

AUTOMOTIVE



INFOCOM



TRANSPORT,
ENVIRONMENT &
POWER ENGINEERING



AERONAUTICS



SPACE

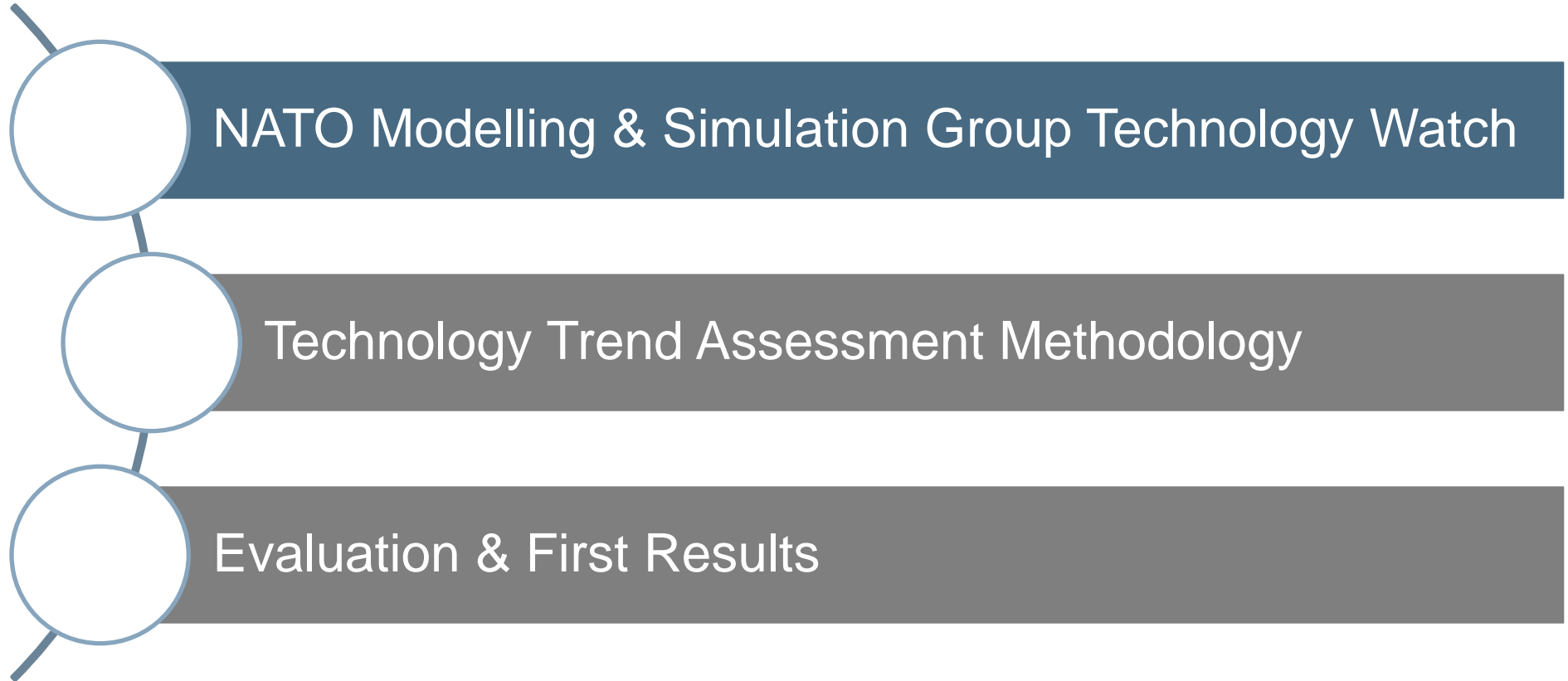


DEFENCE & SECURITY

Technology Trend Roadmap for Modelling & Simulation

Dr. Martin Rother
ITEC 2018





- NATO Science & Technology Organization (STO) continuously performs Technology Watch
- Led and reported annually by the NATO Chief Scientist
- Contributions from STO Panels and Task Groups within STO
 - i.e. bottom-up
- Influence on STO Panels and Task Groups Program of Work (PoW)
 - i.e. top-down



■ NATO Modelling & Simulation Groups (NMSG) needs to address emerging Tech Trends

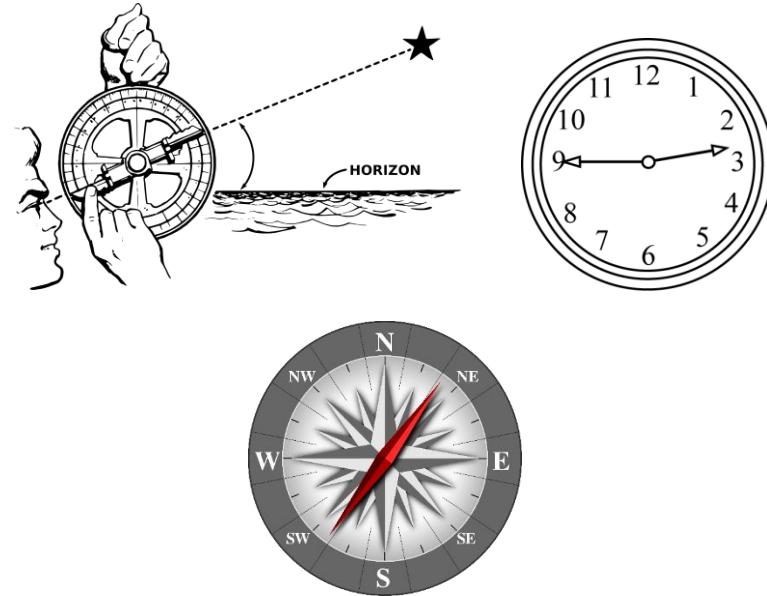
- possible actions
- priorities
- roadmap

■ Need for a methodology / toolset

- assessment (where are we now)
- gap identification (where should we go)

■ Team effort under NMSG supervision

- W. Huiskamp
- F. Perez-Duenas
- R. Siegfried
- W. Bennett
- M. Rother



■ How to assess the impact of technology trends on M&S ?

- ask the experts !!!

■ General open questions lead to general open answers

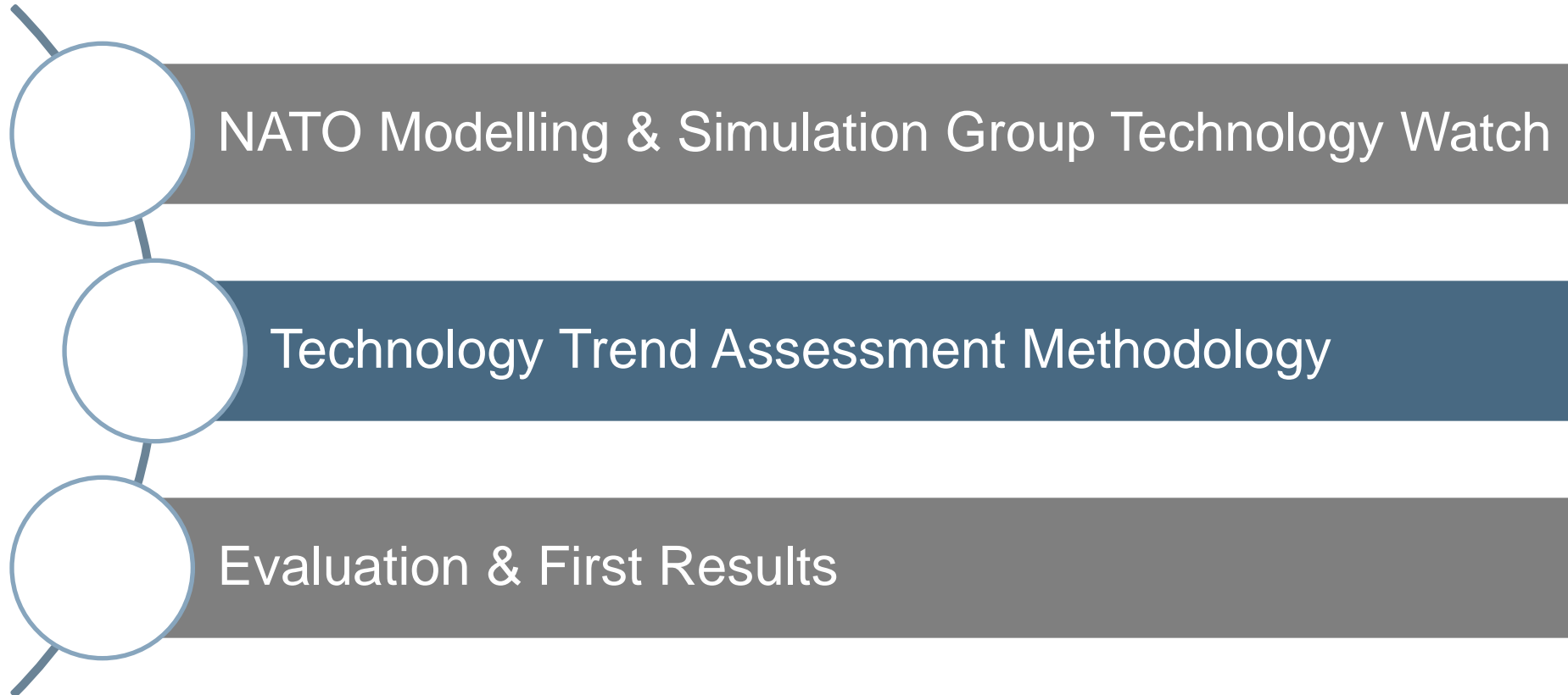
- “Will trend XYZ influence M&S?” —————> “Yes”
- “Which trend is most important?” —————> “Trend XYZ, my field of work”

■ Need for a more structured approach

- be more specific
- categorize assessments

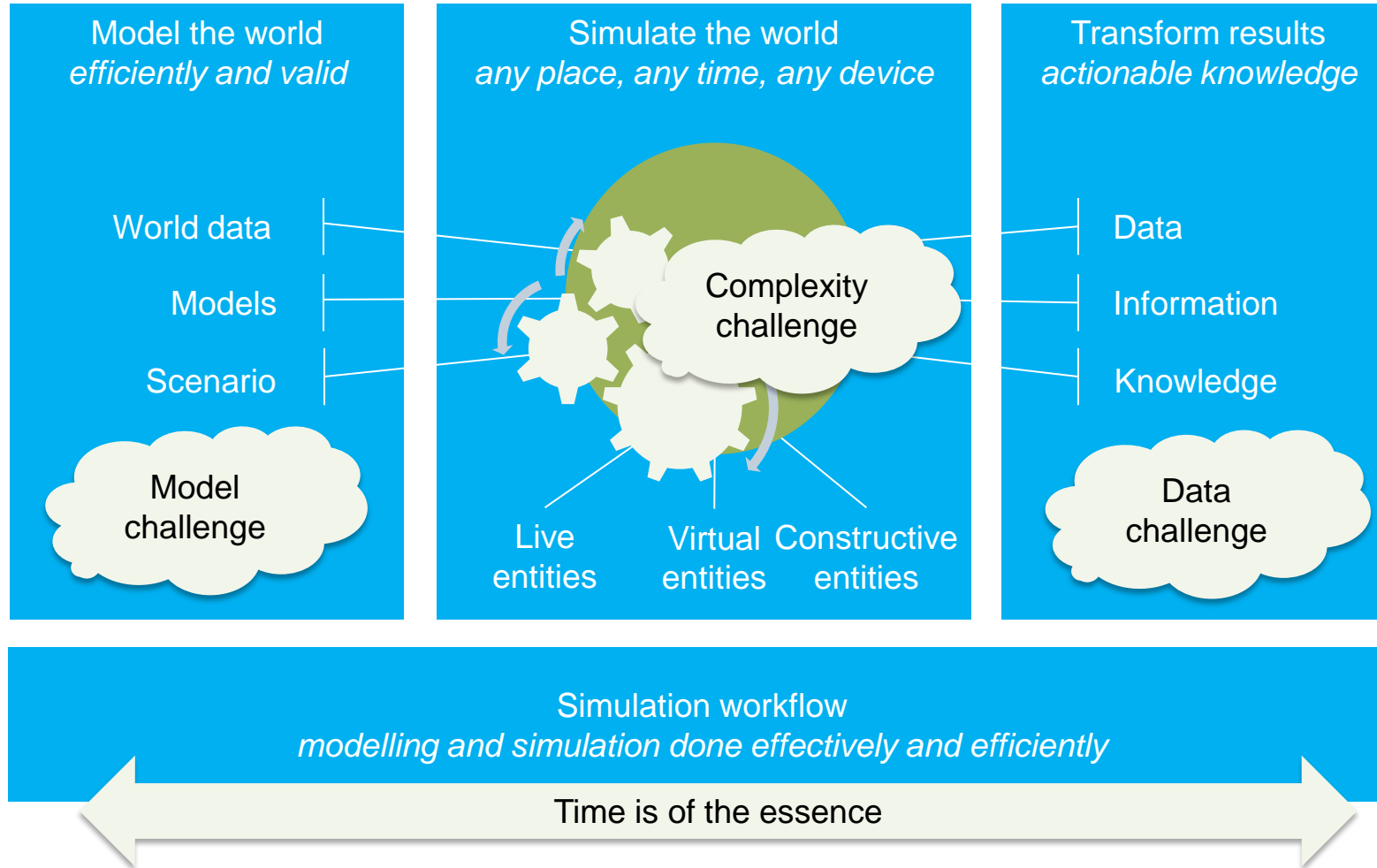
■ How to identify gaps and required actions ?

- direct consequence of proper assessment



Technology Trend Assessment Methodology

The M&S Workflow



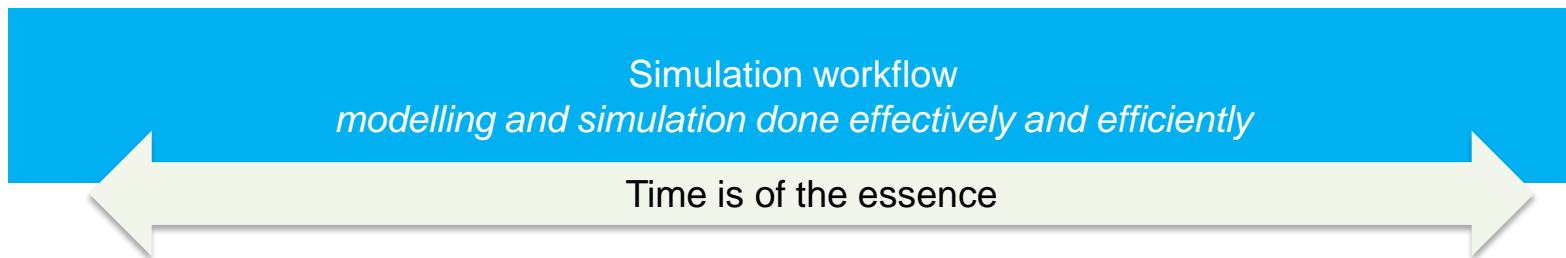
reference: Wim Huiskamp

Technology Trend Assessment Methodology

The M&S Workflow



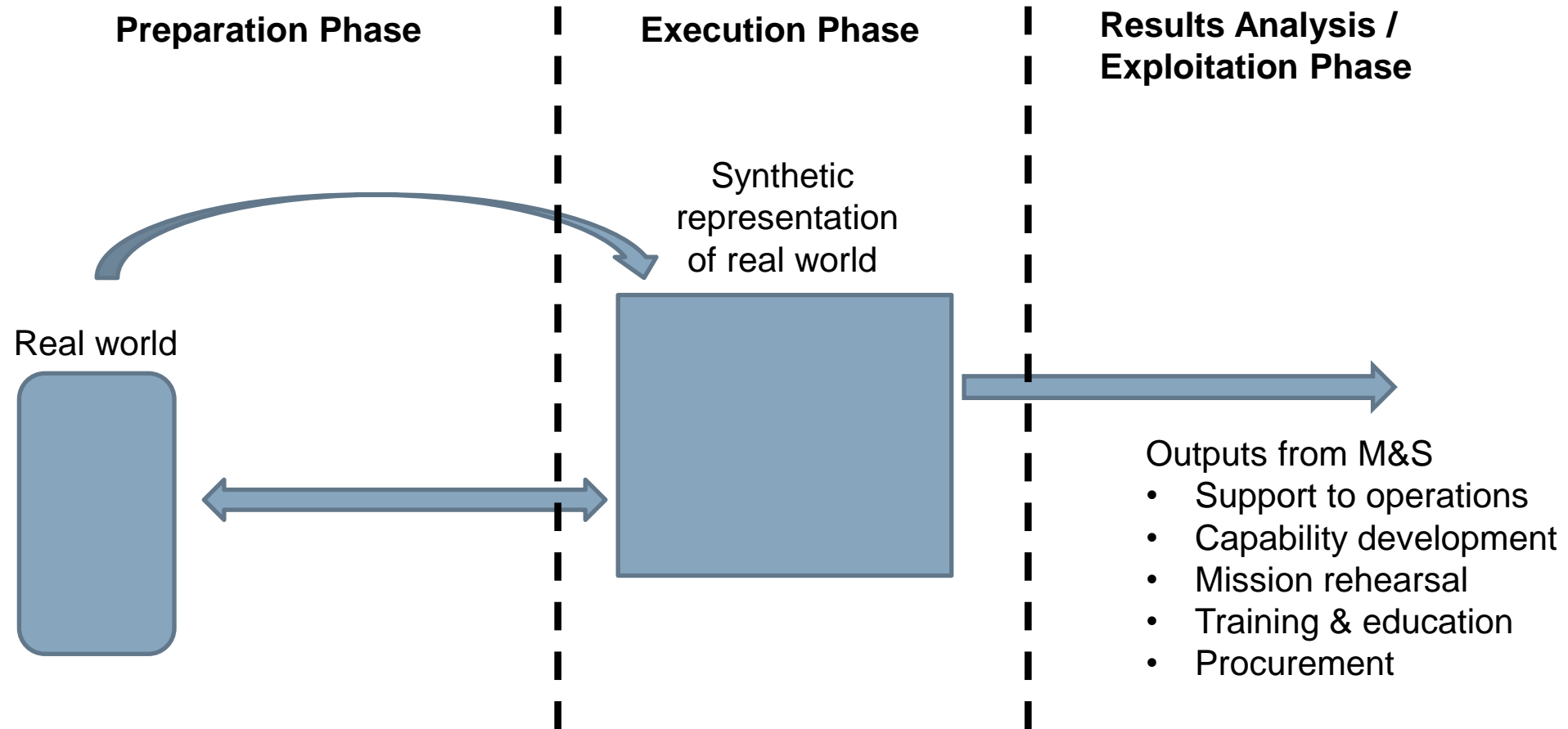
Where is the technology?
Where will a Tech Trend have an impact?
Why will a trend be relevant for M&S?



reference: Wim Huiskamp

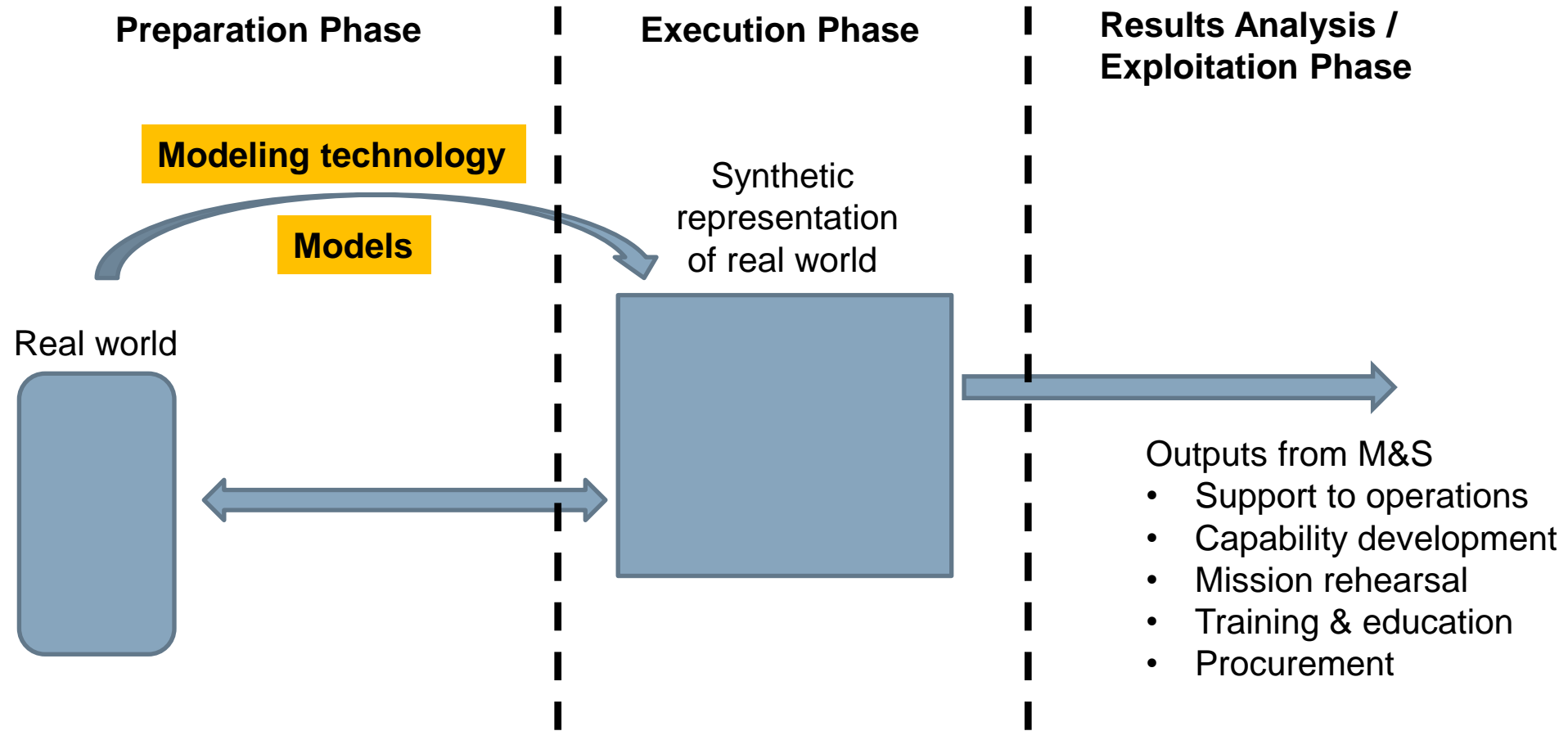
Technology Trend Assessment Methodology

Technology Categories in M&S



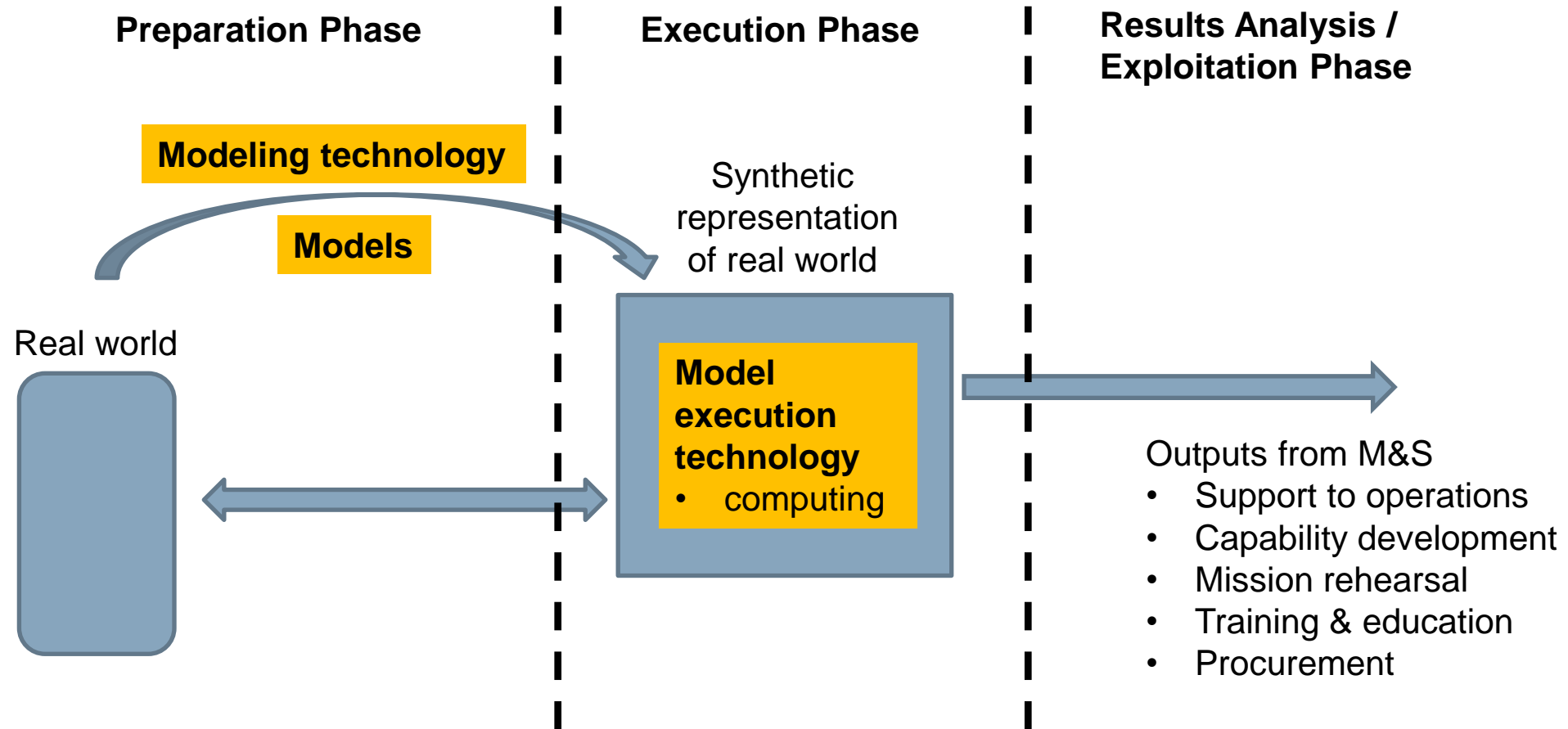
Technology Trend Assessment Methodology

Technology Categories in M&S



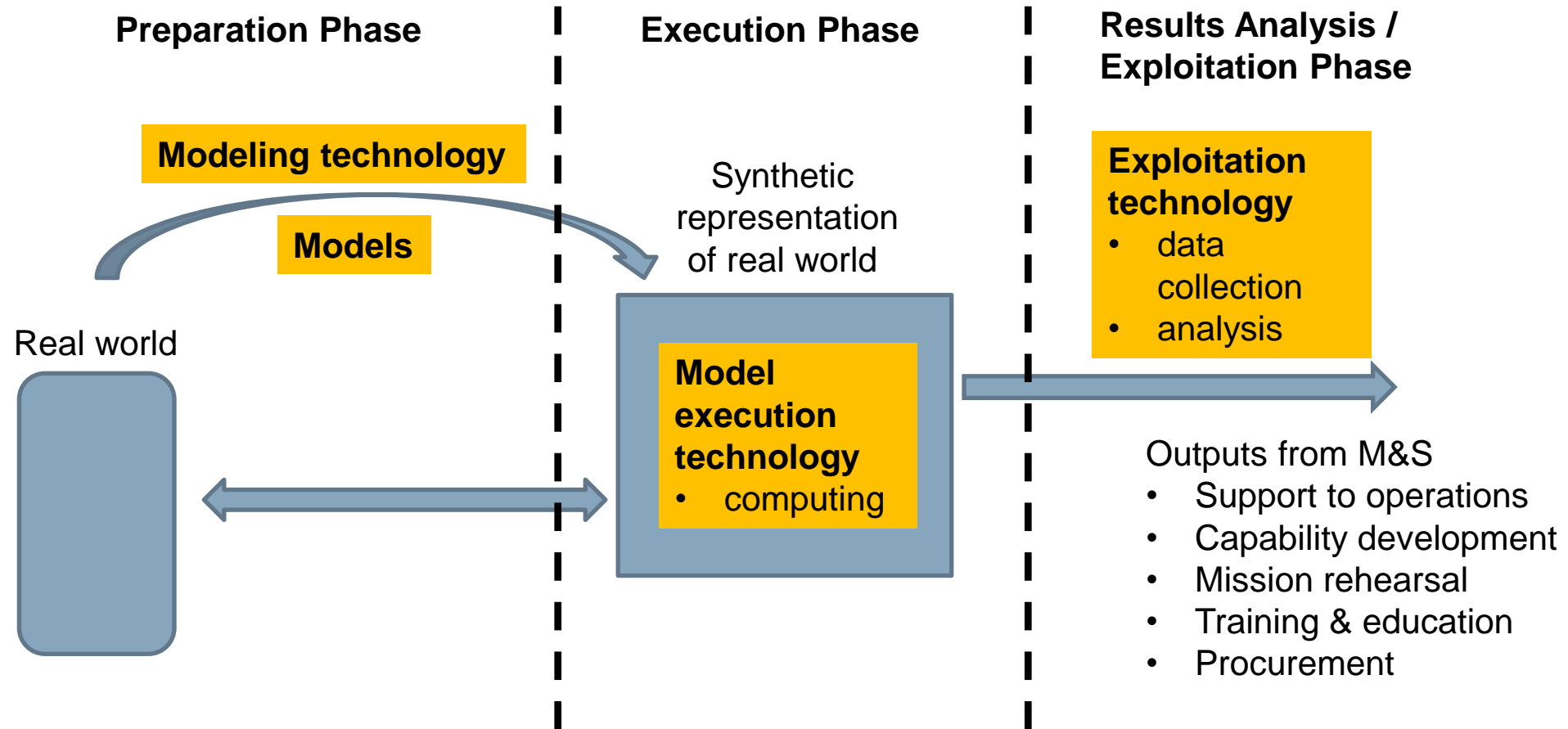
Technology Trend Assessment Methodology

Technology Categories in M&S



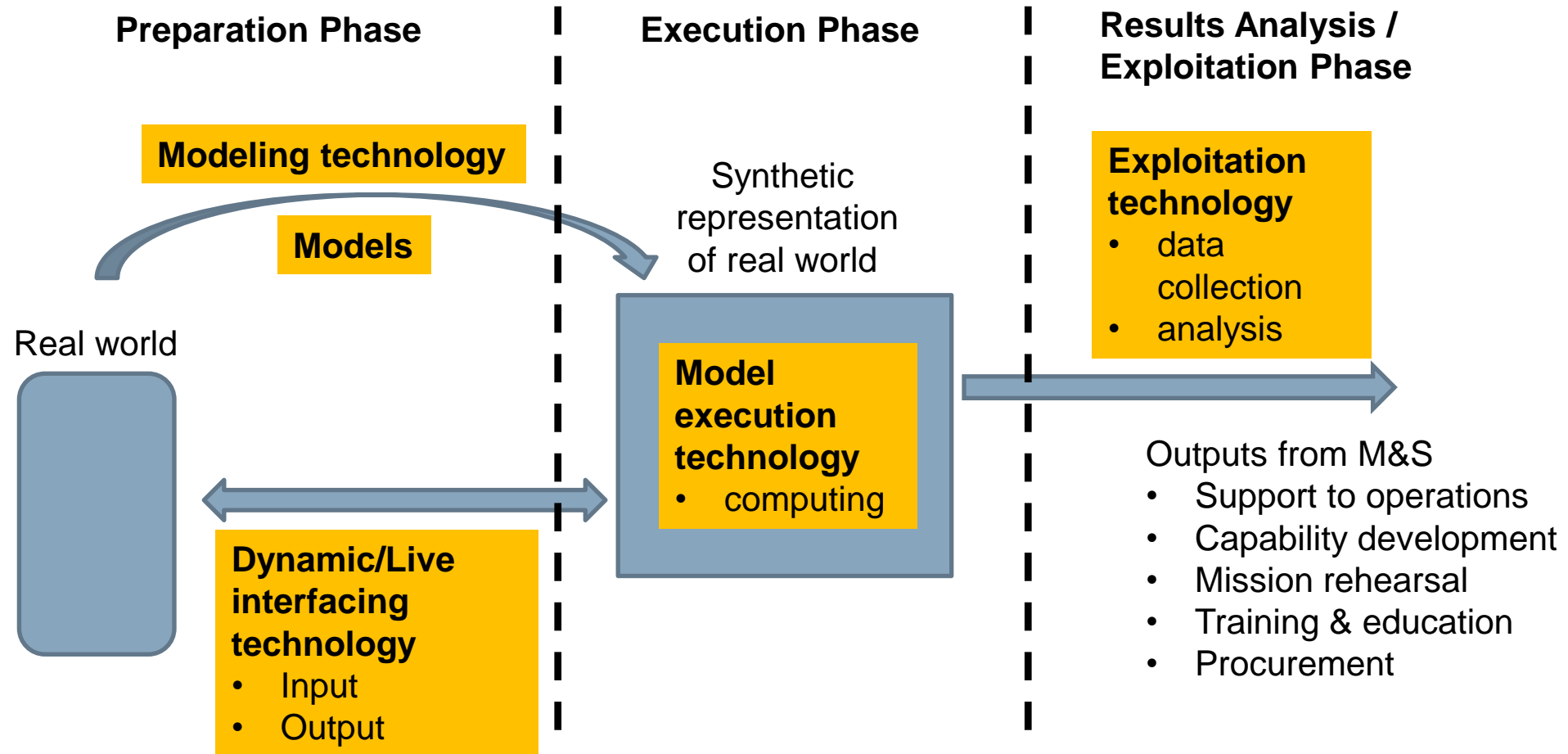
Technology Trend Assessment Methodology

Technology Categories in M&S



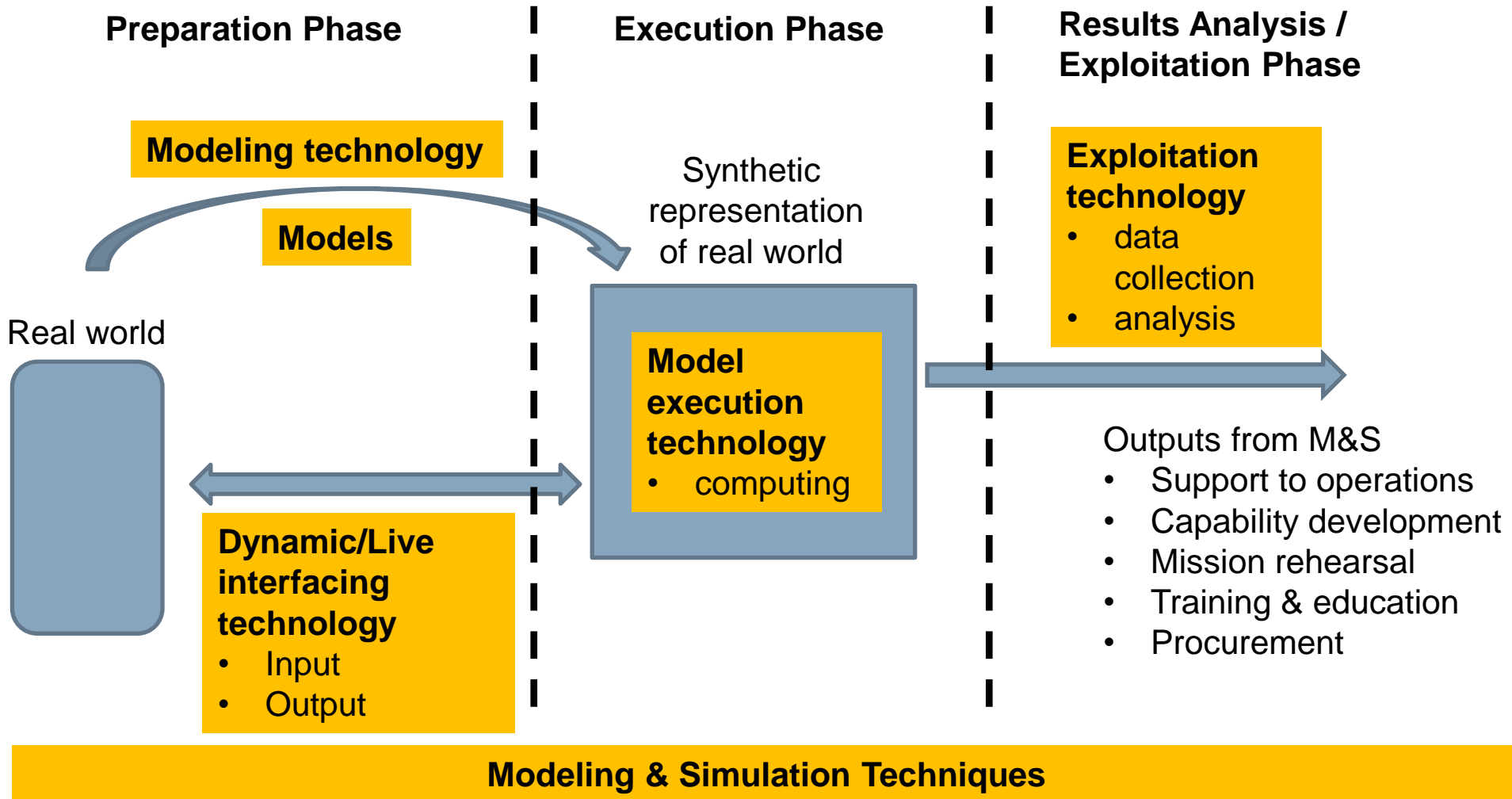
Technology Trend Assessment Methodology

Technology Categories in M&S



Technology Trend Assessment Methodology

Technology Categories in M&S



Technology Trend Assessment Methodology

Examples

M&S Technology Application Area	Current situation	Candidate Future Technology
Dynamic Interfacing	Image generators, Joysticks	AR/VR glasses, Motion tracking
Modeling	SME's expertise	Machine learning
Models	Specialized SW/HW	Virtual prototyping, Additive manufacturing
Model Execution	Individual PCs, HLA/DIS	Clouds, Ubiquitous computing
Exploitation	Reports, Databases	Big data analytics
M&S Techniques	DSEEP	DSEEP overlays, Pay-per-Use

Technology Trend Assessment Methodology

Assessment Categories

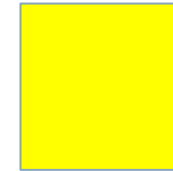
■ Category 1

- technology already in use
- research activities in progress
- first results and demonstrations available



■ Category 2

- possible impact on M&S
- not immediately, but in the long term
- assessment unsure
- more research needed



■ Category 3

- already strong impact in non-M&S domains
- no known research activities in the M&S domain
- possible gap in PoW



■ Category 4

- most likely no strong impact on M&S



Technology Trend Assessment Methodology

Assessment Example

Tech Trend	Modelling	Models	Interfacing	Execution	Exploitation	Techniques
Mixed Reality	Grey	Grey	Green	Grey	Yellow	Yellow
Sensors are Everywhere	Grey	Grey	Red	Grey	Grey	Grey
Artificial Intelligence	Red	Yellow	Grey	Grey	Red	Yellow
Unmanned Air Vehicles	Grey	Grey	Grey	Grey	Grey	Grey
Social Media	Grey	Red	Yellow	Grey	Grey	Yellow
Everywhere Computing	Grey	Yellow	Yellow	Yellow	Yellow	Yellow

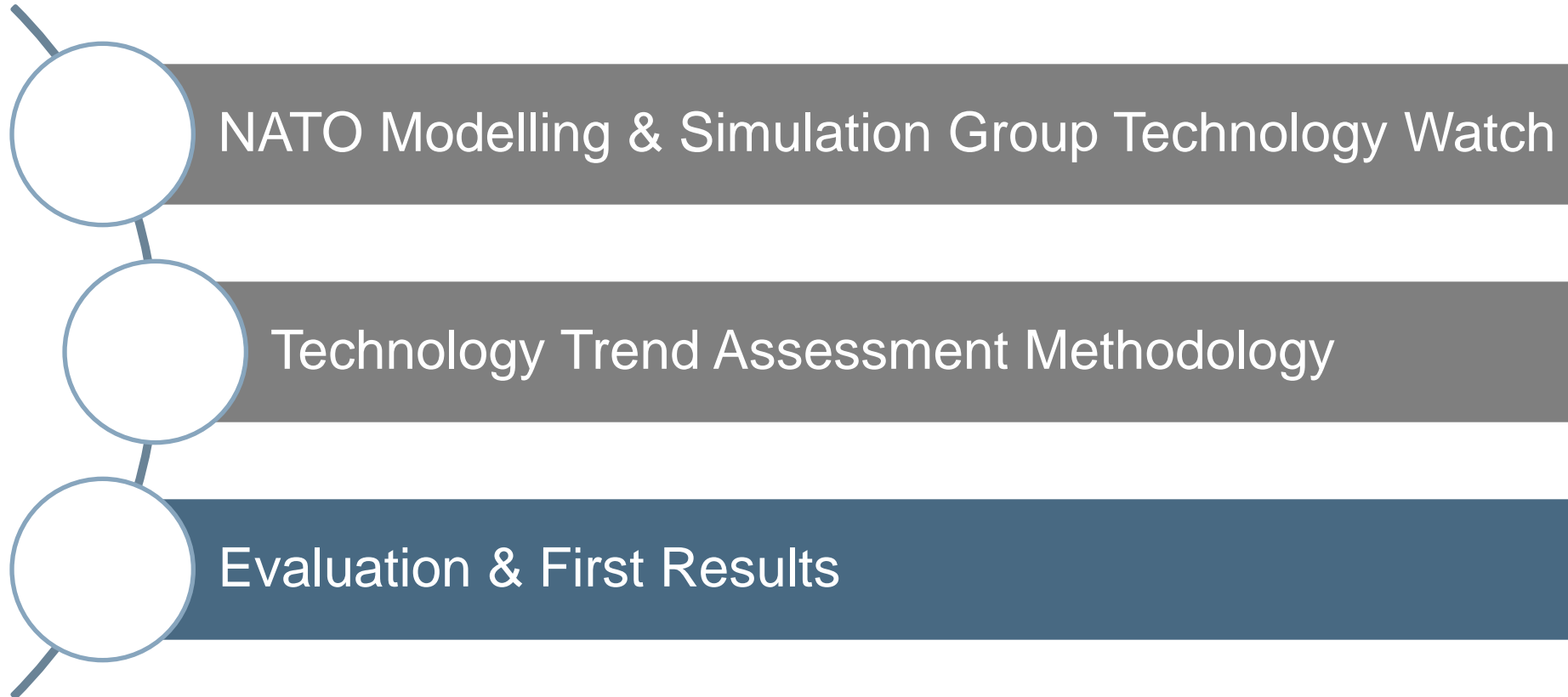
Technology Trend Assessment Methodology by M&S Application Area

■ Impact may depend on M&S use case

- e.g. “Unmanned Systems”
- are/will be used to support operations, expected more application in training
- probably less useful for M&S application in procurement

■ M&S application areas according to the NATO Modelling & Simulation Masterplan (NMSMP)

- support to operations
- capability development
- mission rehearsal
- training & education
- procurement



Evaluation & First Results

First experiences using this approach

■ Challenges / Feedback / Lessons Learned

- many table cells (19 x 5 x 6 =570)
- SMEs feedback not homogeneous
 - some textual, some coarse to some fine grained color coding
- Technology Usage Areas not always clearly distinguished
 - e. g. modelling vs. models
- biased by SMEs activity area and education
- top-left cells tend to receive more input/attraction than bottom-right cells
- currently poor basis for statistical evaluation

■ Strict cell-by-cell evaluation currently not suitable

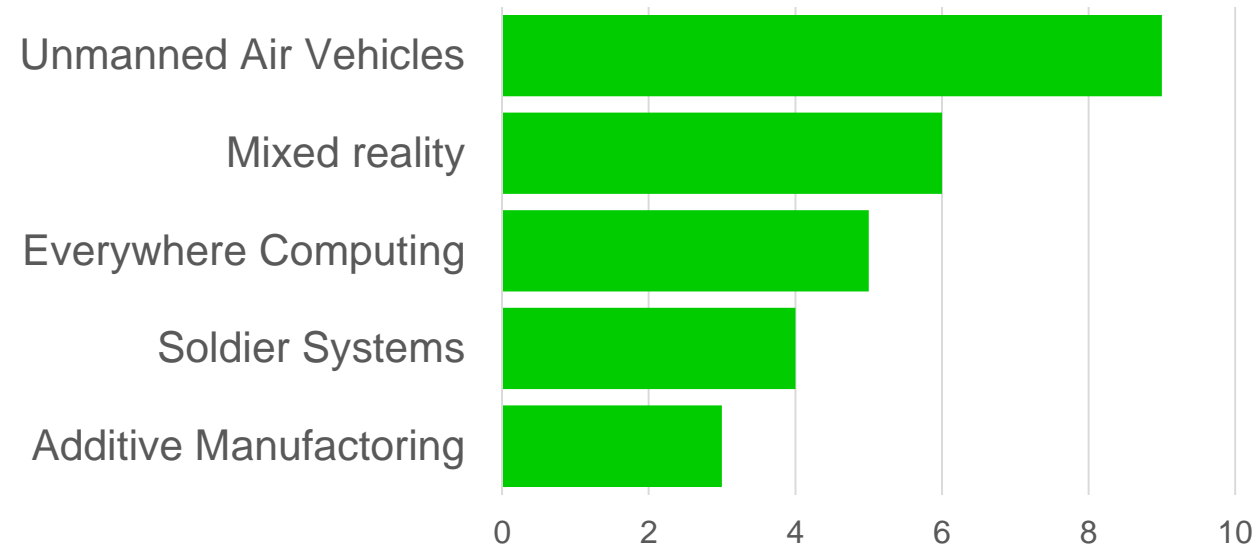
■ Instead try to derive “hot spots”

- use “heat map”-like approach to indicate SMEs interest

Evaluation & First Results

Towards a Tech Trend Roadmap for M&S

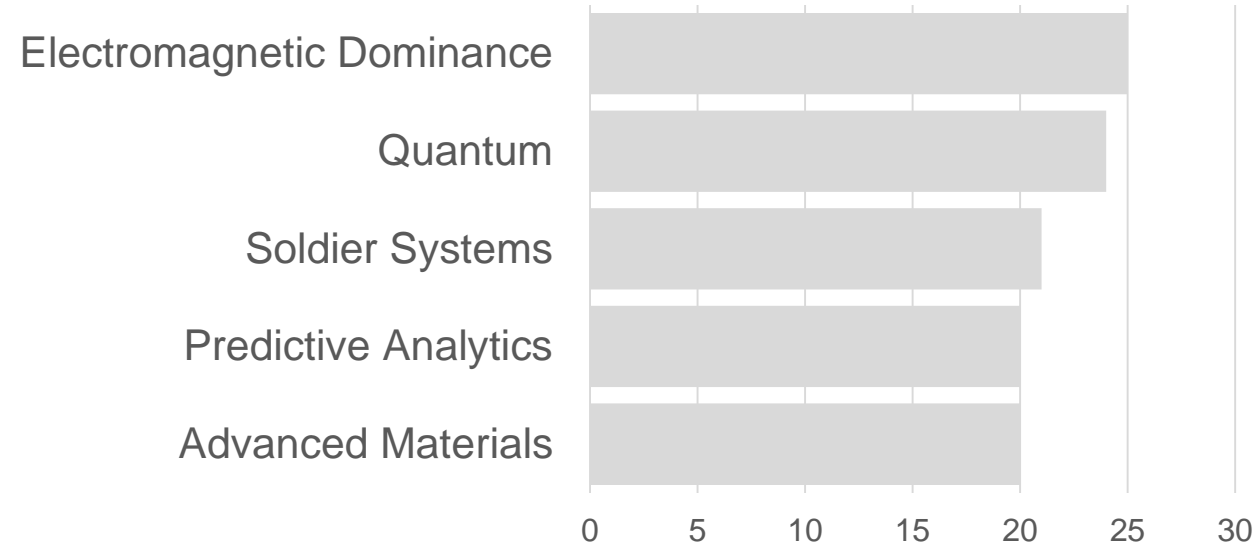
Top 5 Tech Trends with ongoing research & evaluation activities



Evaluation & First Results

Towards a Tech Trend Roadmap for M&S

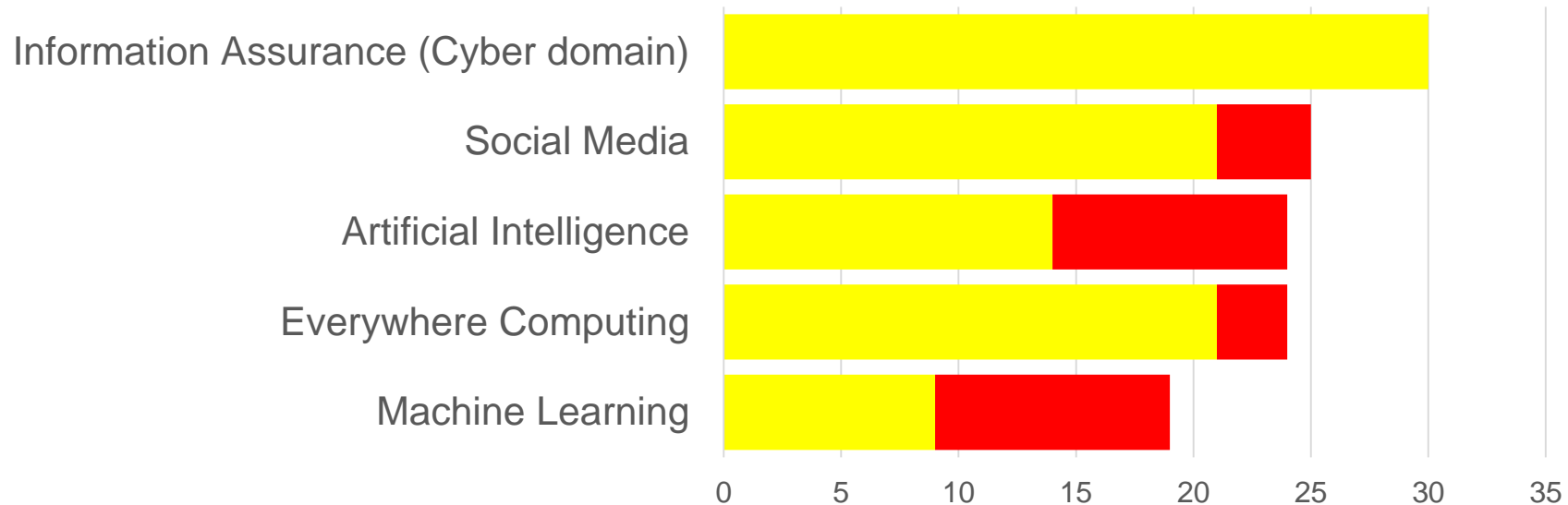
Top 5 Tech Trends assumed to have least impact on M&S



Evaluation & First Results

Towards a Tech Trend Roadmap for M&S

Top 5 Tech Trends with most need for research & evaluation



CAVEAT poor statistics





Thank you for
your
attention!

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