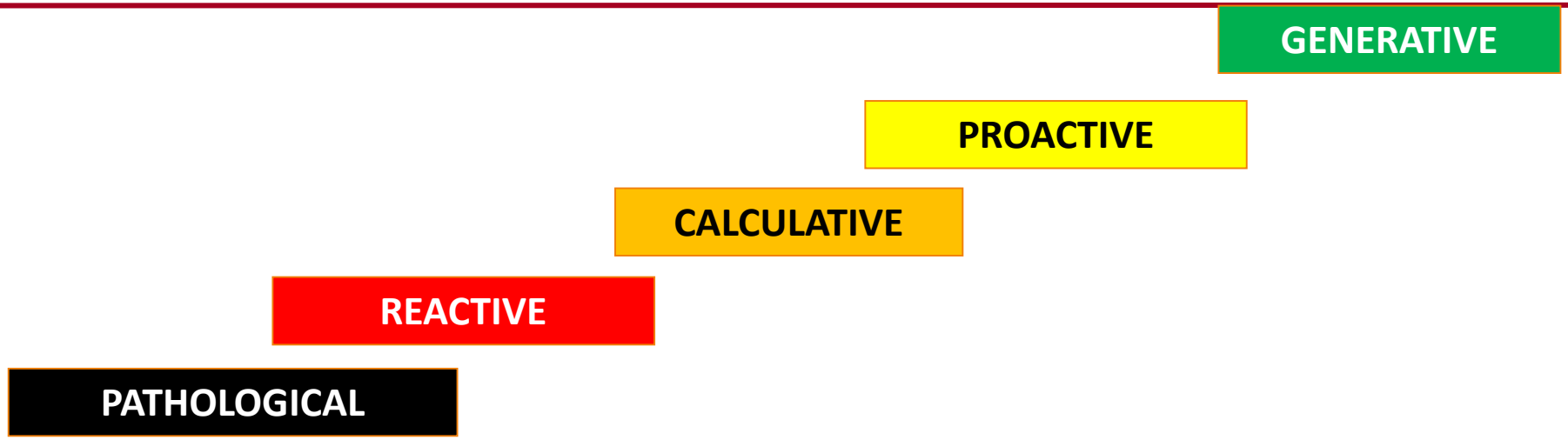
Parker-Hudson Cultural Maturity Model



Safety Culture	Description
Generative	Good safety leadership and management is regarded as an integral part of generating and maintaining operational effectiveness.
Proactive	Personnel at all levels recognise that proactive safety management brings real benefits to operational effectiveness and capability.
Calculative	The organisation realises that compliance with legislation and policy is the minimum acceptable state and will invest in demonstrating compliance. People see safety as a matter of following rules that someone else makes.
Reactive	Management only reacts when things go wrong and then often only to safeguard their reputation. Typically, such an organisation will be a repeat offender and managers will expend a considerable effort on presentation rather than addressing the real causes.
Pathological	Nobody within the organisation takes responsibility for safety. Safety is regarded as an inconvenience to operational output.

Phases of the Tempest Experience

Phase	Phase Description		
	Phase Activity Focus	Ending Event	Activities
0	Pre-work	Learner feels ready to "go to work"	Learner is told the team status (no one but the learner is available) and to study information relative to the team's purpose
1	Interruption	Tasked to investigate and make recommendation	Message from Tempest re: damage to torpedo tube
2	Investigation	Completes investigation	Contacts other personnel about the safety issues involved
3	Decision and Recommended Action	Experience ends	Considers all information; makes recommendation
4	Reflection		Receive information about their decisions and reflect on learning objectives.

Use of Tools

- Started with a manual exercise and developed script
- Used the Experience builder tool to develop phases and plan/create artifacts
- Used Chatmapper® to develop the dialogues
- Used variables to track who was talked to, what information was received in order to determine outcome of experience

Demo

Experience Accelerator
Welcome Student 3
Your Experience Awaits You!
Option Menu
(please select choice below):
HMS Tempest Experience
Multiplayer
Profile Update
Logout
HMS Tempest Experience
New User Orientation---------- Complete
Start of Experience---------- Complete
Investigate Phase---------- Complete
Reporting Phase---------- Active
Debriefing Phase----------
? Help
Reset Experience
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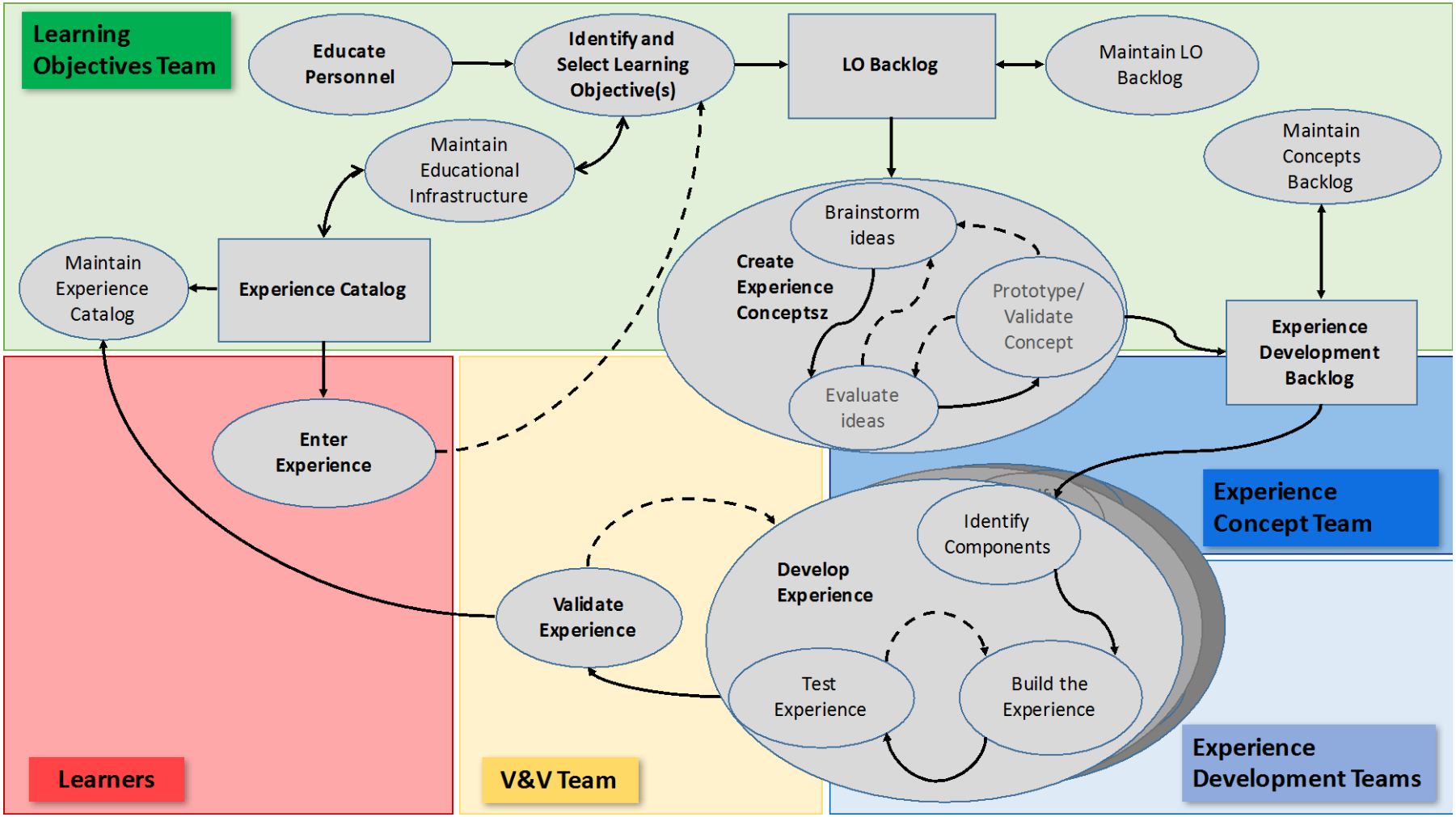
Organizational Experience Development Framework

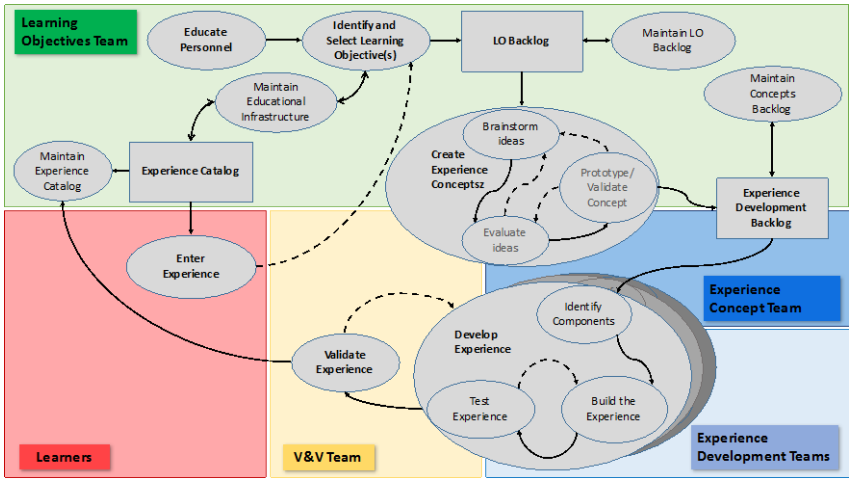


Organizational Experience Development Framework

Learning Objectives Team. Represents knowledge of organizational needs and understands the challenges of its SE environment. Identifies, develops and maintains the learning objectives key to the organization's success.

Experience Creation Team. Creates the concept for experiences that address one or more learning objectives..

Experience Concept. includes: an organizationally representative setting; a target learner; the general timeline, interactions, and flow of activities included in the experience; and the issues, problems, or analyses that are required for the learner to undertake to obtain the learning objective(s)



Experience Development Team. implements an Experience Accelerator experience that captures the concept and LOs.

Experience Verification and Validation Team. Validates the realism of the environment and activities, the achievement of the LOs, and helps calibrate the learning assessment.