The Top 3 Errors in Computer Assisted Exercises and How to Avoid Them

The 3 most recurring errors in the delivery of Computer Assisted Exercises (CAX) seen by LBS over the past 20 years are:

1. Poor exercise design
2. Ineffective Excon structures and ill-defined roles and responsibilities
3. Inappropriate IT used, in particular the main simulation

Let's look at each of these errors and the mitigation measures that ensure they are avoided. Although found most frequently in CAX they also apply to manual wargames involving no IT. They are equally applicable to training/education events and to analytical/research events.

Error # 1: Poor exercise design

Many CAX suffer from either poor design or no design at all. The aim of the design phase is to analyse the exercise objectives (training or research) and participants to derive the information required to enable the desired decisions to be made, and the tools, processes and expertise required to affect information flows.

All too frequently an exercise is planned either without due regard to the objectives, the needs of the participants or without having a design team in place that collectively understands all aspects of CAX. Remember Peter Perla's quote (on the How we do it page) and the 4 categories of people required to successfully design a CAX:

- Military officers or MOD personnel who, ultimately, 'own' the objectives.
- Operational analysts/researchers to ensure verified (realistic) model and simulation outcomes.
- Software engineers/technical experts with knowledge of software capabilities and limitations.
- A wargame designer with knowledge of all of the above plus training and analytical design expertise.

A combination of all these skills and functional expertise is required to ensure that the proposed CAX solution is achievable and will achieve the objectives. It is critical to create the correct team at the outset of exercise planning and maintain it through development, delivery and validation so that LL can be carried forward.

The team also needs collective expertise in the elements of a wargame, as shown on the What is Wargaming page; remember whether CAX or manual, training or research, these are all *wargames*, as explained on the How we do it page, and that the wargame is not just the simulation!

Hence the design team needs a skill set that covers all aspects of the wargame:

- Determining and writing exercise aims and objectives.
- Scenario writing.

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- The participants' requirements.
- Data bases.
- Models and simulations, including any supporting tools (e.g. for operational analysis).
- Rules, procedures and umpires.
- Analysis, be in for training or research purposes.

Creating the correct team is the first step. The second is to follow a robust, logical and traceable process to design, develop and deliver the CAX, and then validate and refine it. In much the same way as various forms of the military decision making process use different terminology but generally follow the same steps, wargame design processes all consist of broadly similar phases. The devil is in the detail, with the actions taken in each phase being critical. The outline process is shown in Figure 1.

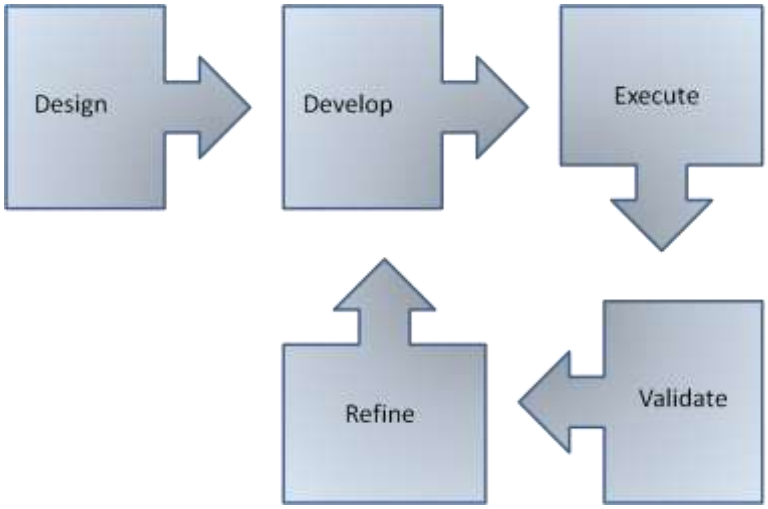

Figure 1. Outline Exercise Creation Process

A more detailed break-down of step by step activity is listed below, first for a training/educational wargame and then for an analytical/research wargame. It is the correct application of these steps and sub-steps that ensures a successful CAX (or manual wargame).

Training/Educational Wargames

Training wargame design:

1. Identify the exercise aim and TOs. The major stakeholders (e.g. exercise author/designer, simulation specialists and operational research analysts) must be involved as early as possible. This ensures that the entire team understand the objectives and can provide guidance to the responsible military personnel to ensure that these are achievable and achieved.
2. Identify the people to be trained, their roles and the decisions they will be expected to make.
3. Determine the effects on the participants that are desired, and the exercise activities required to achieve these.
4. Determine the types, level and sources of information the participants will need to make their decisions and to enable the desired effects to be visited on them.
5. Identify the processes required to achieve Steps 3 and 4.

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6. Identify the tools, technology and personnel (SMEs, control staff, role-players etc) needed to make the exercise elements and processes work.
7. Create an audit trail by documenting all decisions taken and the reasons for them.

Training wargame development:

1. Validate the scenario, simulation model(s) and data to ensure that these support the exercise aim and TOs. They must also be sufficiently realistic (i.e. verified) to allow participants to 'suspend disbelief' and believe in the virtual environment.
2. Play-test the simulation(s) (if used) and systems; try to break them. Ensure that the simulations contain the correct level of detail and are playable in accordance with the exercise level, timeline etc. Capture all LL.
3. Play-test the exercise processes. This is the principal testing of the procedures that will make or break the exercise. Rehearse the staff in their game roles, preferably in a mini game. Capture all LL.
4. Prepare the final rules, incorporating any LL from steps 2 and 3 of the exercise preparation and development stage.
5. Create an audit trail by documenting all decisions taken and the reasons for them.

Training wargame execution:

1. Conduct simulation and systems set-up.
2. Conduct user training as required.
3. Conduct pre-exercise and STARTEX briefs for control staff and Training Audience.
4. Conduct the exercise.
5. Analyse the exercise.
6. Conduct the After Action Review (AAR).
7. Collect and collate LL throughout for the validation and refinement phases.

Training wargame validation:

1. Analyse all LL and feedback for internal[1] and external validation[2].
2. Produce the Post Exercise Report (PXR).

Training wargame refinement:

1. Incorporate feedback from LL analysis and the PXR into subsequent exercise planning, preparation and development phases, as applicable.
2. Create an audit trail by documenting decisions taken and the reasons why.

Analytical/Research Wargames

Research wargame design:

1. Specify the aim (to include the overall Research Question) and objectives.
2. Identify the subject(s) of the analysis, and any critical elements within these.

[1] Internal validation is the process of determining how successfully training has achieved specified training objectives.
[2] External validation is the process of determining whether the training objectives for an internally valid training programme are realistically based on the current requirements of the job.

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3. Determine how the subjects of analysis will be evaluated and any variables that will be required to achieve this.[3]
4. Identify the metrics that will need to be gathered to measure and gauge this evaluation, and how this data capture will be done.
5. Identify the people required to ensure of validity of the analysis.
6. List any assumptions made to date.
7. Identify the processes required to achieve the objectives.
8. Devise the tools, techniques and SMEs needed to make the processes work.
9. Create an audit trail by documenting all decisions taken and the reasons for them.

Research wargame development:

1. Validate the scenario, model and data.
2. Verify the model, data and all OA to be used in the wargame if this will directly affect the wargame output.
3. Play-test the wargame to confirm the level of detail and to try to break the model.
4. Conduct pre-play tests of procedures with control staff.
5. Prepare final rules, incorporating any LL gleaned throughout the wargame development stage.
6. Create an audit trail by documenting all decisions taken and the reasons for them.

Research wargame execution:

1. Conduct pre-exercise and STARTEX briefs for control staff and players.
2. Conduct the exercise.
3. Collect and collate LL throughout the wargame to inform the AAR, wargame validation and refinement.

Research wargame analysis (which can be part of the execution or a separate activity, but is fundamental to the success of a research wargame for obvious reasons):

1. Analyse observations. This is the critical step in an analytical wargame and leads to the key outputs required to achieve the aim.
2. Produce the analysis report in accordance with the aims and objectives.

Research wargame validation:

1. Analyse LL for internal and external validation.
2. Produce the PXR.

Research wargame refinement (if required for subsequent iterations):

1. Incorporate feedback from LL analysis and the PXR.
2. Create an audit trail by documenting decisions taken and the reasons why.

[3] This is preferably done using quantifiable criteria to determine success or failure, although qualitative factors might need consideration, for example during the analysis of people in a decision-making process.

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Error # 2: Poor Excon structures, processes and procedures

Poor Excon structures lead to inefficient information flows, while poor Excon processes and procedures lead to incoherent information being presented to the wargame participants. The roles and responsibilities of Excon personnel are included under the heading 'Excon processes and procedures'.

Failing to achieve the correct Excon structure and processes introduces the greatest risk of failure into a CAX. Conversely, having a robust Excon should mitigate most other CAX failings.

Mitigation: Figure 2 shows a generic training wargame Excon construct, and Figure 3 shows generic training wargame Excon roles and processes. These will be exercise-specific and so vary from wargame to wargame depending on the size, complexity and geographical location of each event. Although much of the terminology will remain the same, the constructs will be different for an analytical/research wargame. Determination of the necessary Excon structures is a key outcome of the robust design and development process detailed above; this guarantees the correct Excon structures to support the exercise and deliver the objectives.

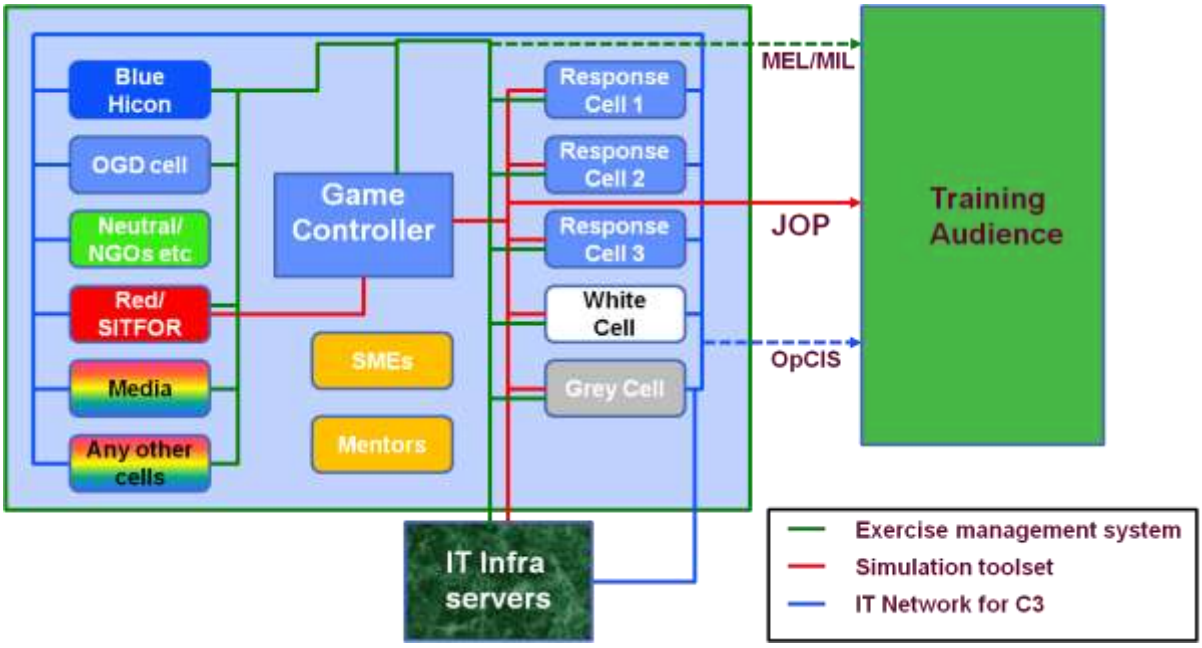

Figure 2. Generic Excon Construct (Training Wargame)

Ensuring that Excon personnel have detailed Terms of Reference (TORs) that specify their roles and responsibilities – and that they understand and follow these – is fundamental to successful wargame execution. Generic examples of Excon roles are at Figure 3. While specifics might vary between events, functions, TORs and responsibilities will remain broadly the same.

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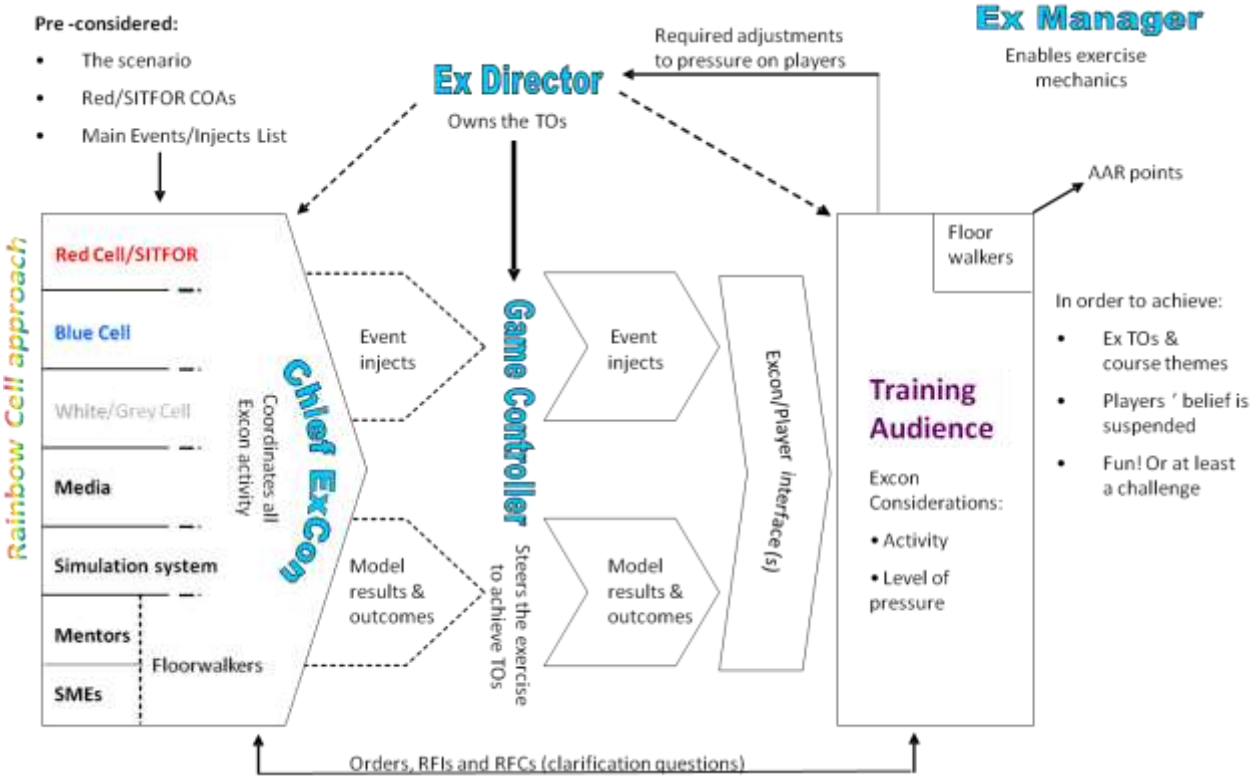

Figure 3. Generic Excon Roles and Processes

The key responsibilities of the personnel named in Figure 3 are:

- **Exercise Director**. Ultimately responsible for the selection and achievement of the aim and objectives.
- **Game Controller**. Responsible in all respects for the minute to minute coordination and control of exercise activity to steer the wargame towards the aim and objectives.
- **Chief Excon**. Responsible for the coordination of all Excon elements to ensure all information presented to the Training Audience is coherent and credible.
- **Exercise Manager**. Responsible for Real Life Support, provision of infrastructure etc.

A key concept pioneered by LBS is the Excon 'Rainbow Cell', an approach that ensures that all scenario and Master Events/Master Injects Lists (MEL/MIL) material presented to the Training Audience via any means remains coherent and leads directly towards the achievement of the TOs. Simply stated, this involves blending the different coloured cells into one cohesive 'rainbow' unit, with each cell integrated into a cohesive and coordinated whole. Successful achievement of this end state is as much art as science and demands considerable experience and man-management skills as well as technical competency. Weaving together the various inputs from the simulation(s) and human in the loop SMEs is a major contributor to successful wargame execution.

Having the correct SMEs available is fundamental to achieving objectives pertaining to specialist areas, be these in a training or research wargame. Examples from training/educational wargames are diverse but include:

- All areas of the Comprehensive Approach.

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- Consultation with International Organisations (IOs) and Non-Governmental Organisations (NGOs).
- Other Government Departments (OGD).
- Cultural advisors.
- Political advisors.
- Legal advisors.
- Aspects of the Contemporary Operating Environment (COE) such as:
    - Terrorism.
    - Organised Crime.
    - Civil violence.
    - Ethnic tension.
    - Competition for resources.
    - Religious fanaticism
    - Migration.
- Establishing and maintaining Campaign Authority.
- Chemical, Biological, Radiological and Nuclear (CBRN).
- Space.
- J1 to J9 functions as required by the TOs.
- Environmental (maritime, land, air plus logistics and Special Forces).
- Influence Operations and the role of the media.
- Stability Operations.
- Humanitarian Assistance (HA).
- Peace Support Operations (PSO) and Peace Keeping Operations.
- Civil-Military Cooperation (CIMIC).
- Coalition operations, collective decision-making and alliance interoperability.
- Strategic communications.

SME assistance to research/analytical wargames covers the entire spectrum of defence activity. This could range from immediate issues such as Countering Improvised Explosive Devices to predicting the security environment 30 or even 40 years in the future.

Whatever the training context or research question, the selection of the correct SMEs is fundamental to success; hence why it features as a specific question in the wargame design steps.

Error # 3: Inappropriate models and simulations that do not best support the exercise objectives

Remember from the What is Wargaming page that the simulation is **not** the wargame. A wargame has 7 elements, and the tool set (simulation, OA models, operational CIS and whatever else IT is used) is but one part of the whole. Forget the other elements at your peril! Too often a simulation or other supporting tool will have been selected for reasons other than its ability to support the wargame aim and objectives: it will be aggregated at the wrong level, demand too much attention from Excon personnel, not allow sufficient adjudication or introduce a myriad of other failings.

Too many people mistake the simulation for the wargame, concentrating most (all?) of their time and effort on the tool. This applies both in the design and development of a wargame and during the execution phase. The outcome is buying a tool that is inappropriate for the desired objectives and/or

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the tool becoming a monster during execution, demanding attention and to be fed and constraining other activity; it takes over the wargame rather than supports it.

One example (from many): a US army and corps-level CAX in 2008 with both a distributed Training Audience and Excon; a huge wargame at the operational level. Yet the simulation used to support the wargame was JCATS: the Joint Conflict and Tactical Simulation. The clue is in 'Tactical'. In a wargame where the lowest response cells were at brigade level, JCATS operators were busy loading infantry sections on to individual trucks. If they did not program refuelling then vehicles would stop and their passengers would automatically de-bus. So much time was spent attending to this level of detail that too little was left to concentrate on activity at the correct level of warfare.

Mitigation: Note that in both training and analytical wargame design phases, the selection of the tools and technology to support the wargame is the penultimate step, followed only by the creation of an audit trail. The error – selecting the tools first – can easily be avoided if the design process described above is followed and all elements of the wargame flow directly from the objectives and the requirements of participants.

But what if a tool is already in use, or is given free to a nation with limited modelling & simulation resources, so there is no choice but to use it? Again, following the correct design and development steps will identify any issues and flaws in the supporting tools. These can then be mitigated by adjustments to the exercise processes established.

As illustrated in Figure 3, the complementary delivery of both simulation outcomes and human in the loop adjudication, injects and events is critical to success. All aspects of this process must be derived from, and directly support, the achievement of the exercise aim and objectives.

The rigorous application of the design and development processes outlined above will ensure that the tools selected to support exercises do just that; the models will be relevant and lead directly to the achievement of the wargame aim and objectives, be these training or research related.

Conclusion

The errors listed above are not exhaustive; they are simply the most common ones made with regards to CAX. However, adopting the mitigating measures outlined will ensure the successful delivery of wargames in the most cost-effective and transparent manner, while also identifying and solving problems and minimising risks.

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