A process for placing the human at the centre of the constructive simulation

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Agenda

- Background
- The Development Process
- Architectural Description
- The Combat ID Case Study
- Next Steps

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Dstl

- Dstl are the centre of scientific excellence for the UK MOD.
  - “To create the winning edge for UK Forces and Government through the best use of science and technology”
- Provide support to:
  - Procurement Decisions
  - Defence Policy Making
  - Operations
- Deliver defence research technical services, track global technological developments.

Background

- A customer wanted to assess the Balance of Investment between different Combat ID pillars:
  - Target Identification, Situational Awareness and Tactics, Techniques and Procedures.
- There were no existing models, wargames, simulations or analysis tools which were capable of informing this decision.
- A novel analysis approach was developed to enable the comparison of technological and human solutions.
  - The process used is applicable to a wide variety of different problems involving the modelling of novel human factors representations.
- This presentation describes the process an associated architecture and case study which can be used as a template for generating new human factors representations.

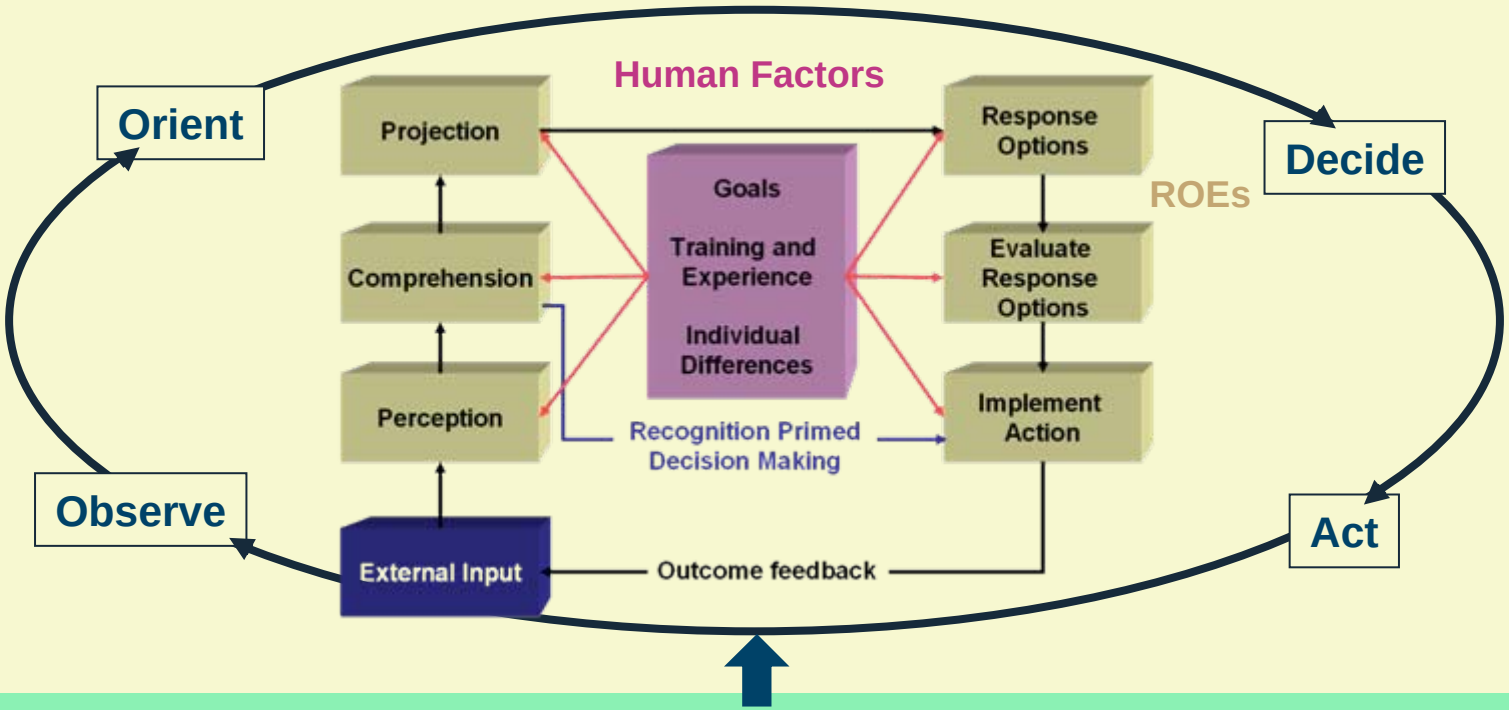
Measures of Combat ID Operational Effectiveness

- Level of Attrition (number of blue casualties)
- Frequency of fratricide Incidents (and collateral damage)
- Operational Tempo
- Political Impact (potential for national and international incidents and repercussions)

Combat ID process Outputs

- **Probability of ID (PID)**
- **Time to ID**
- **Range at ID**

Combat ID process



Combat ID Pillars

- **Situational Awareness**
- **Target Identification**
- **Tactics Techniques and Procedures**

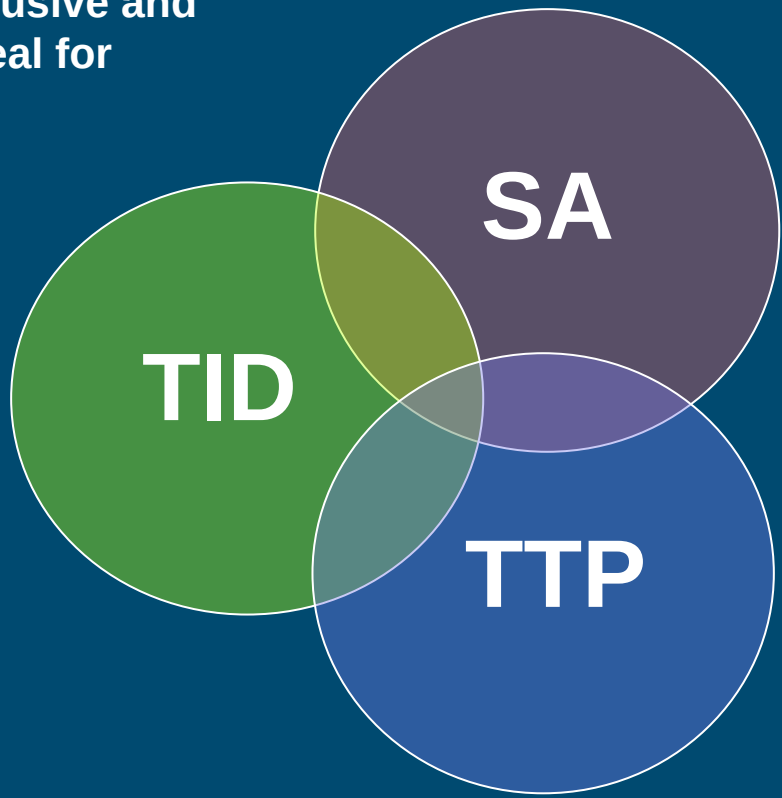
The Three Pillars of Combat ID

Although defined by UK doctrine, they are not mutually exclusive and therefore are less than ideal for analysis purposes

Target Identification

Anything that provides information on identity. This includes uniforms, panels and markings, and IFF systems.

Also includes sensors and electro-optics.



Situational Awareness

Anything that helps a decision maker develop their awareness of the battlespace.

However often used to refer to tools that provide a tactical picture of some sort, also real time imagery.

Tactics Techniques and Procedures

Concepts and doctrine, ROEs and other processes.

Often used to refer to training options.

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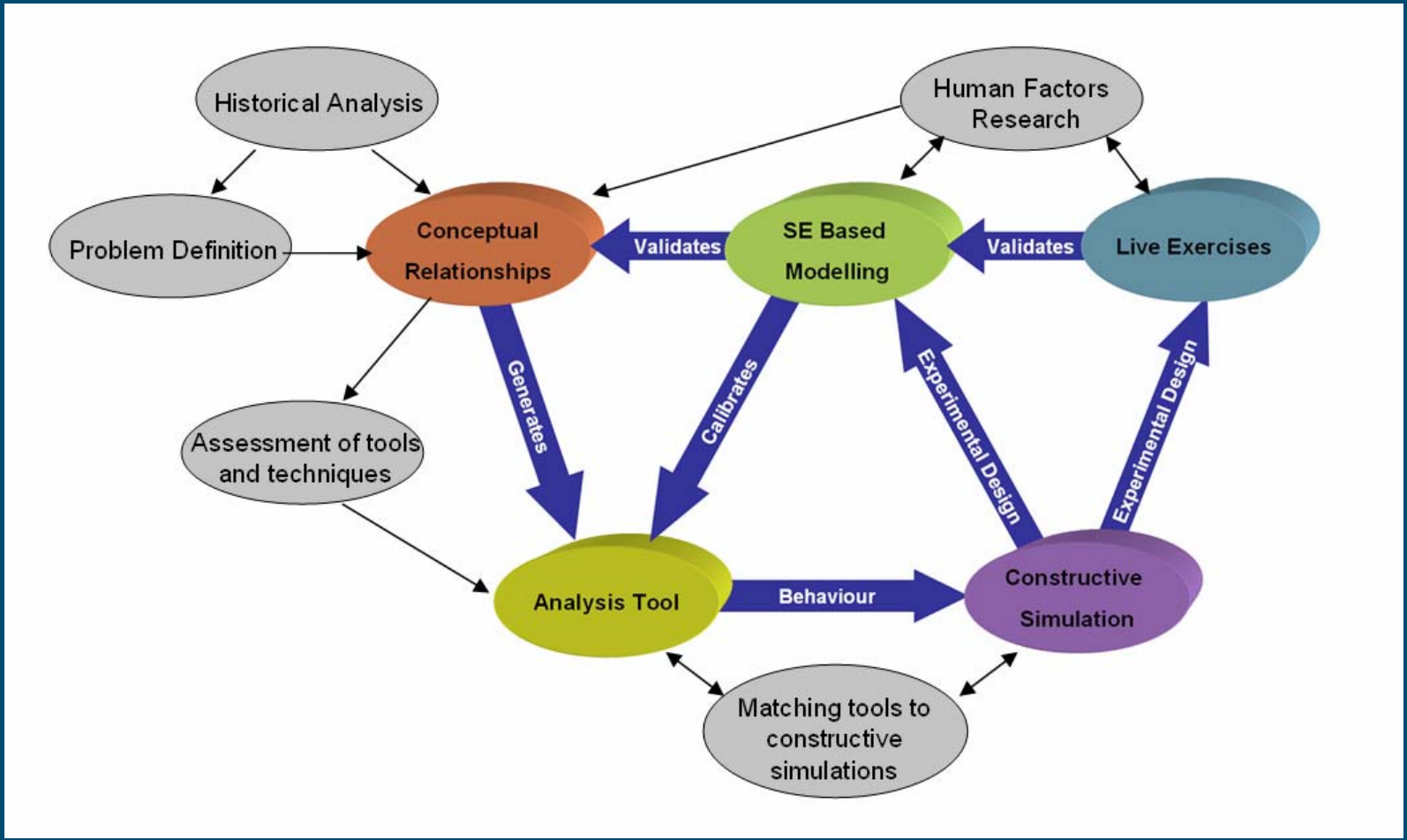
The Development Process



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Architectural Description

- The following slides provide a high level set of categories which can be used to describe a particular representation in terms of use, function, detail, coverage and quality.
- They are complementary to cognitive architectures, and intended to promote correct use and reuse.

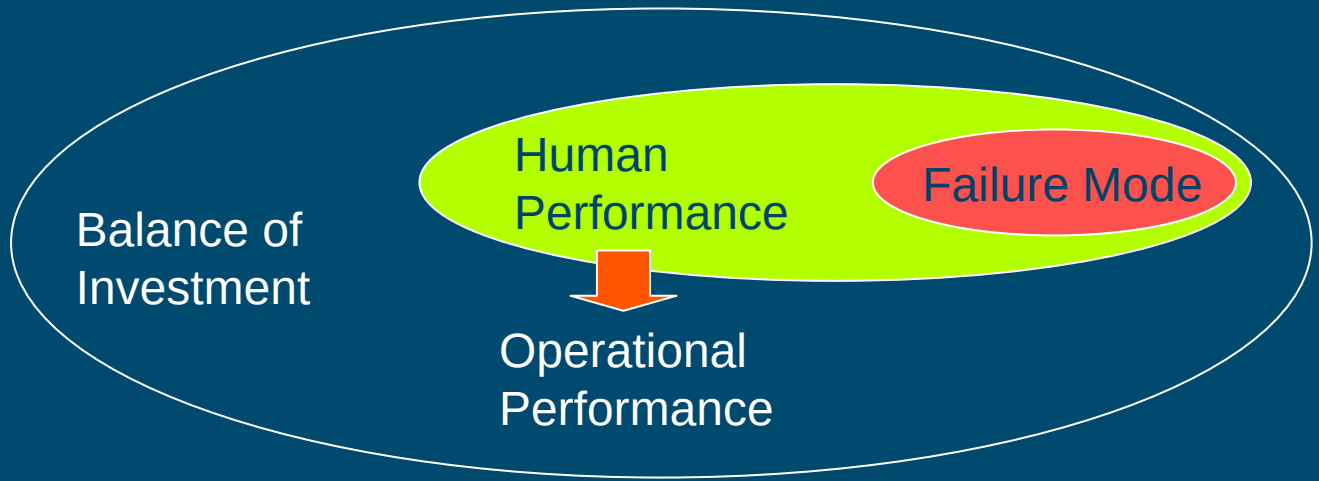
Type of Question

Task

Management,
Surveillance,
Warfighting

Status/Configuration

Equipment, Team,
Training Levels



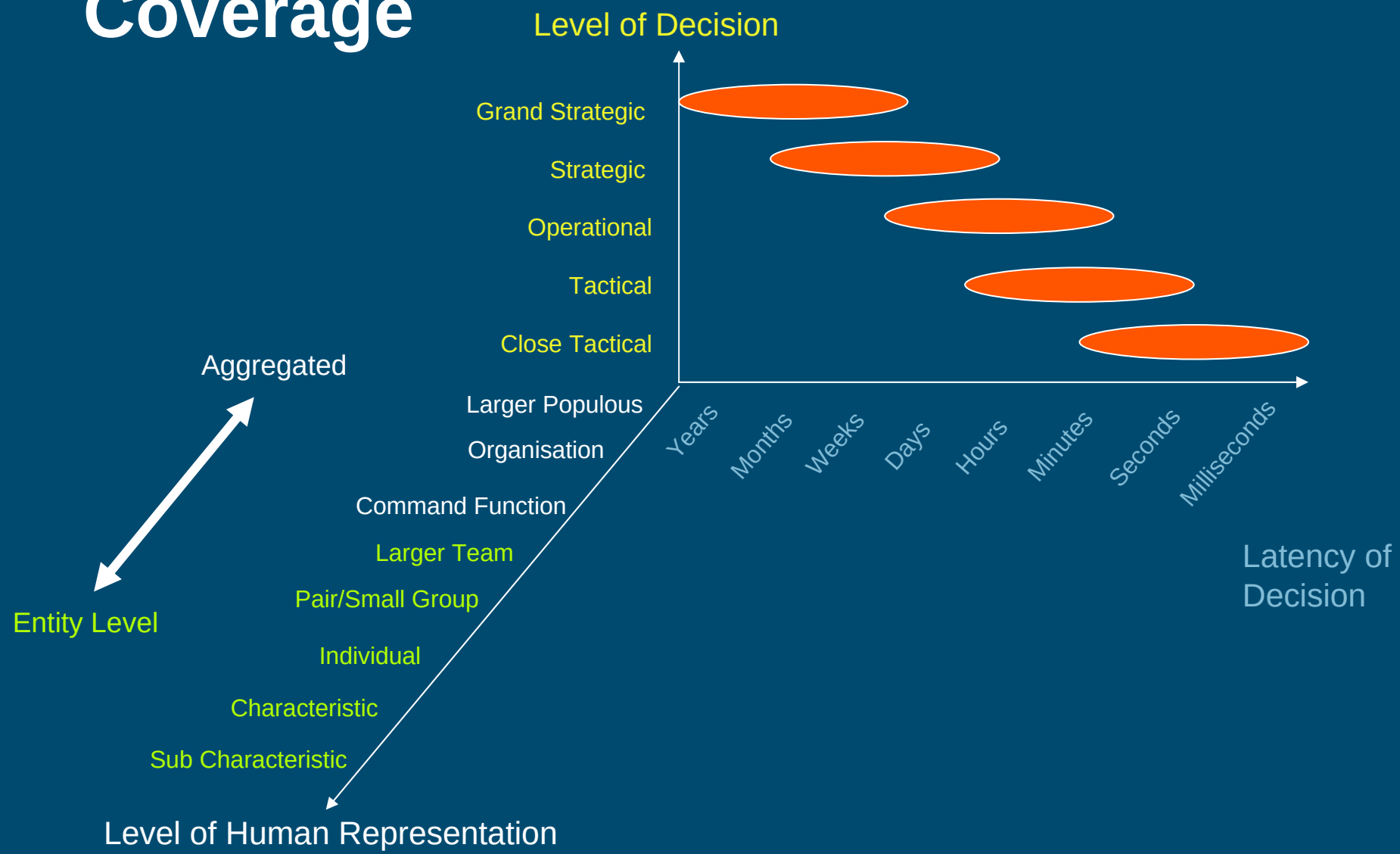
Environment

Location, Type of
operation

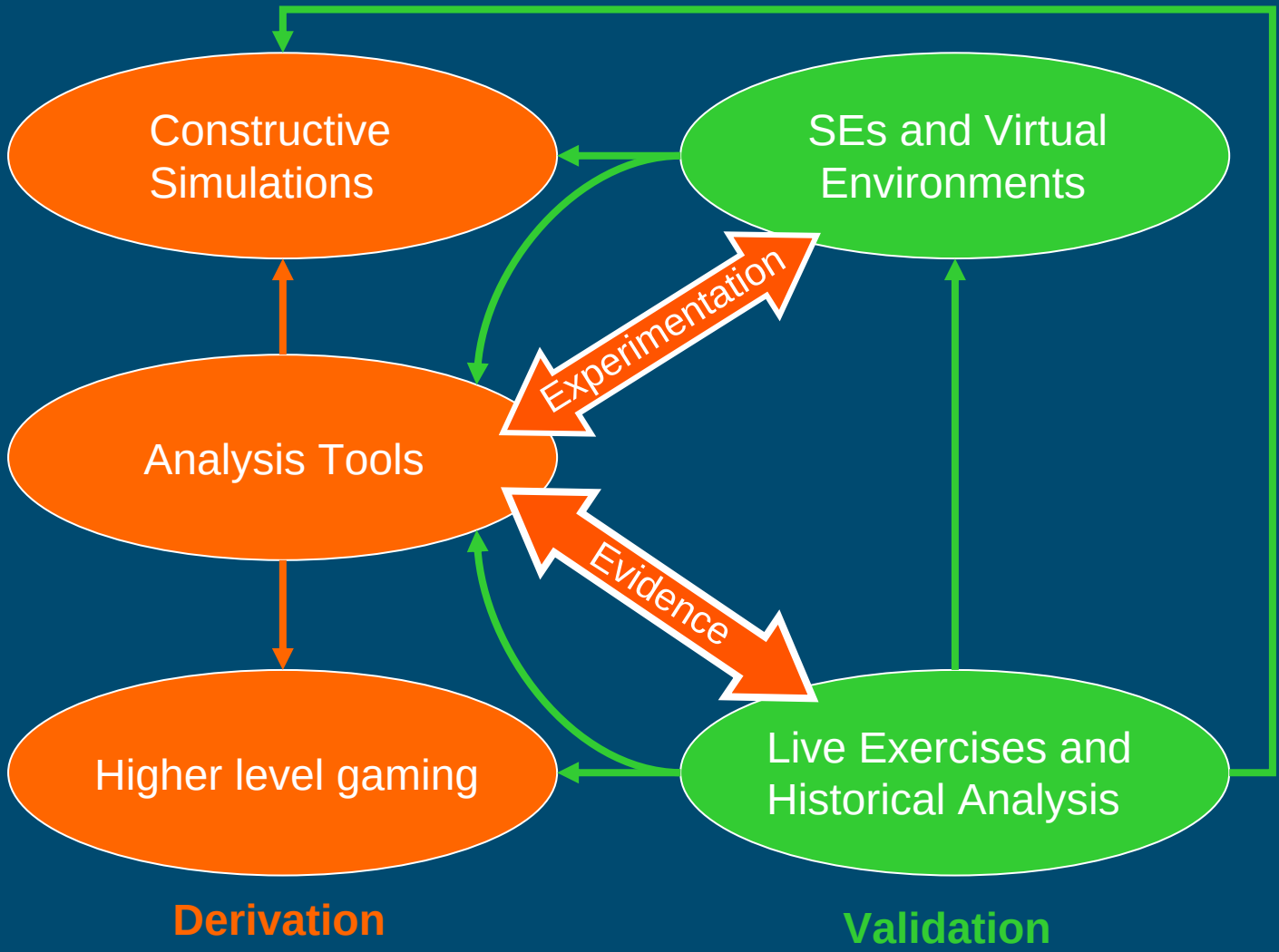
Conditions

Fatigue, Fear,
Level of comfort

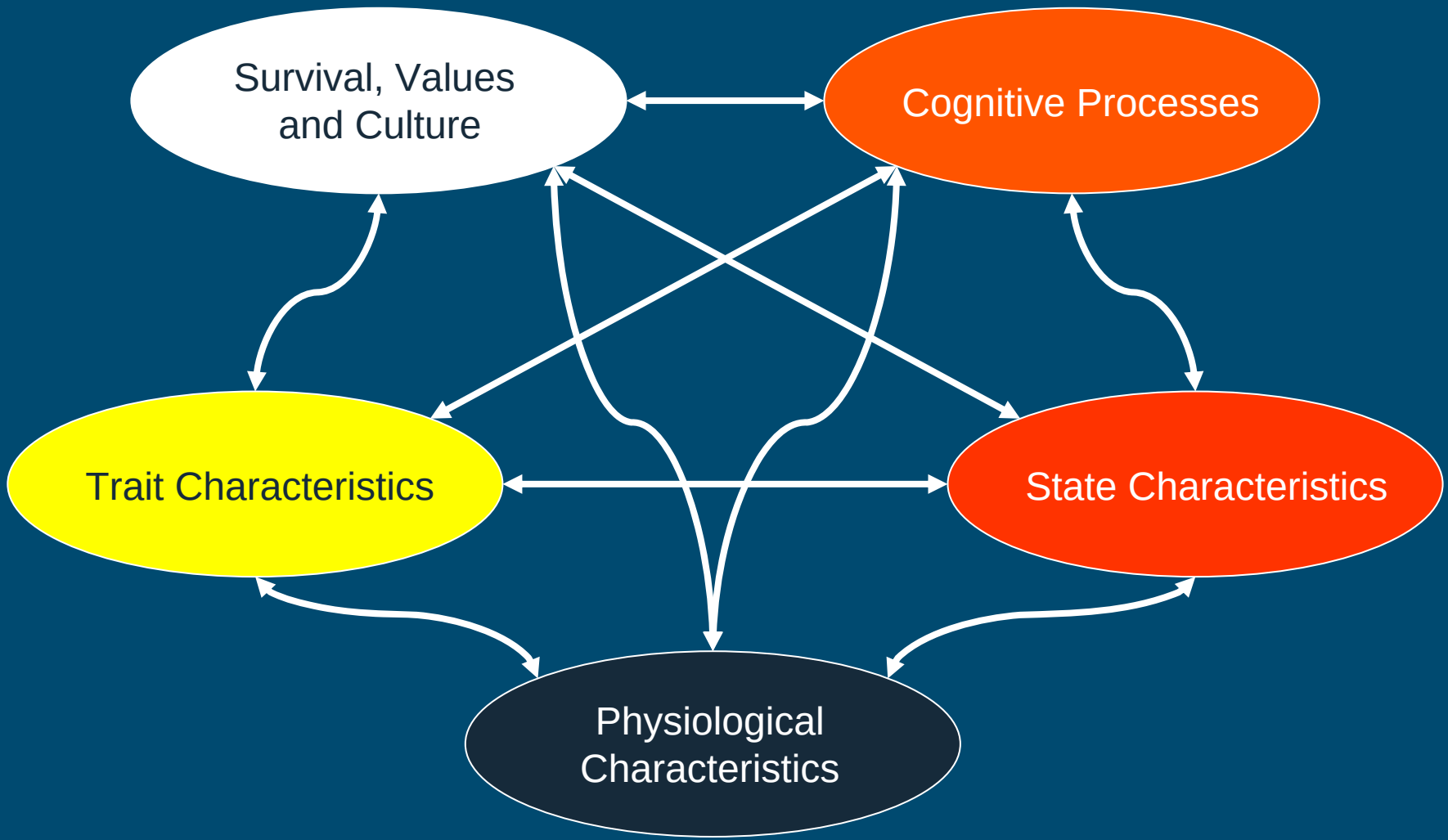
Coverage



Type of implementation



Human Factors Characteristic



Constraints and Quality

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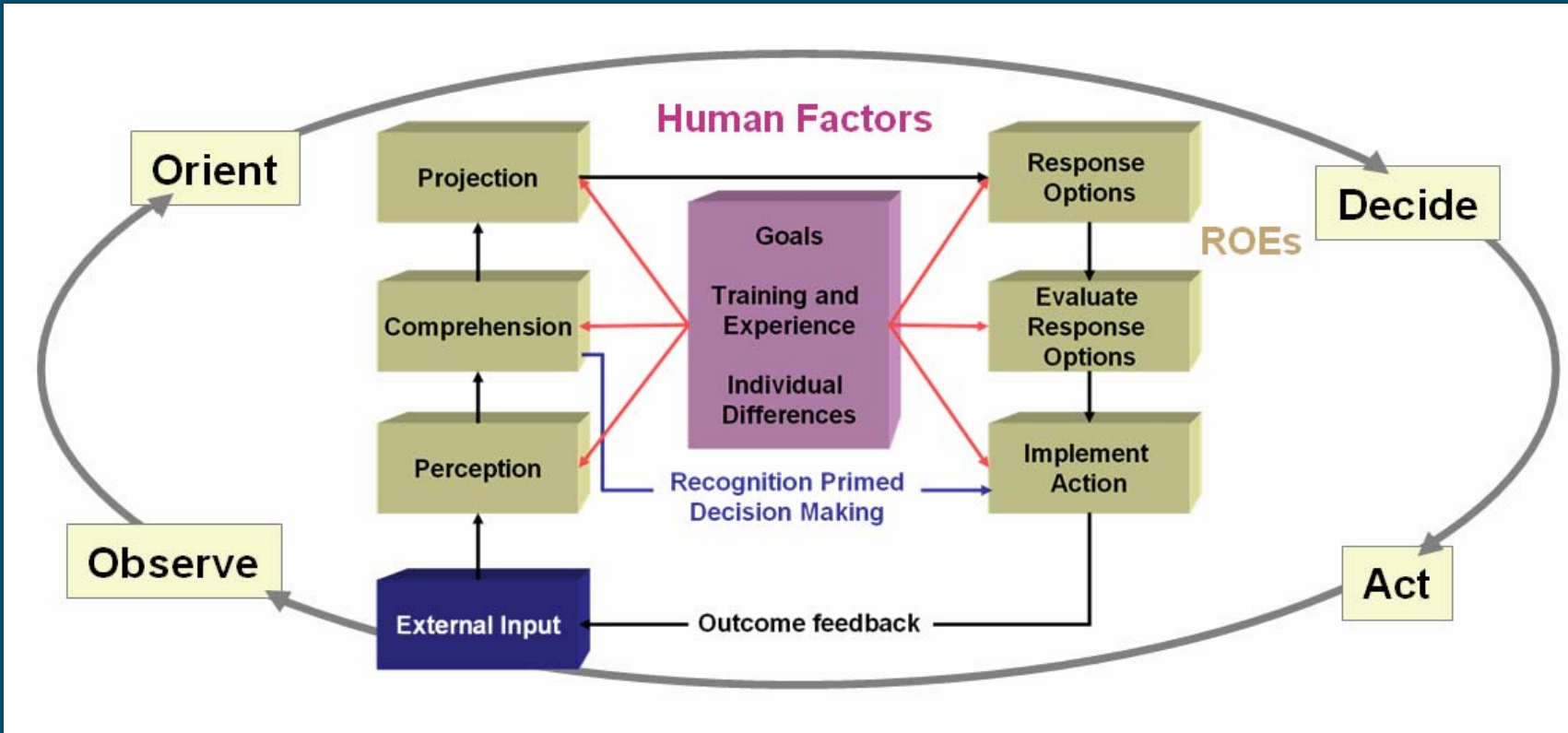
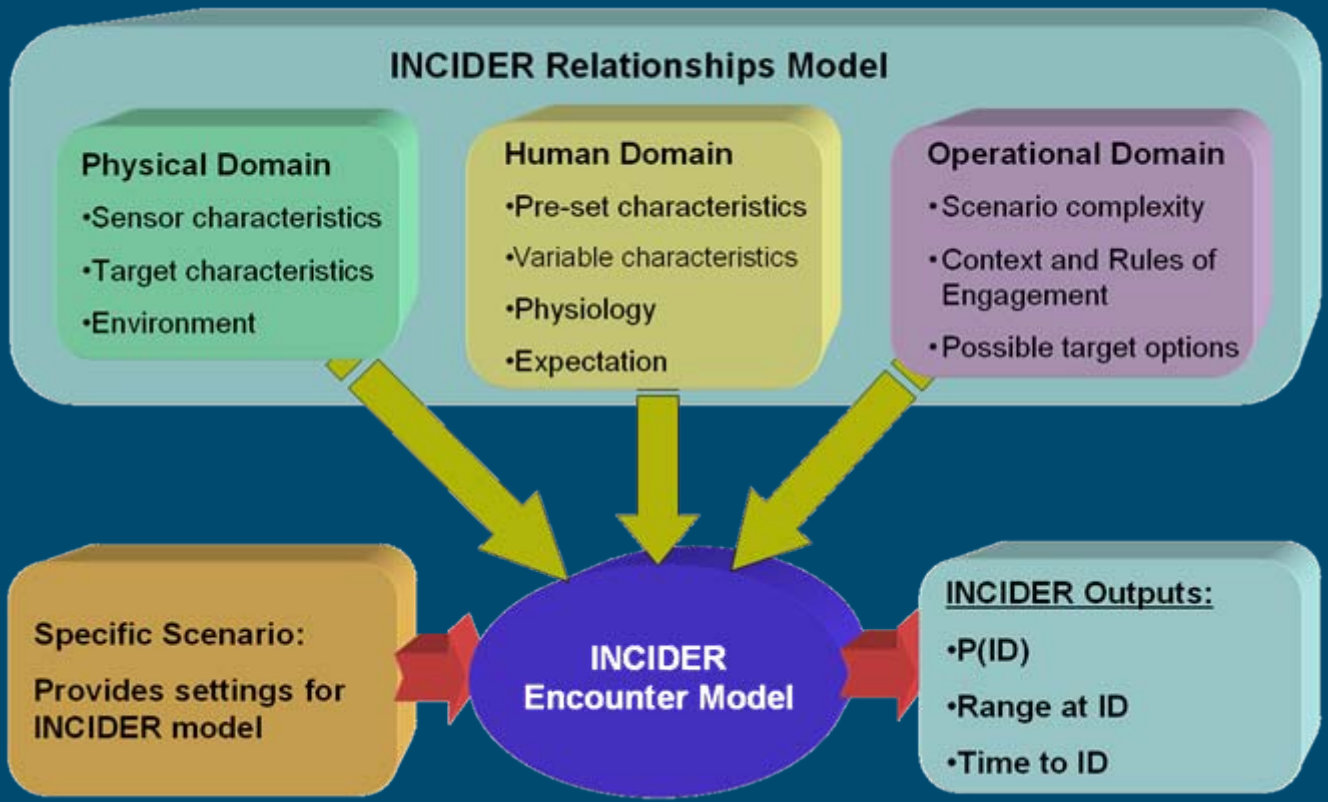
The Combat ID Case Study

- The following slides describe the Integrative Combat Identification Entity Relationship (INCIDER) model.
  - Initially, the INCIDER Conceptual Model captured information about parameters and relationships.
  - This was developed into the INCIDER analysis tool.
  - An ongoing SE experimentation programme was used to validate and refine the representations.
  - A distillation of the INCIDER model was then generated in Net logo.
  - This representation is being refined, and has been used to de-risk development within the UK Close Action Environment (CAEn).

The Combat ID process



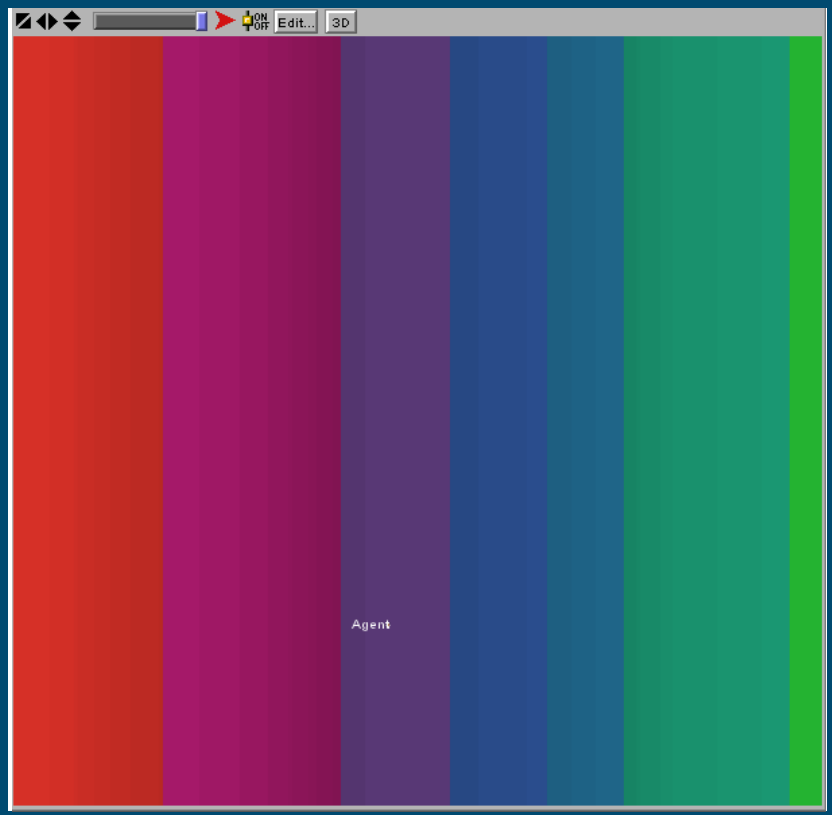
The INCIDER Model

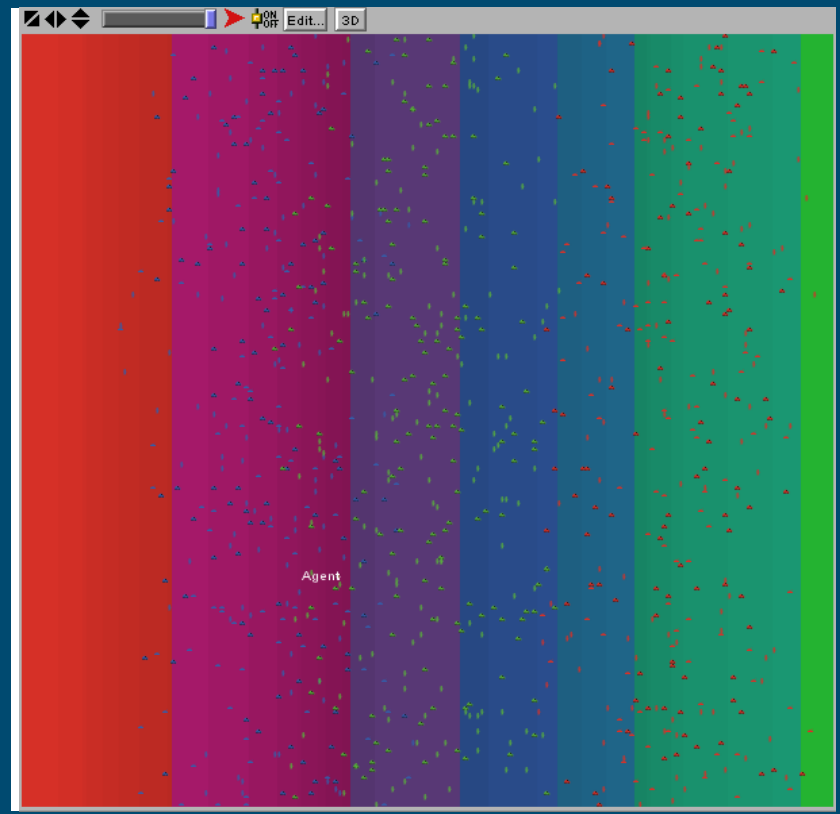


Agent Based Model representation

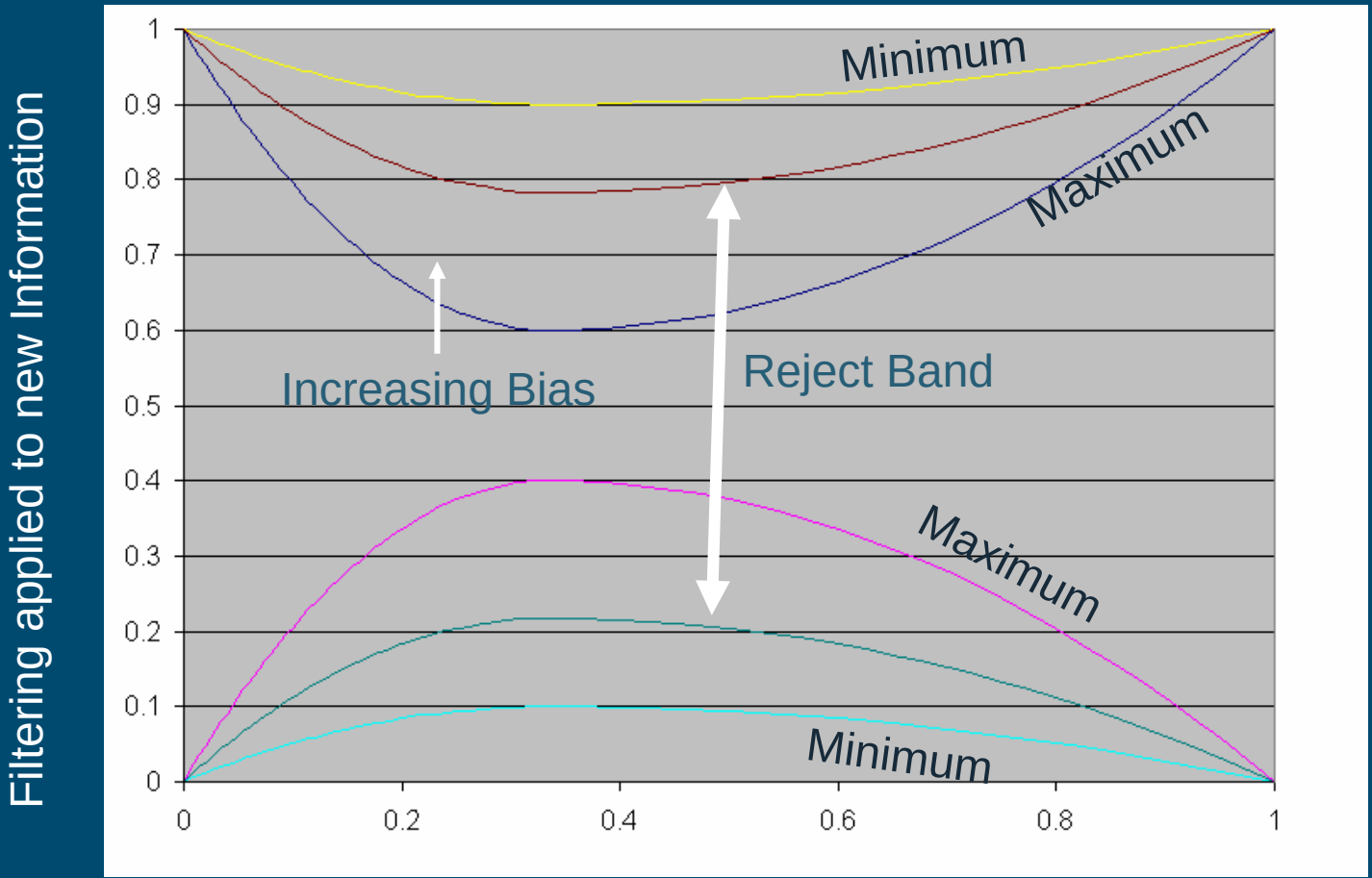
- A simple model has been developed by TNO.
  - Based on the Net Logo environment,
  - This has been used as a development test bed.
- The model generates a random ground truth and preconception.
  - To provide a large number of scenarios.
- An agent then explores, and makes ID decisions, updating local and global SA.
- Variations of parameters are used as data farming variables.
  - Based on the approach developed by the SEED centre in the Naval Postgraduate School.

Preconception and Ground Truth

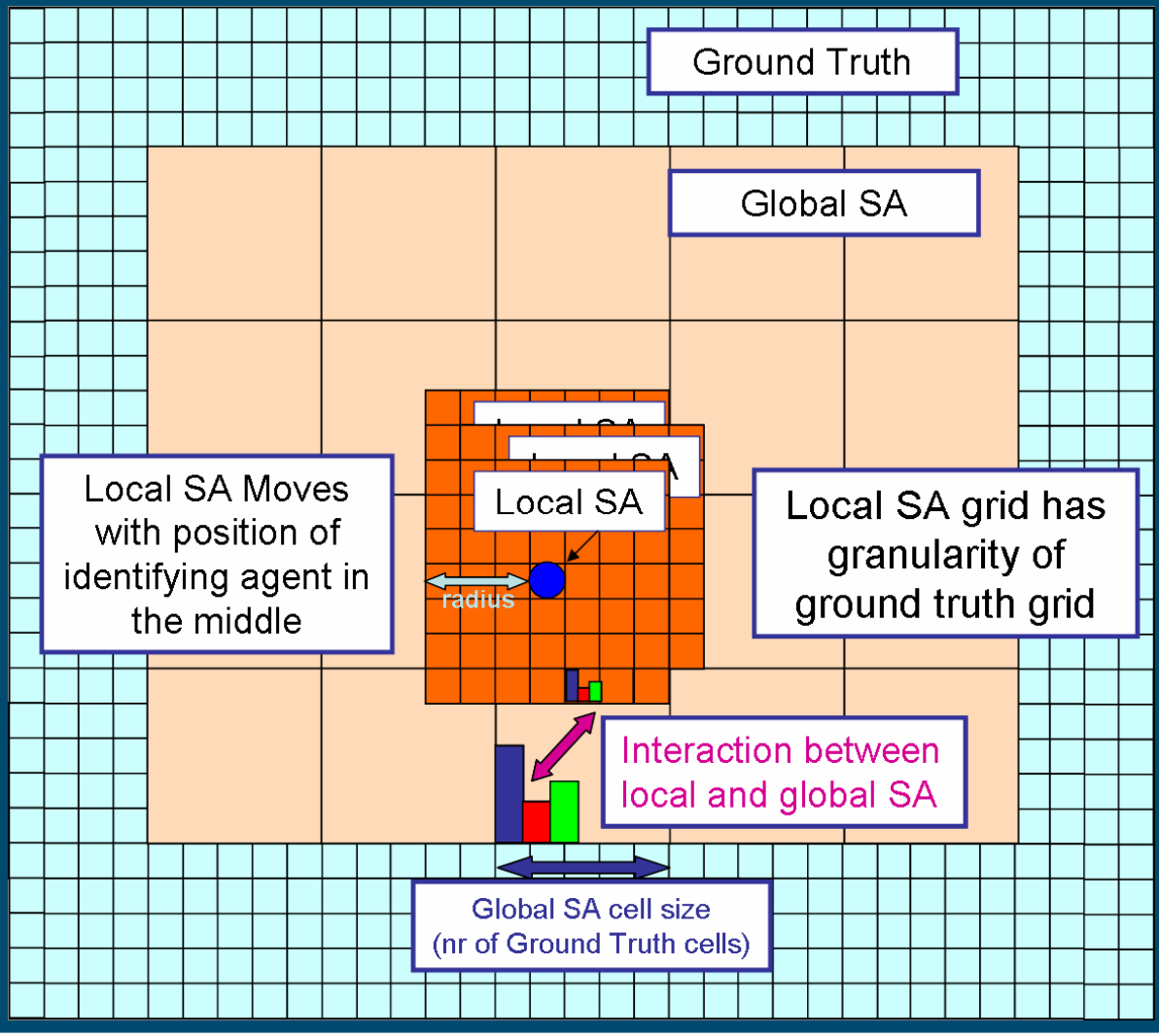




Information Acceptance Curves



Global and Local SA



Important Results

- Innovative SA representations have been developed which can be applied to a range of Network Enabled Capability (NEC) investigations.
- The Data Farming approach has proved to be very a very powerful technique to support application development.
- The Net Logo model will soon be in a state which enables it to perform a range of simple analysis tasks.
- Model concepts have been exploited within the Close Action Environment (CAEn).

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Next Steps

- The Net Logo tool is approaching a limit of diminishing returns.
  - We don’t want to re-invent the wheel in taking it further.
- The next step will be to take what we have learned, and incorporate it within a more mature Agent Based Model.
  - With terrain, engagement and tactical decision making representations.
  - An additional objective is to develop the INCIDER representations within cognitive architectures such as ACT-R and Soar.
- Next HF developments will investigate team and group decision making.

Questions?