

Modeling and Simulation (M&S) an Issue of Credibility

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“The Challenge”

- Develop an “acceptable” representation of reality
- Produce desirable and qualified results

How does the M&S developer/analyst offer reasonable grounds for being believed?

Background

- Things to overcome: (the way it is)
 - Traditionally placed in the engineering tool category
 - The benefit is at the task level (one who can wield the hammer is the benefactor)
 - The “it-wasn’t-built-here” syndrome
- Things to reach for: (the way to go)
 - Increase to primary use (reduce cost, reduce risk)
 - Re-use (stop re-inventing a wheel)
 - A means to gain greater sophistication/complexity

Takes an incredible level of knowledge to transport the needed level of belief.
The more complex the more knowledge base required.

The Approach: M&S Knowledge Levels

- Move from a tool concept to a knowledge base concept
- Define common processes and methods to represent consistent knowledge levels

Three (3) defined levels of representation:

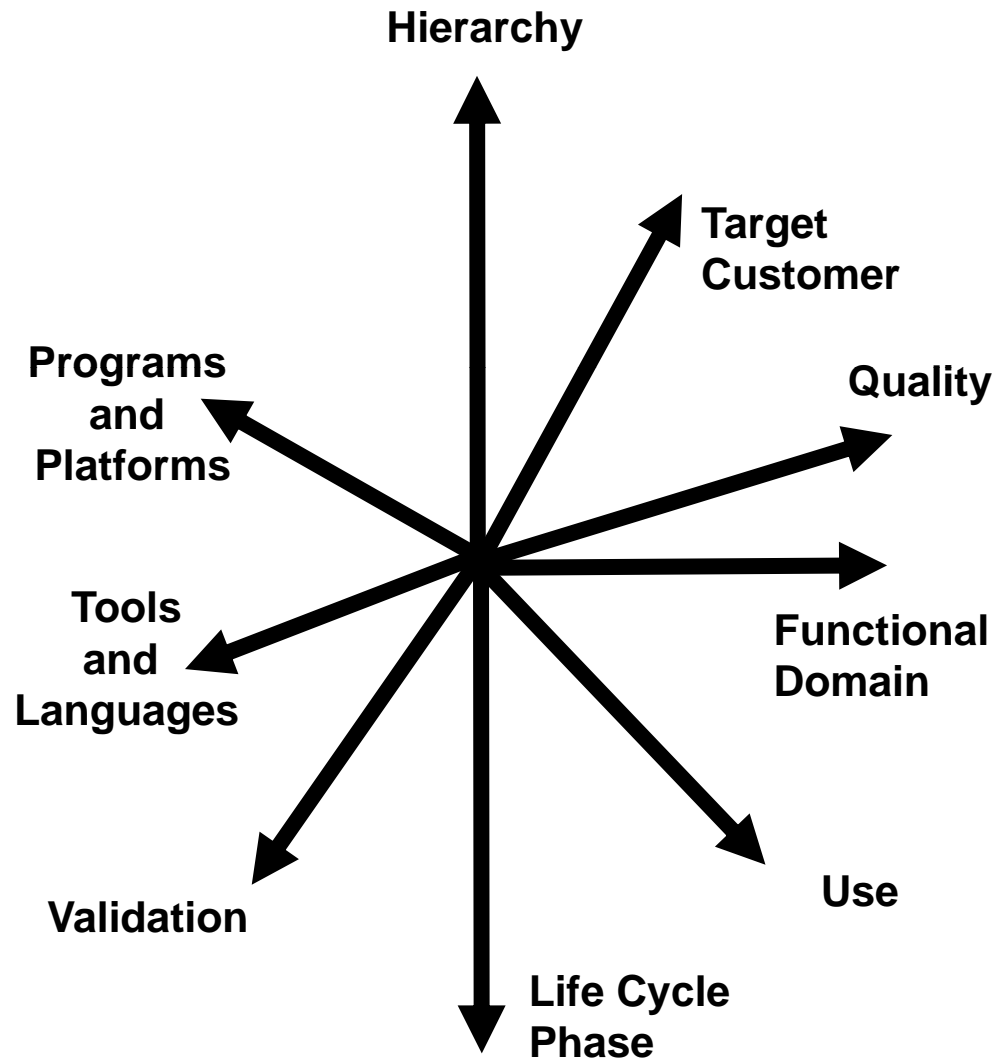
Registration, Certification, Accreditation

Registration

- Implement common practice to recognize models (subsystem/engineering) by a specific group/body of experts
- Institute formal process (as simple as):
 - Cataloguing models
 - Generating Read-Me files
 - Performing comparative analysis (similar algorithms/models)

Easy way to capture/present models of various types in multiple categories
THE KEY – Common Taxonomy

Taxonomy Structure Example



Certification

- Clearly and fully document characteristics of models/simulations (platform/system) beyond Read-Me files/cataloguing
- Must meet verification and validation requirements (customer satisfaction)
- Demonstrates adherence to a credible CM process

Most cases certified M&S will be built from registered M&S

Clear contribution to growth of maturity of M&S at this level

Larger community commitment and interest – Process Bar Raised

Accreditation

- Most widely recognized/implemented quality assurance method (Well Documented)

“Accreditation: the official determination that a computer model is acceptable for a specific purpose. [MORS]”.

- M&S (platform/system to warfare/campaign) must convey reality (as much as possible)
- M&S intent of use is clear and agreed to (official approval process)

Certification efforts direct contribution to this level

Knowledge level boundary crossed from “what” is represented to “how well”

Thought For the Day!

Broaden the approach of accreditation of models and simulations across communities (training, analysis, acquisition, testing, planning, experiment) extending the specific use portion of the definition to a different level.

The statement that most appropriately applies here is that models and simulations are rapidly evolving into a major vehicle through which the intuition and insight regarding capabilities will be developed and proven.

Will drive reuse consideration/determination early in the planning process

M&S Potential Use

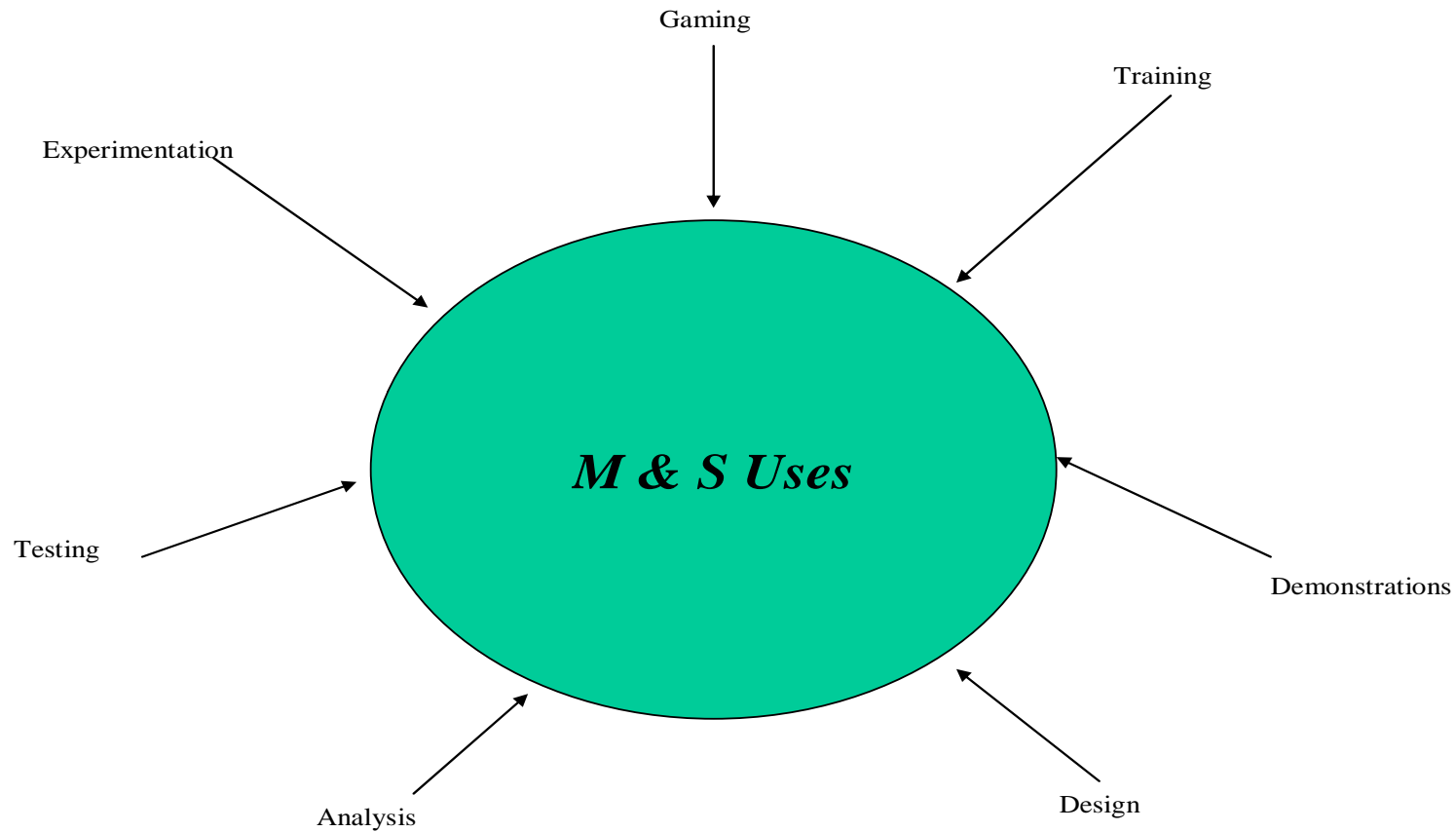


Figure 1

Environment leads to reuse as the true enabler of knowledge exchange

Some Notes on M&S Potential Use

- Experimentation – addresses problems and situations that cannot be done any other way or it is the only way
- Such applications could reach down into Testing and Demonstrations
- Gaming is a whole new perspective from the game itself to being a “player” of/in it
- Such applications could reach down into Training, Testing, and Demonstrations

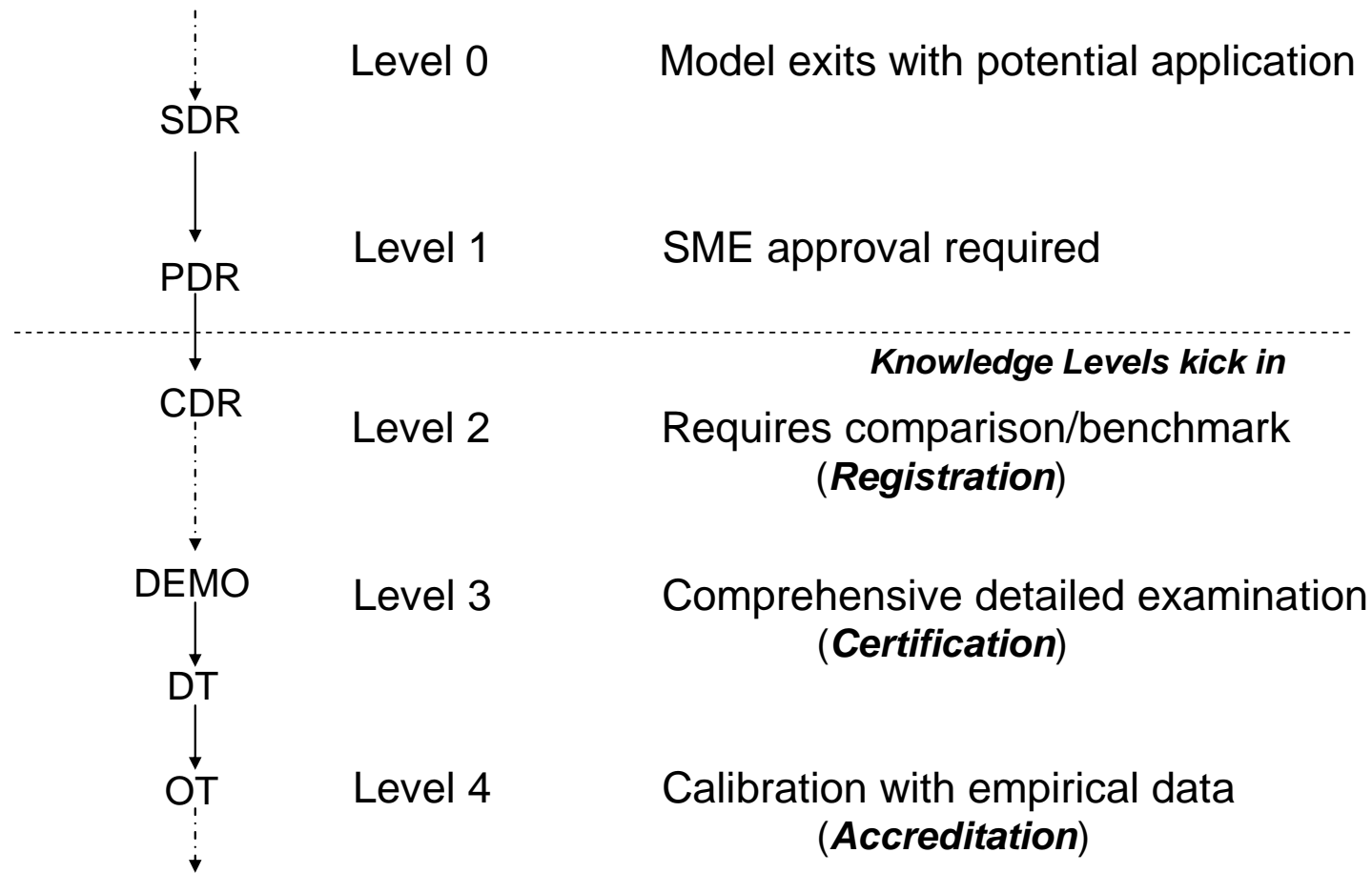
To “maintain” certification or accreditation models and simulations must continue to be well-developed, well-documented, well-calibrated

A Supporting Method M&S Qualification

- M&S health check (How well is it?) - the “grade”
- Criteria / activity to determine the grade (all in support of the knowledge levels)
- 5 descriptive levels – additional information/knowledge exchange

Another means to categorize M&S to better plan, manage, and maintain.

M&S Qualification Levels (0-4)



The new DoDI 5000.02 gives significance to this approach.

Conclusion

- Need to establish additional methods to characterize measureable credibility
- Further refinement of definitions associated with M&S goodness and clearer defined roles and responsibilities (agents, authorities, review panels)
- Emphasis on M&S credibility stimulating V&V activities to begin earlier in model development and to be part of the M&S life cycle

This approach could be easily adoptable across all industries.

Back Up Slides

System Level M&S Context (Hierarchy)

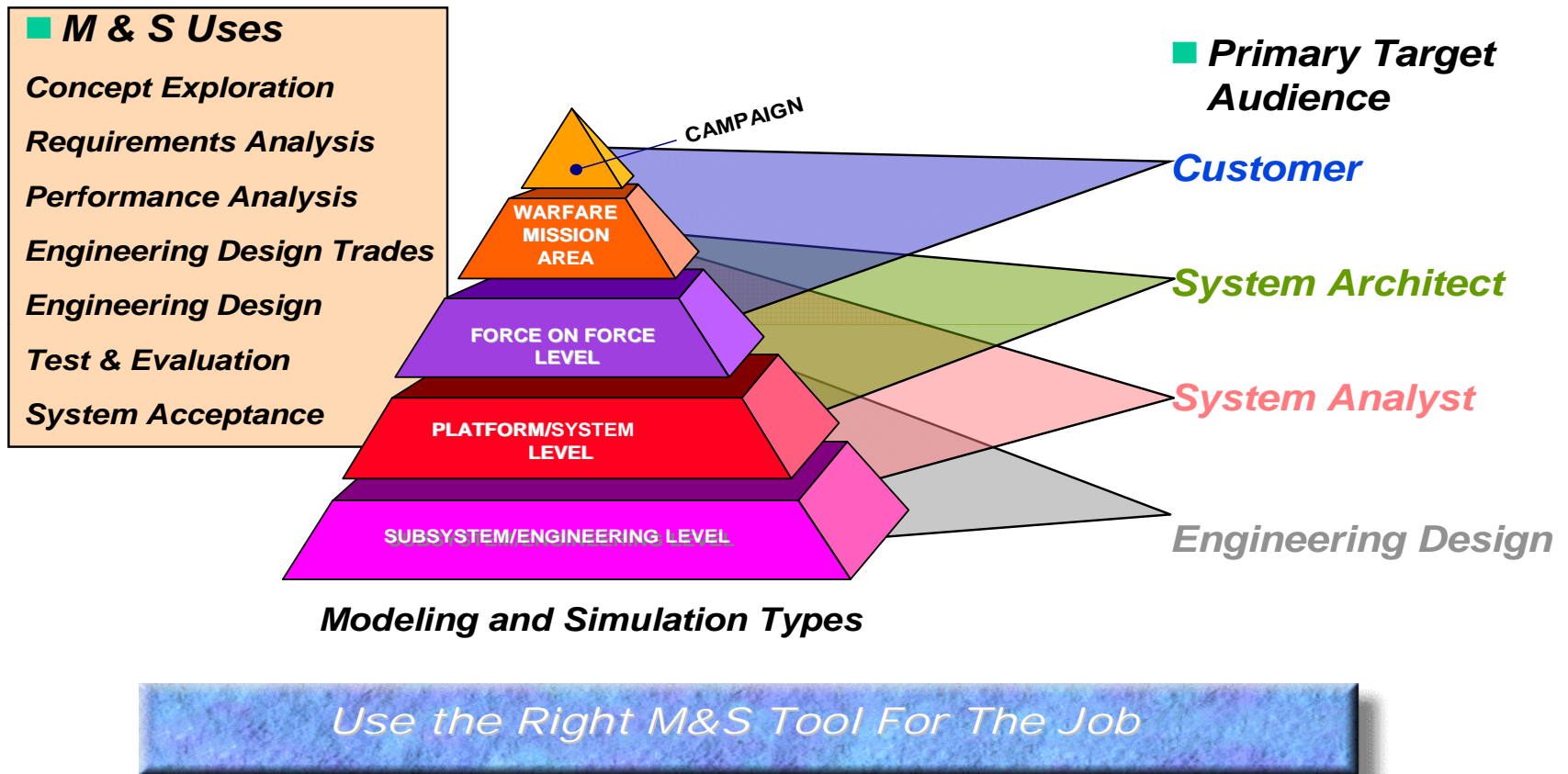


Figure 2

Taxonomy Value

- Basis for classification of analytical modeling and simulation techniques
- Standardized vernacular that may be used to describe these techniques
- Stimulate more communication between the various Analysis, Modeling, and Simulation communities
- Intended to be framework for comparing and contrasting various techniques
- Envisioned as a standard template of attributes to be addressed in descriptions of analytical modeling and simulation efforts

Acronyms

- CDR Critical Design Review
- CM Configuration Management
- DoDI Department of Defense Instruction
- DT Development Test
- M&S Modeling and Simulation
- MS2 Maritime Systems and Sensors
- SSTC System and Software Technology Conference
- MORS Military Operations Research Society
- OT Operational Test
- PDR Preliminary Design Review
- SDR System Design Review