



SHOALTM

Australian Systems Engineering Workshop
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Model-Based Conceptual Design through to system implementation

Lessons from a structured yet agile approach

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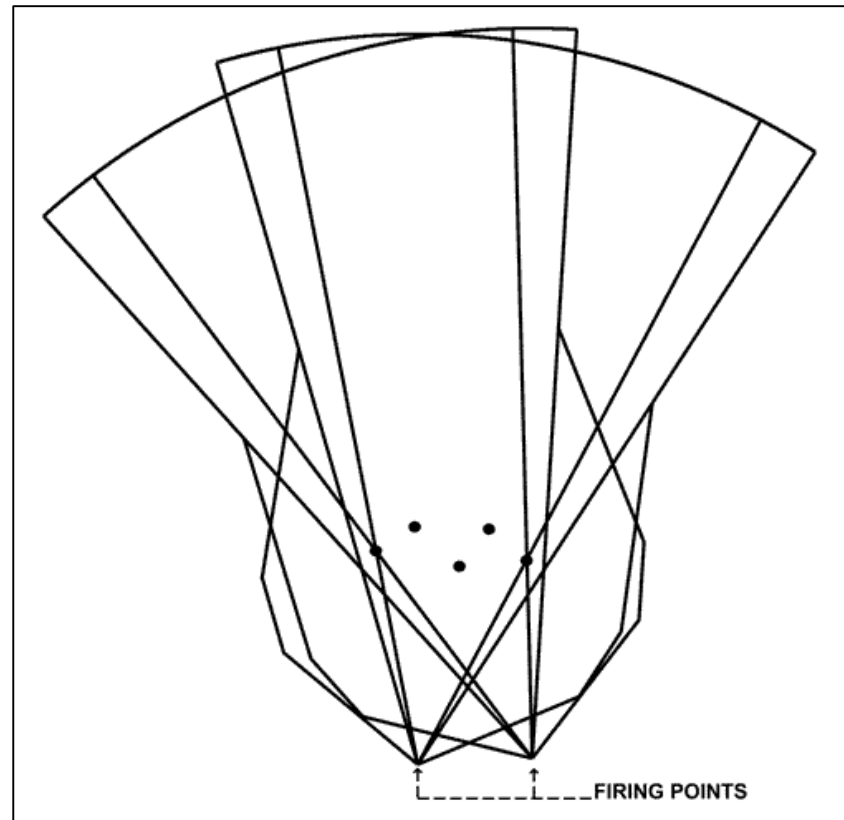
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Presentation overview

- Background
- Conceptual design using model-based methods
- Software development using Agile
- MBCD and Agile
- Flexibility and Traceability
- Lessons learnt
- Further development and future applications
- Conclusions
- Questions

Background

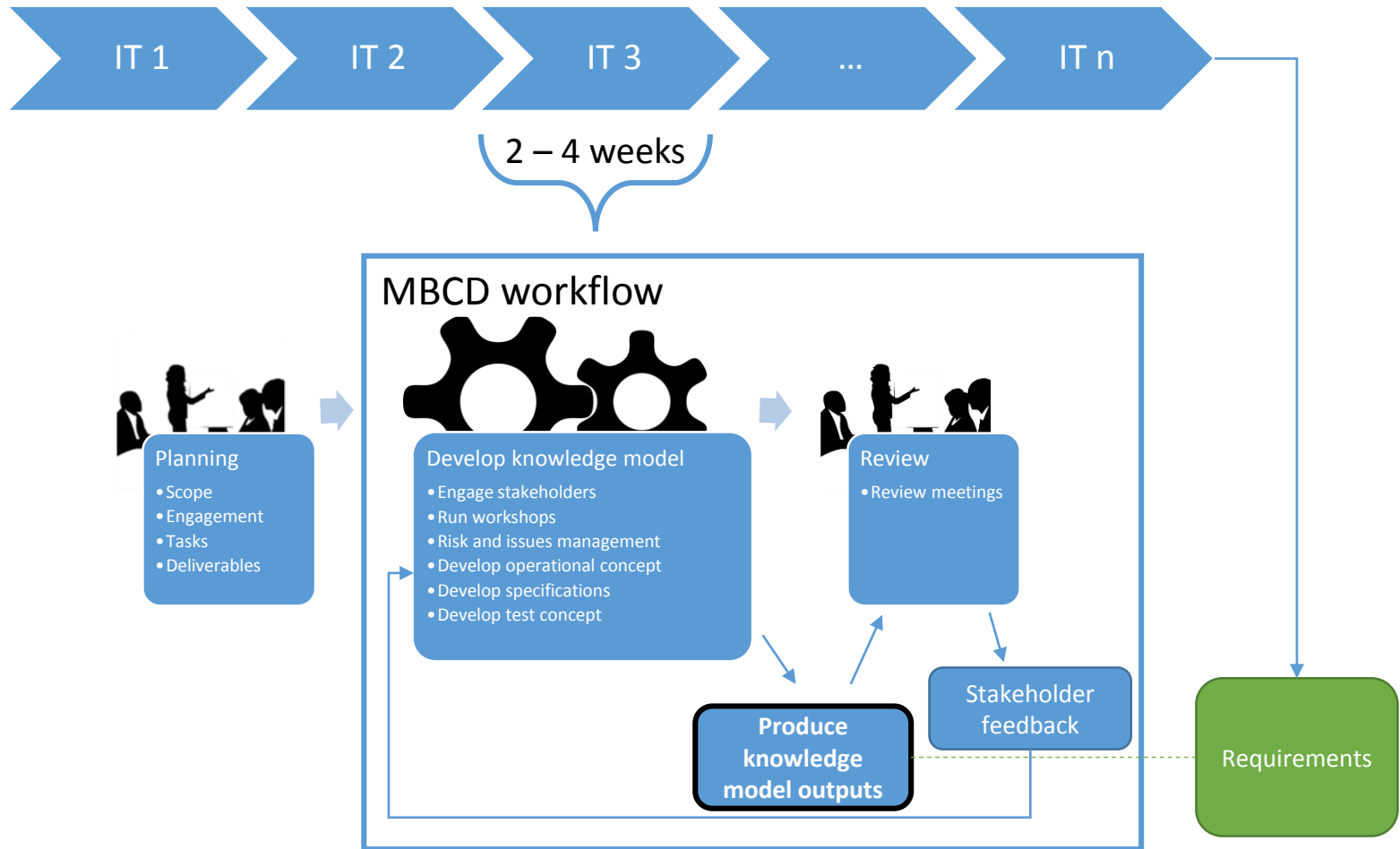
- Range safety planning
- MBCD using WSAF
- Agile Scrum



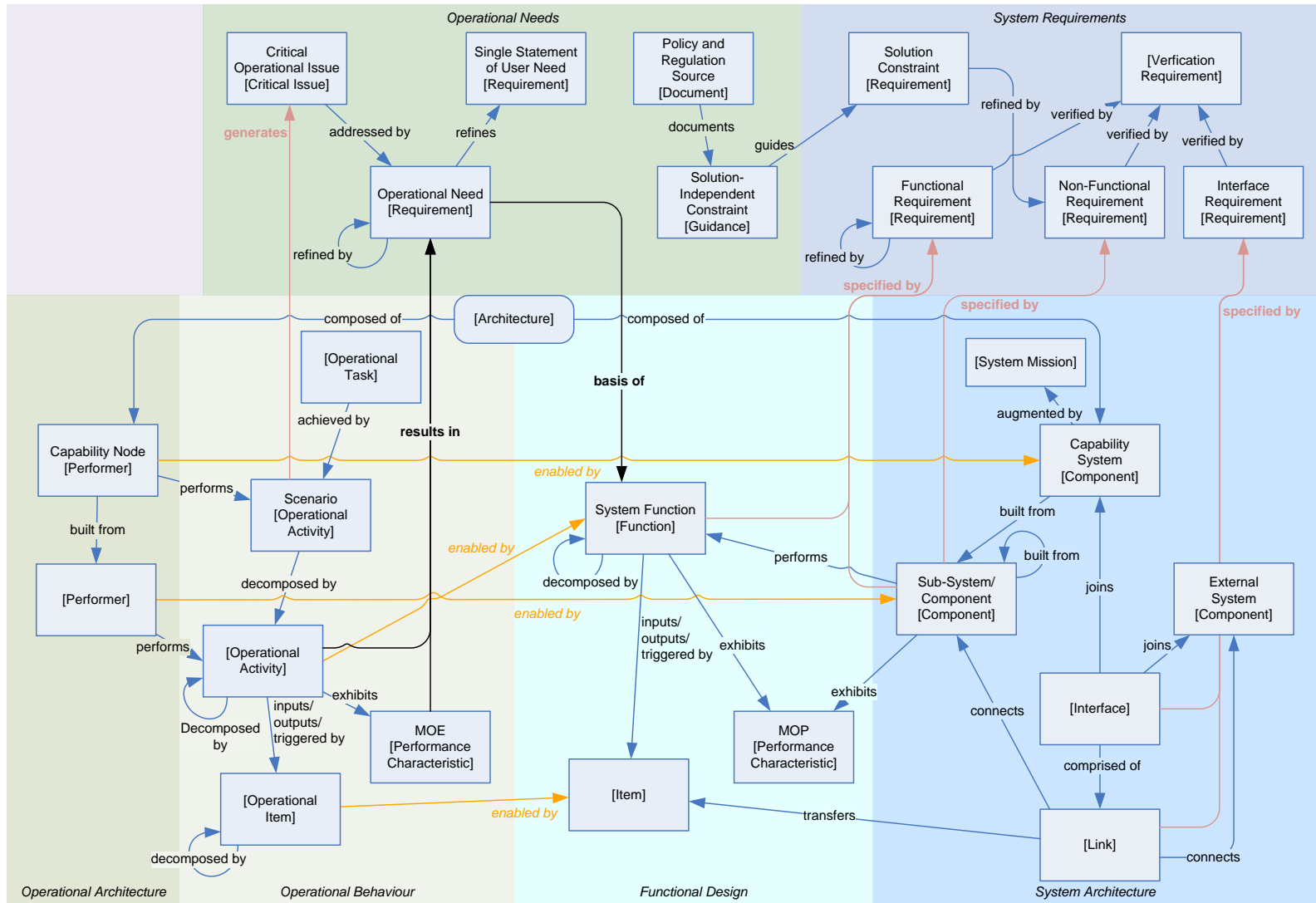
Example US military range safety trace – Deterministic trace

Source: http://www.apd.army.mil/jw2/xmldemo/p385_63/main.asp

Model-based Conceptual Design (MBCD)



Model-based Conceptual Design (MBCD)



A rearranged sub-set of the key elements diagram from the WSAF reference model v1.5.1

Components of WSAF Capability

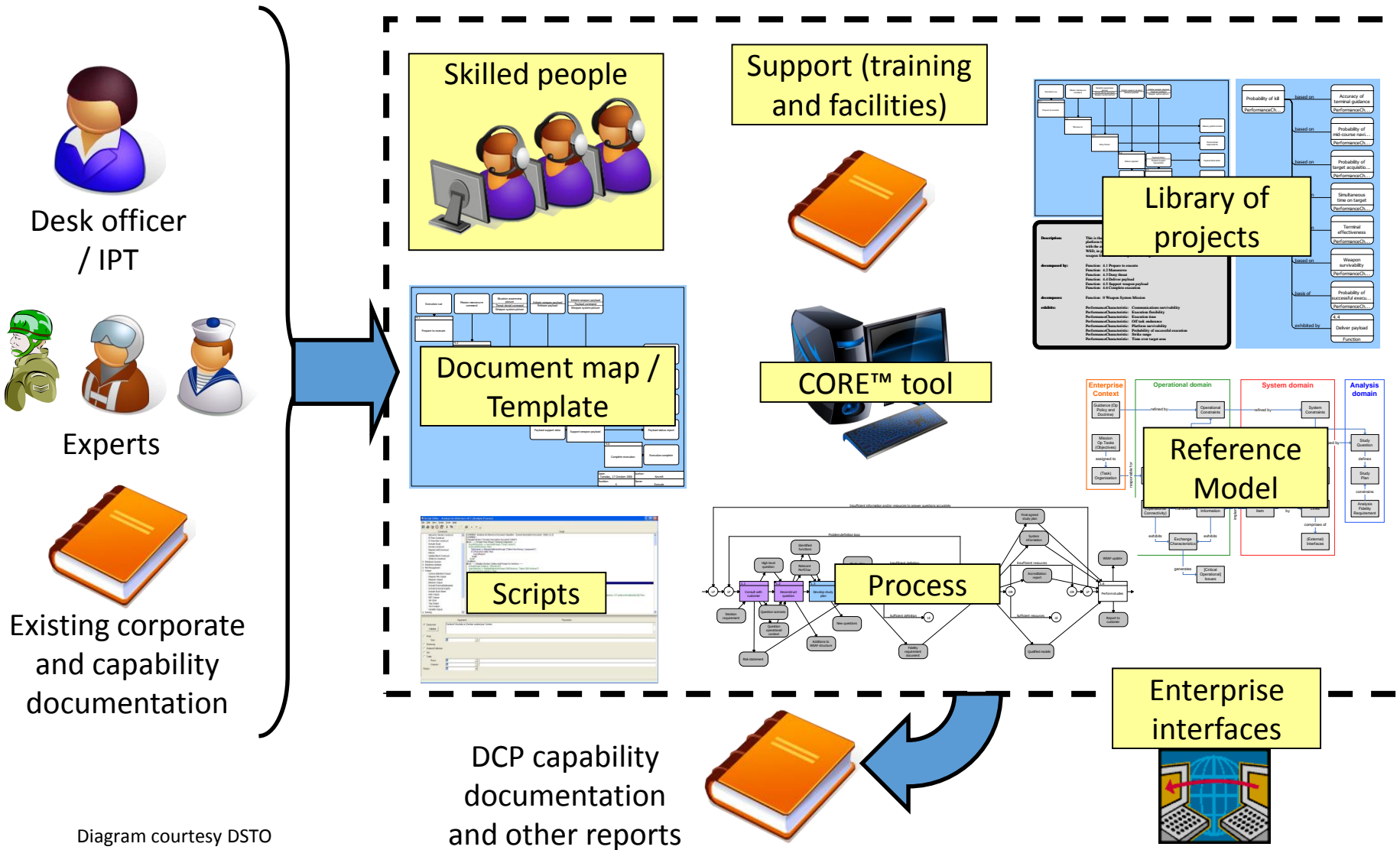
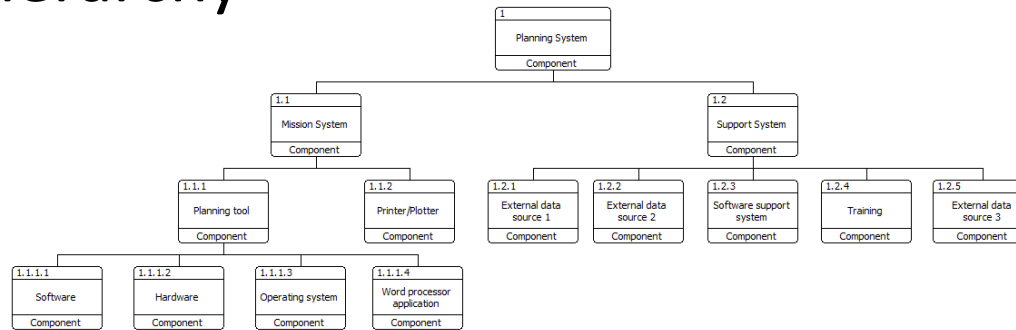


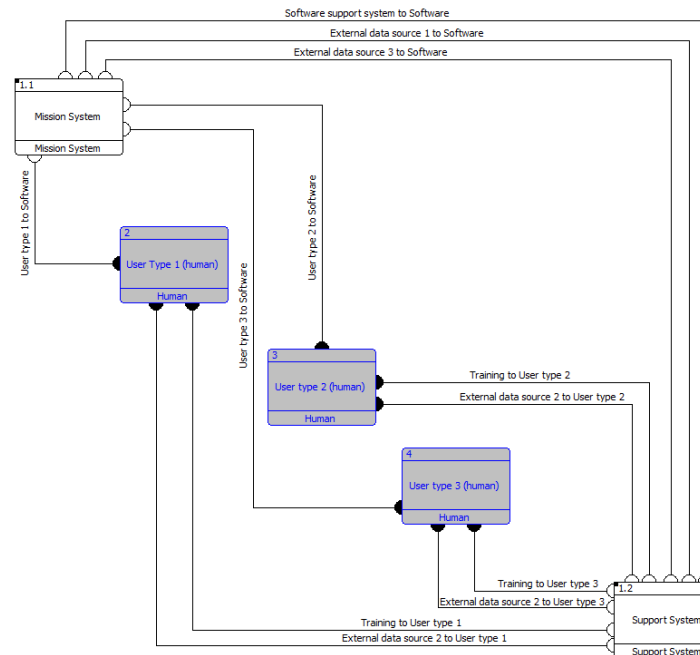
Diagram courtesy DSTO

Example Views

- System hierarchy

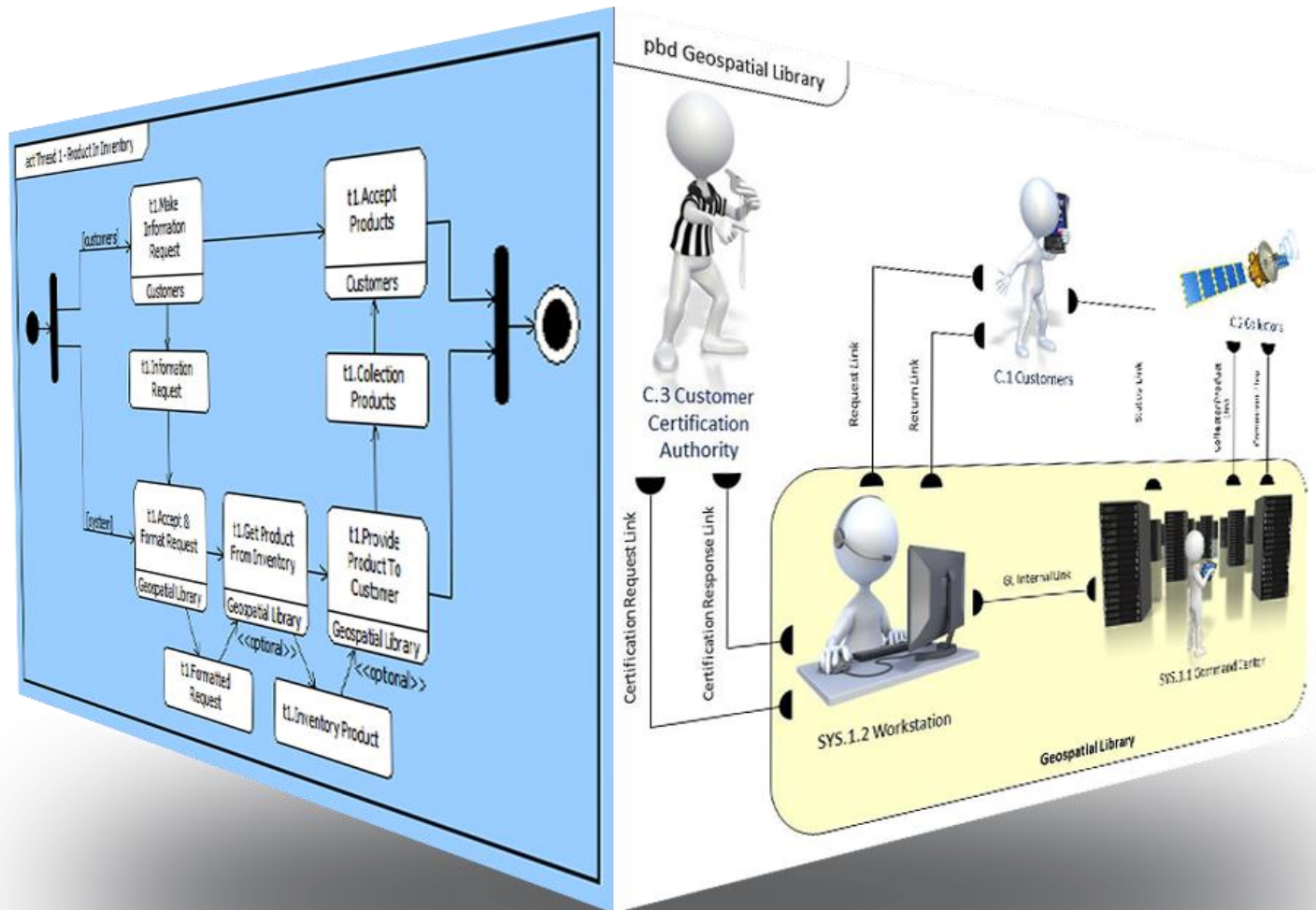


- System connectivity



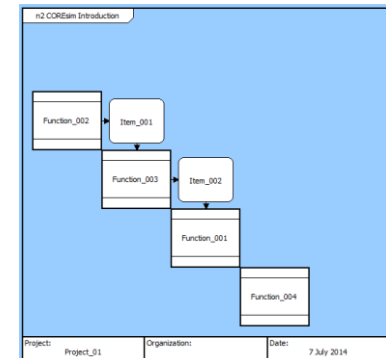
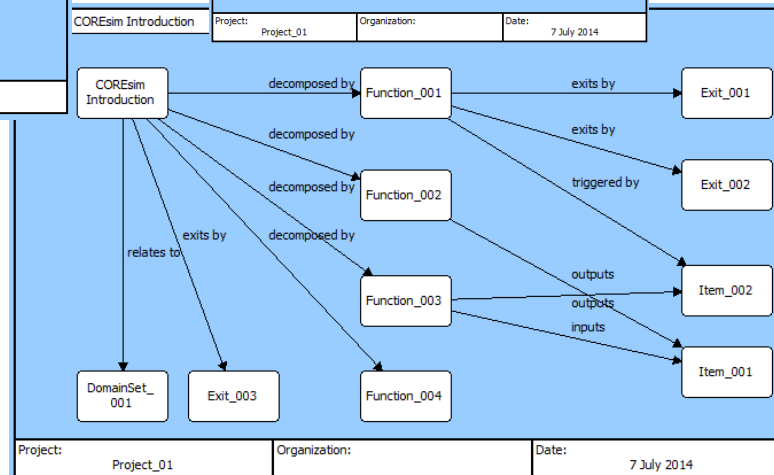
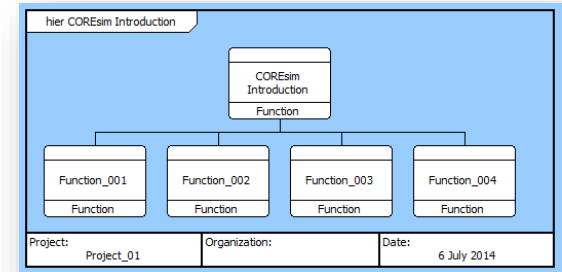
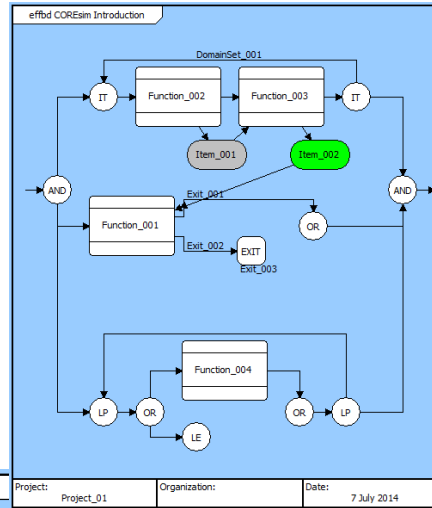
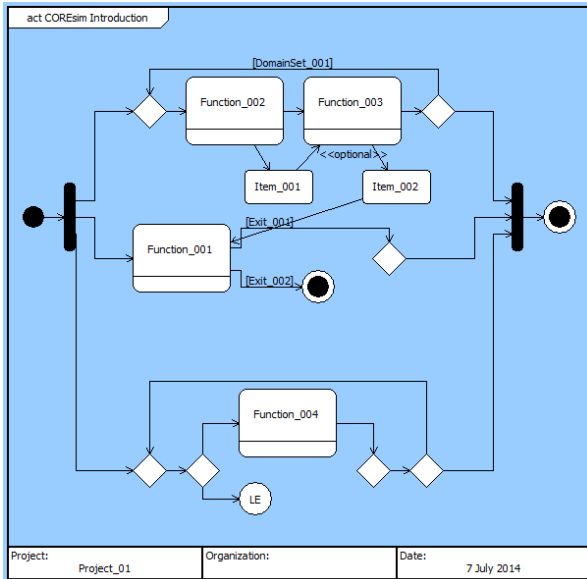
Conceptual design using MBSE

- One model – many views



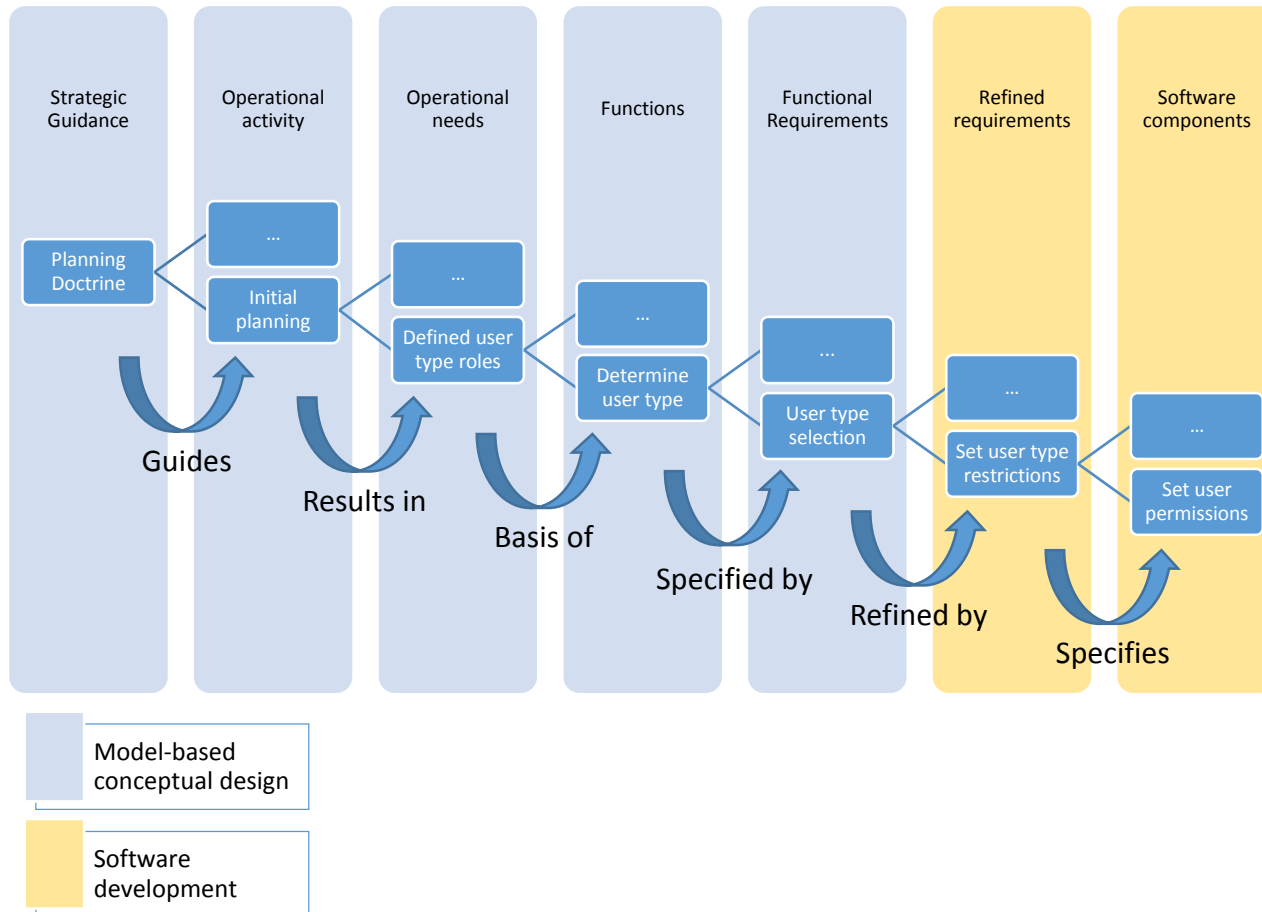
Conceptual design using MBSE

- Same data – different views



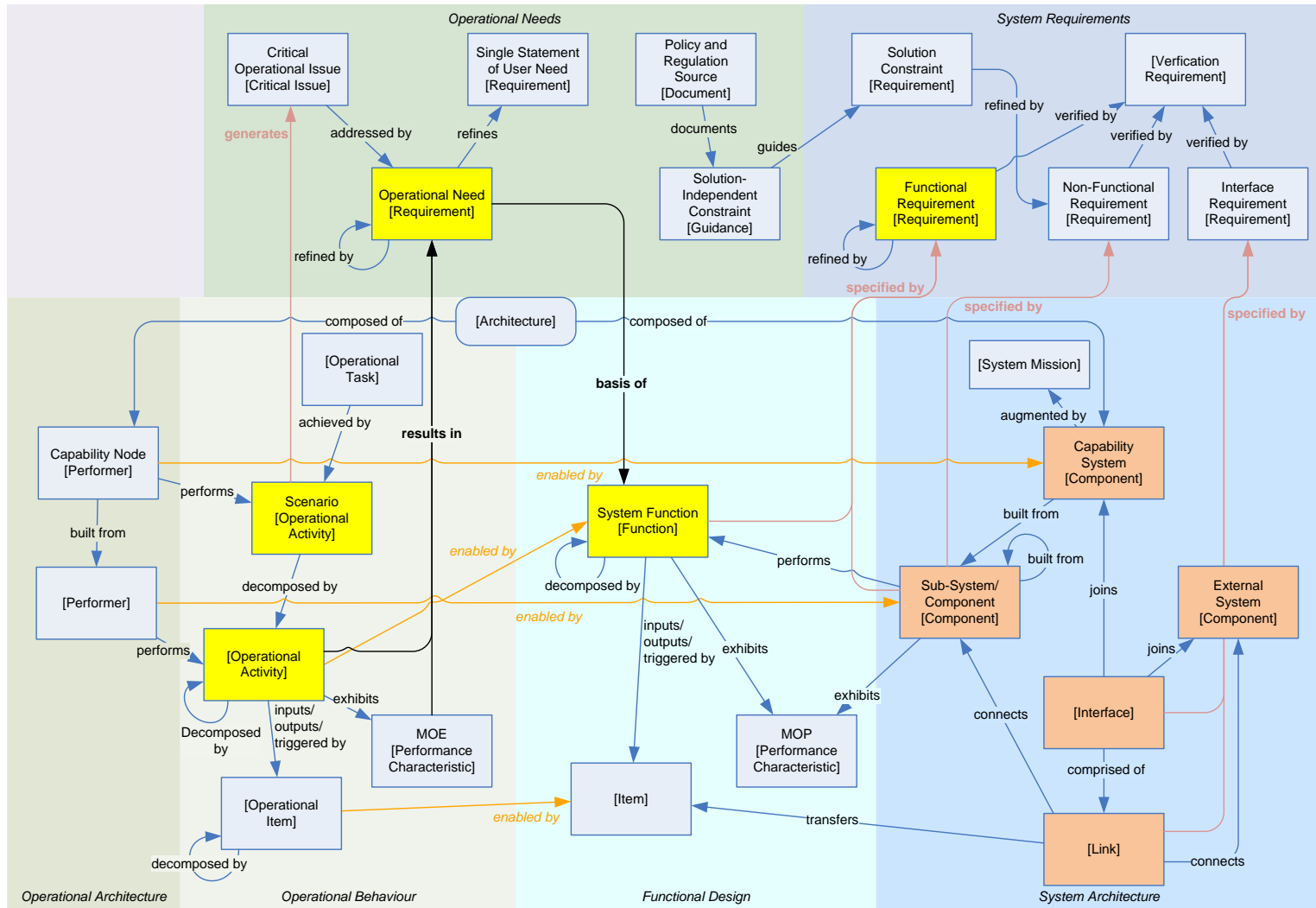
Traceability

Example traceability path



Traceability

Wider traceability view

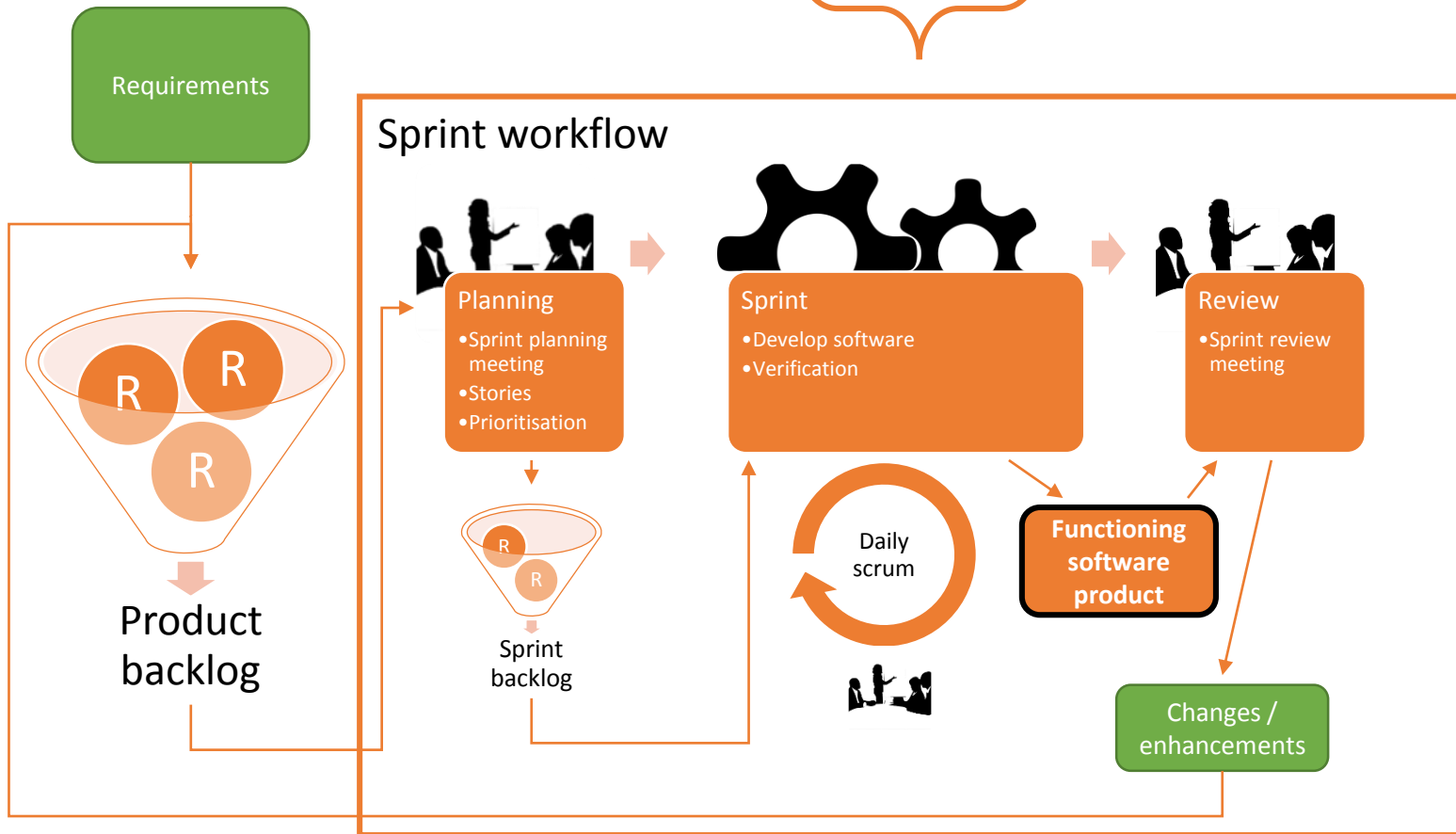


A sub-set of the key elements diagram from the WSAF reference model v1.5.1







Software development using Agile Scrum



2 - 4 weeks



Scrum roles

-  Scrum master
-  Developers
-  Product owner
-  Project team
-  Stakeholders
-  Users

Software development using Agile Scrum

Manifesto for Agile Software Development

“We are uncovering better ways of developing software by doing it and helping others do it.

Through this work we have come to value:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

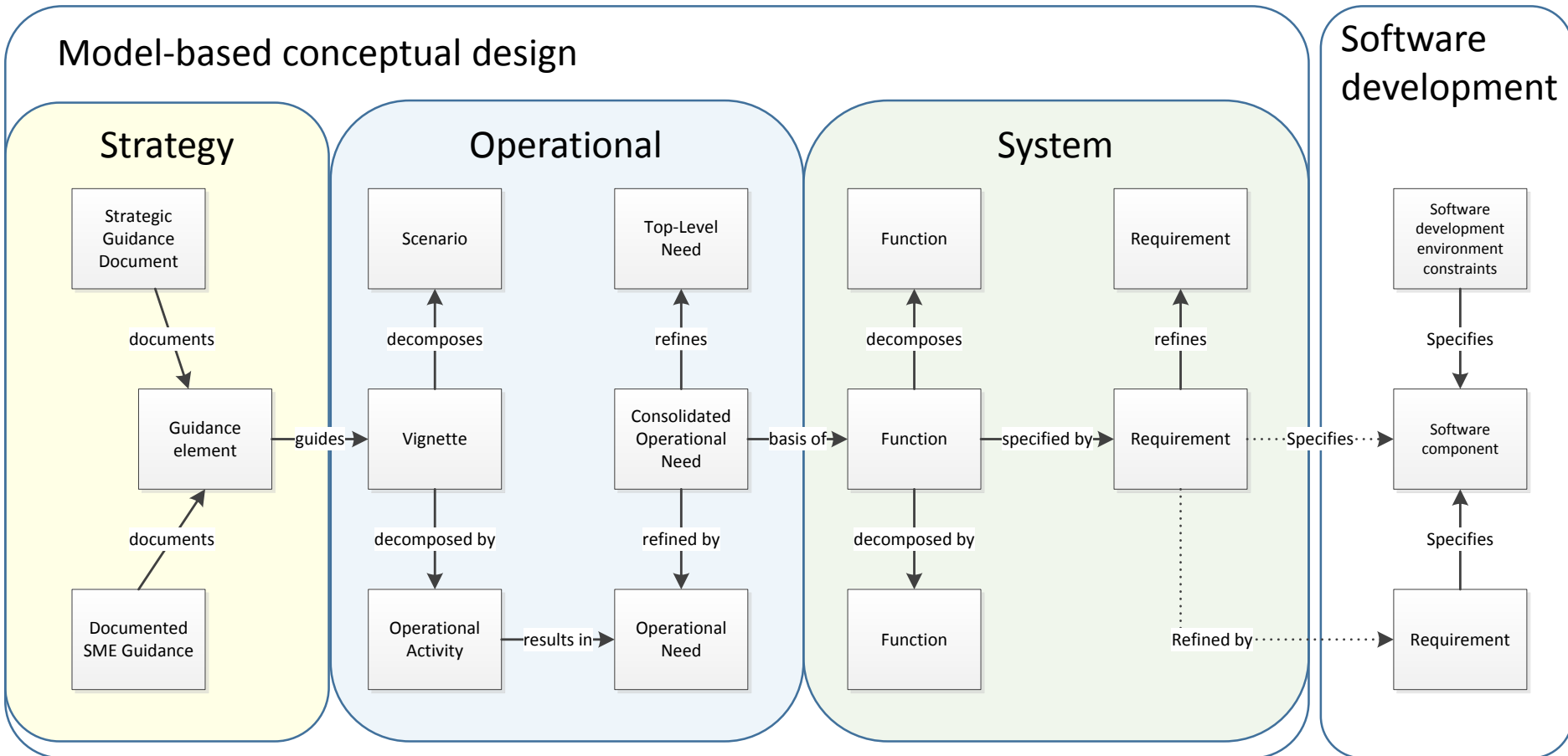
That is, while there is value in the items on the right, we value the items on the left more.”

Source: <http://www.agilemanifesto.org/>

MBCD and Agile

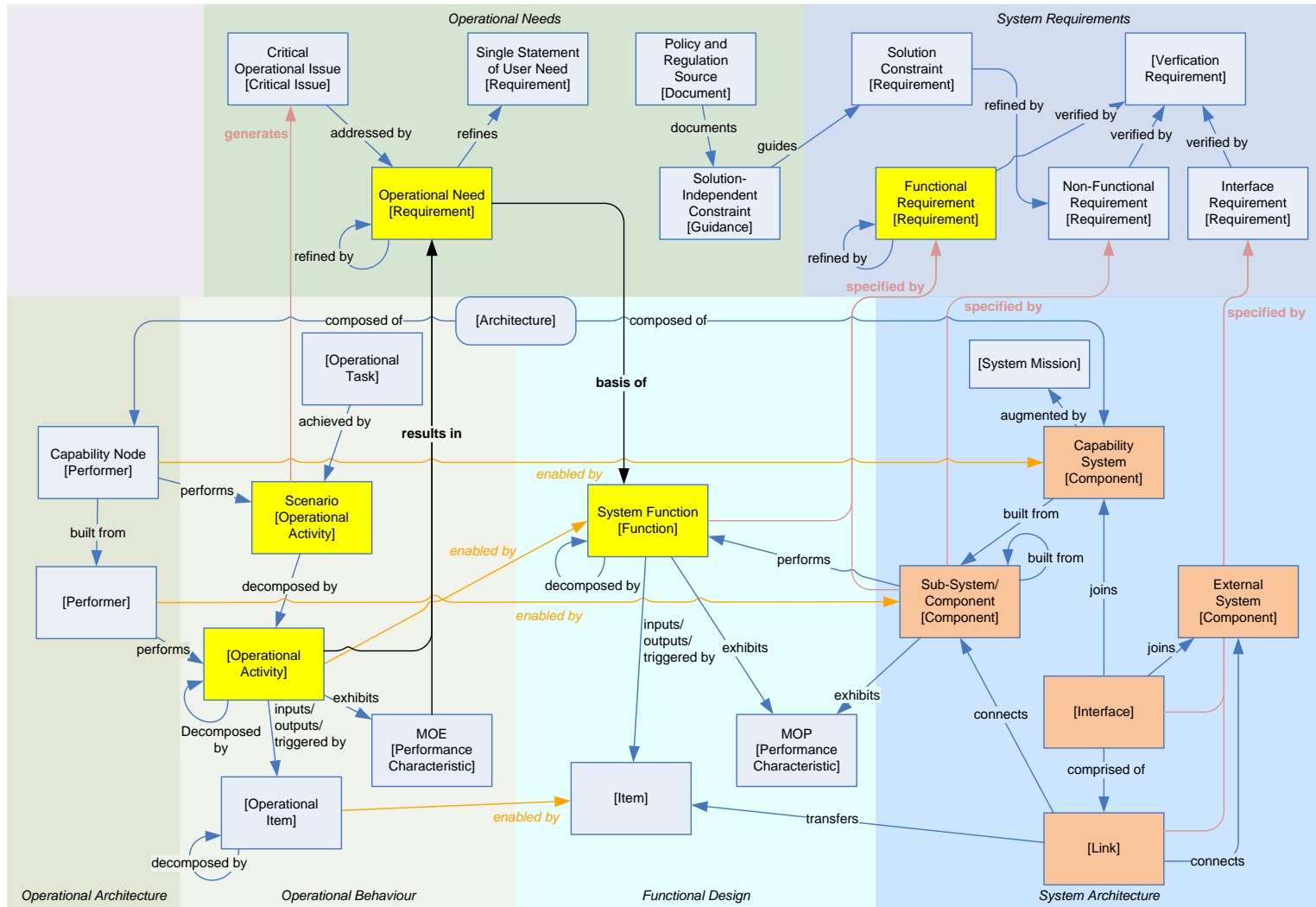
- Leveraging MBCD traceability in Agile development
 - Prioritisation
 - Model can identify requirements to be implemented to provide specific functionality or meet specific needs.
 - Responding to change
 - Allows informed assessment of the impact and suitability of proposed design changes resulting from early customer assessments of the product.
- Focus on function
 - Rich functional models help define the “what”
 - Software development effort can focus on the “how”
 - Reduces uncertainty for the software developers

MBCD and Agile



MBCD and Agile

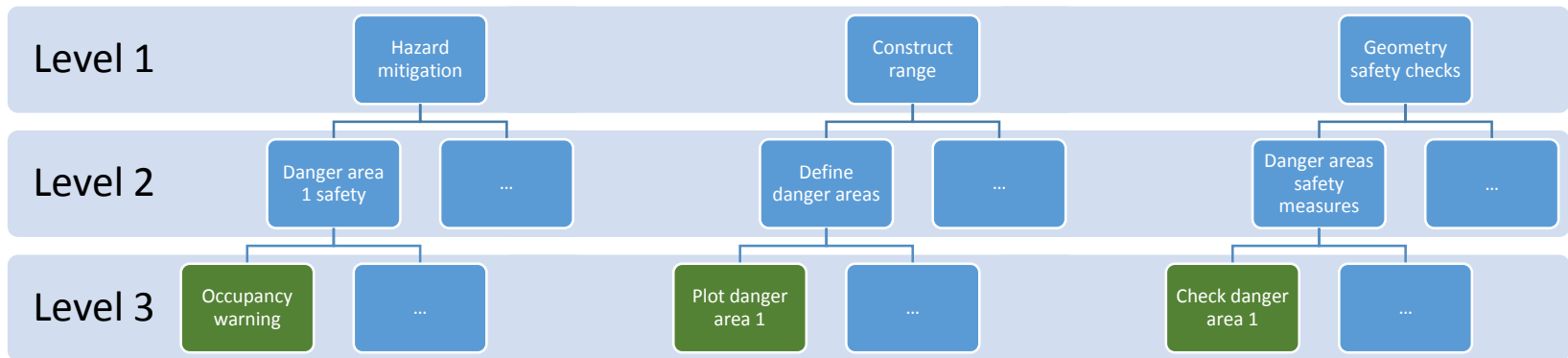
Wider traceability view (WSAF subset)



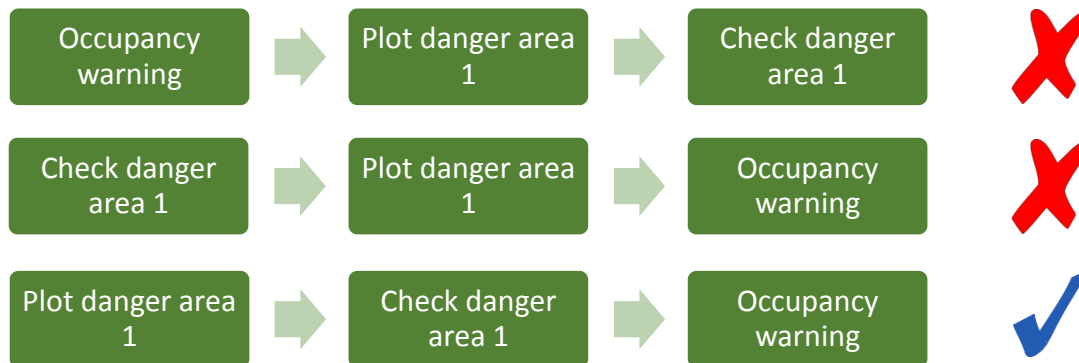
A sub-set of the key elements diagram from the WSAF reference model v1.5.1

Functional models

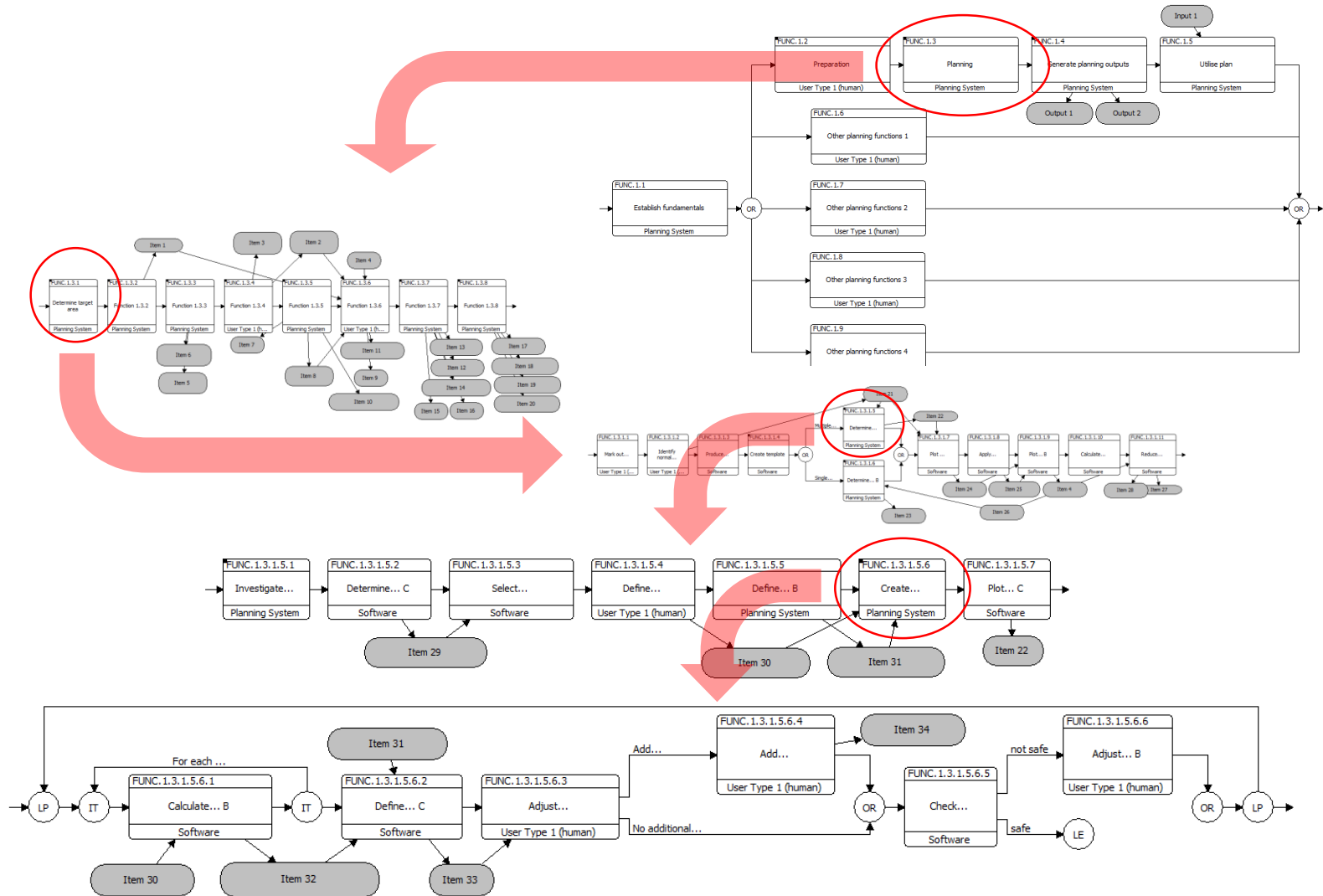
- Why are they important?



- But what is the required functional sequence?



Functional Model



Lessons learnt

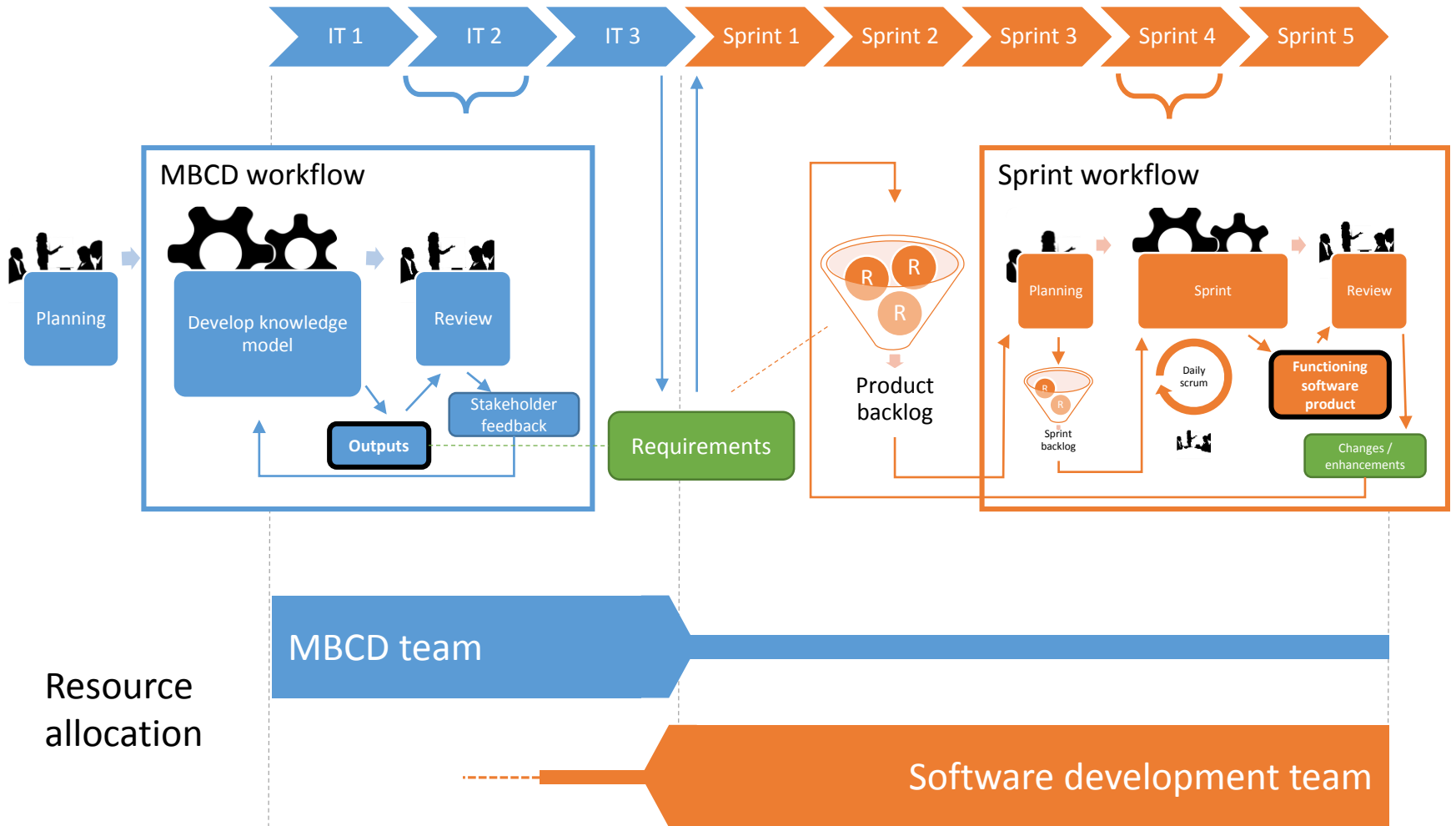
- Requirements derived from functional models are easily transitioned into the software development space. MBCD processes have a natural synergy with software development processes.
- MBCD is capable of supporting the flexible nature of Agile development by providing clear traceability back to user needs.
- Involvement of the development team in the MBCD process beneficial.
- Software architecture and components were not modelled in detail – potential enhancement.

Further development and future applications

- Further exploit synergies between MBCD and Software Development.
- Close the distinction between conceptual design phase and software development phase.
- Integrate MBCD solution system definition process and software architecting / planning process.

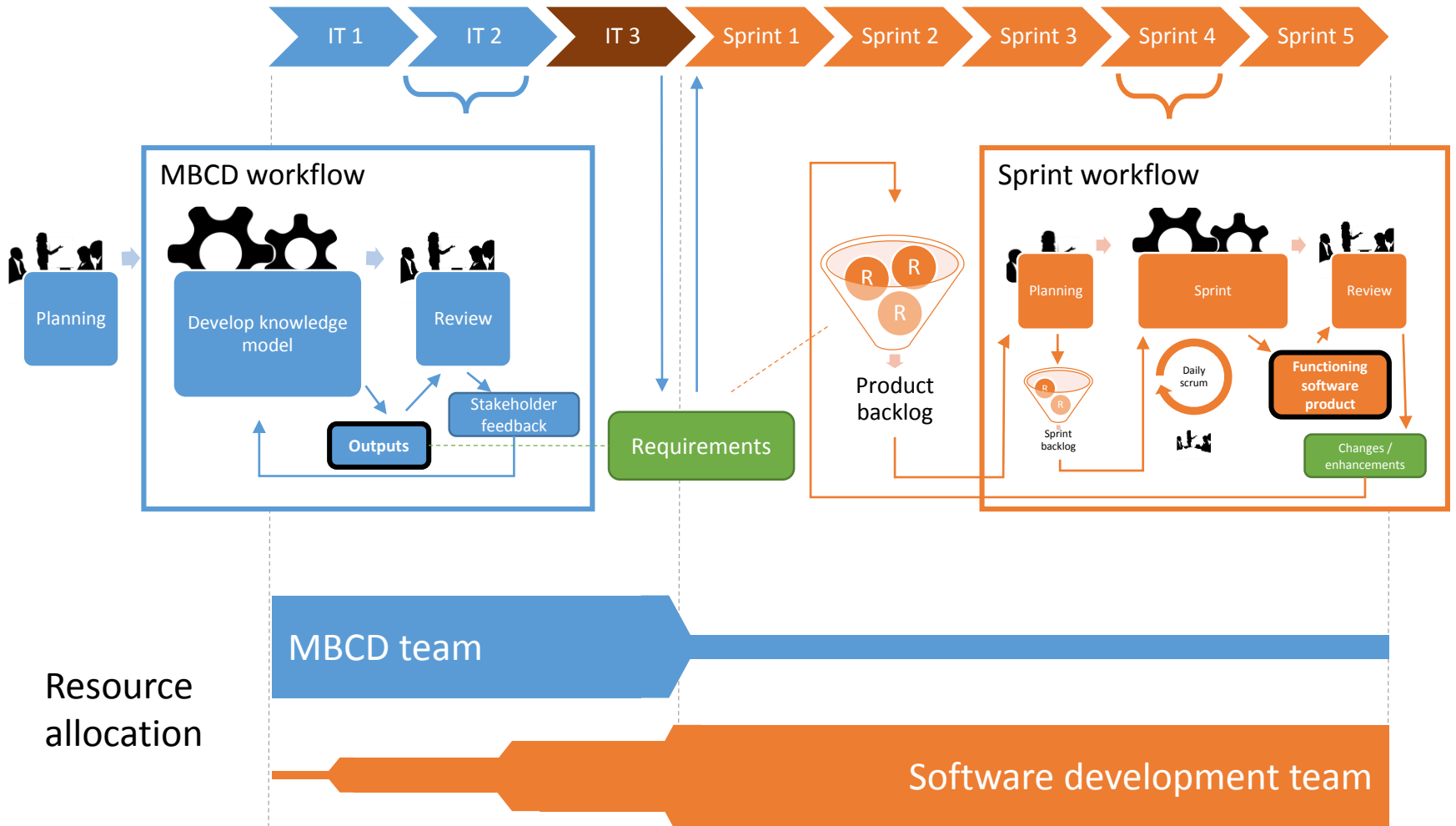
Project process enhancements

Existing process



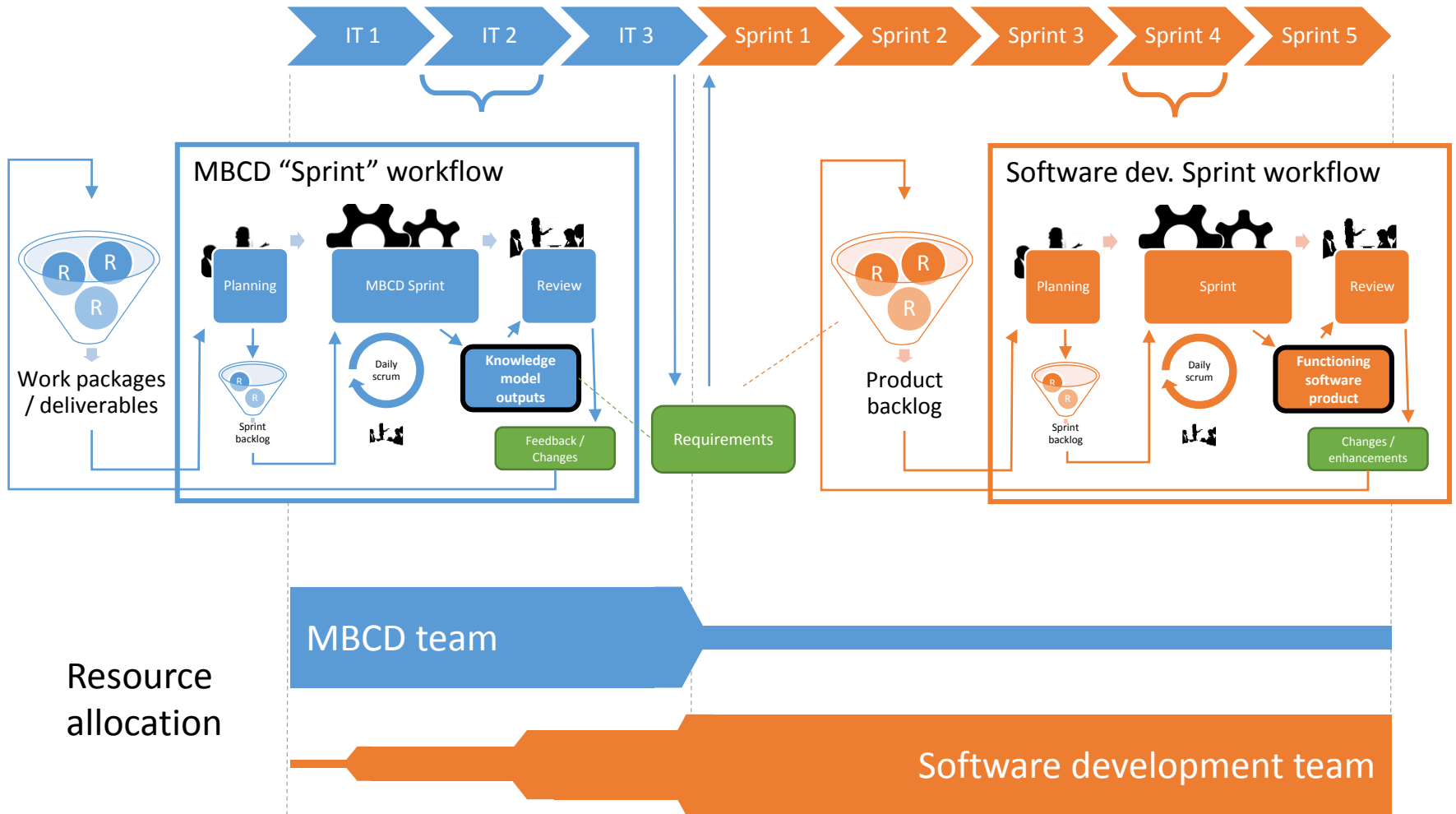
Project process enhancements

Enhanced process



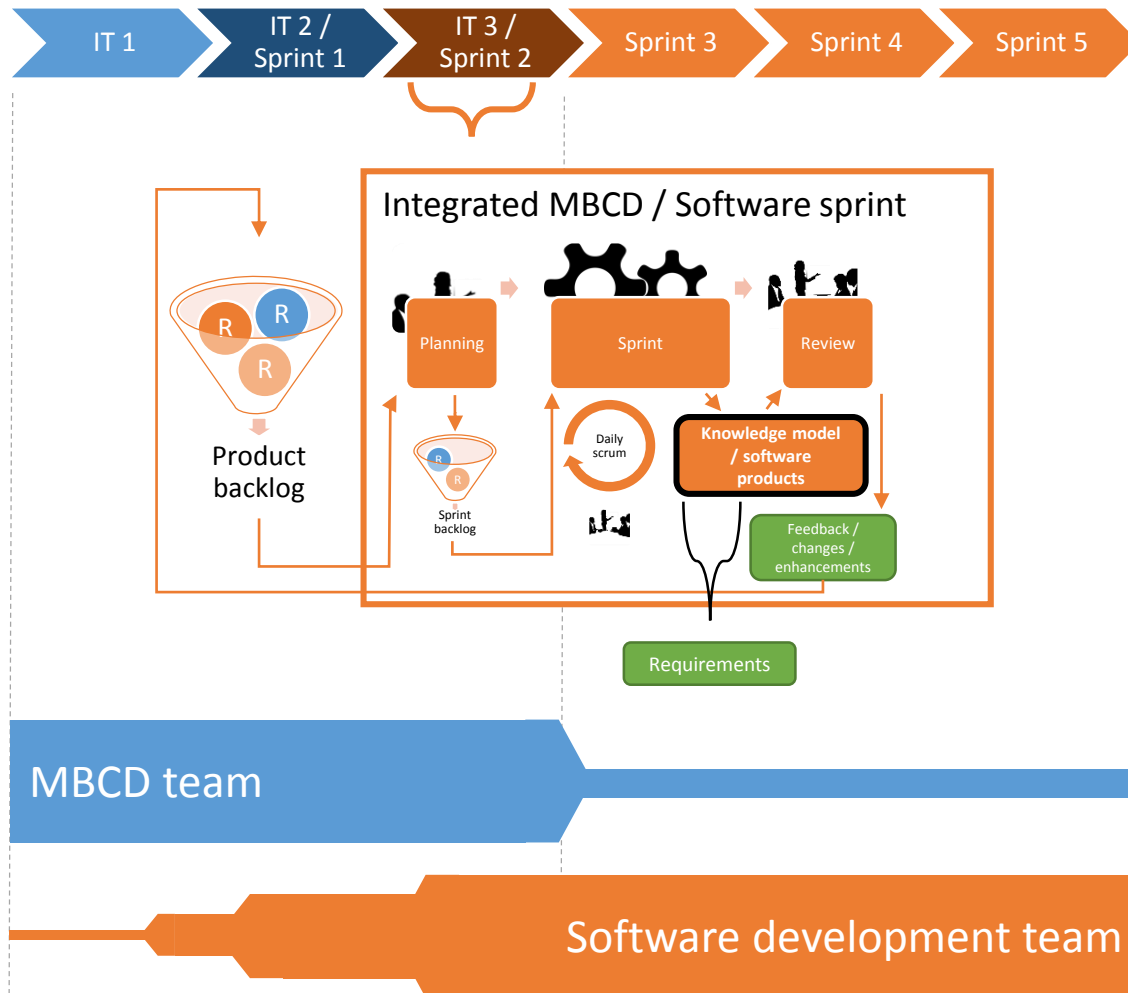
Project process enhancements

Agile for MBCD



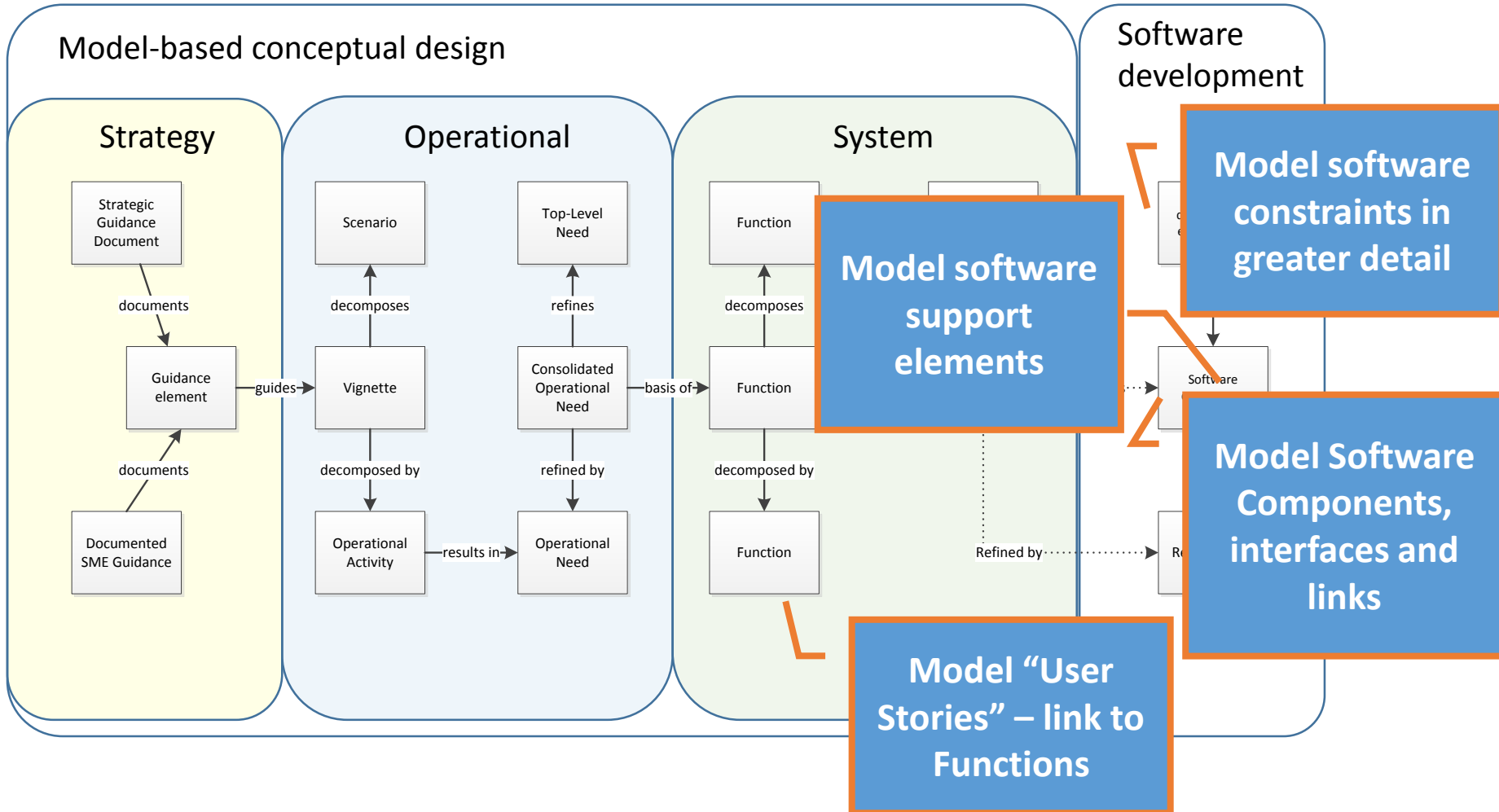
Project process enhancements

Fully integrated agile development



Project process enhancements

Potential modelling enhancements



Conclusions

- MBCD can deliver a robust software system specification and support an Agile Scrum implementation
- The synergies between MBCD and Agile Scrum methods were successfully leveraged in range safety software development
- Potential further enhancements of the MBCD / Agile approach have been identified

Acknowledgements

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Questions?





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