Systems Engineering Experience Accelerator
Experience Development Tools

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• 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
• 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
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.
# Parker-Hudson Cultural Maturity Model

<table>
<thead>
<tr>
<th>Safety Culture</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generative</td>
<td>Good safety leadership and management is regarded as an integral part of generating and maintaining operational effectiveness.</td>
</tr>
<tr>
<td>Proactive</td>
<td>Personnel at all levels recognise that proactive safety management brings real benefits to operational effectiveness and capability.</td>
</tr>
<tr>
<td>Calculative</td>
<td>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.</td>
</tr>
<tr>
<td>Reactive</td>
<td>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.</td>
</tr>
<tr>
<td>Pathological</td>
<td>Nobody within the organisation takes responsibility for safety. Safety is regarded as an inconvenience to operational output.</td>
</tr>
</tbody>
</table>
# Phases of the Tempest Experience

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