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# UK Innovate 2010

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# Highlights of the journey to introduce a Model Driven Systems and Software Development Capability

Simon Kenward

General Dynamics UK



Smarter software for a smarter planet.



It's getting late in the day, should I sleep through this one?

**Yes:**

"I managed to sneak in and only came for the coffee and biscuits" OR

"I have to work with him and have heard it all before – several times"

**No:**

"I'm thinking about introducing, or expanding a Model Driven engineering capability"



## Overview

An introduction to General Dynamics UK and your speaker – the landscape for our journey.

An overview of the journey – rolling out the strategic engineering toolset with a focus on IBM Rhapsody.

A ‘top tips’ reminder – the key learning points.



# General Dynamics Corporation

**Strength on Your Side®**

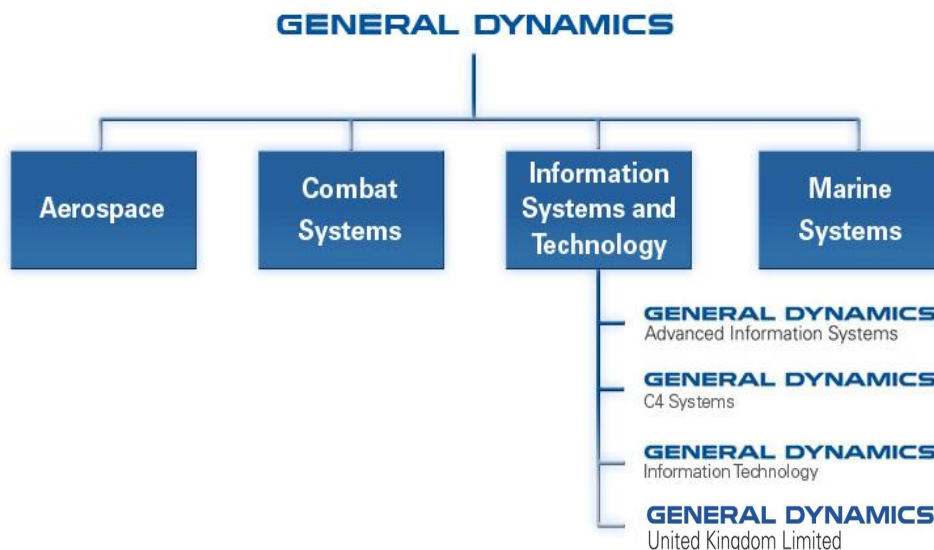
One of top five **Global** Defence Contractors

Delivering capability to customers across the globe

91,700 employees worldwide

2009 revenues of \$31.9bn

Business units based in the United States, Canada, Mexico, Austria, Switzerland, Germany, Spain and the United Kingdom



## About General Dynamics UK

Prime Systems Integrator

Established in UK for over 46 years

Around 1,600 people

Our customers are in Defence and Security / Resilience markets

UK, Europe, Middle East, Africa, Asia

In the UK, three main business areas:

C4I Systems

Mission & Security Systems

Advanced Projects and Technologies – Armoured Vehicles  
and UoRs

Unique UK facilities, laboratories and capabilities

Leader in R&D and innovation



## C4I Systems



### Prime and Systems Integrator for UK's Bowman C4I system

- £2.4bn programme let in 2001, now fully deployed
- Secure voice comms of exceptional quality
- Secure tactical internet with Situational Awareness, even in harsh environments
- 13,000+ vehicles fitted, plus ships, aircraft, soldiers and buildings
- Incremental capability uplift programme
- Actively supporting current operations and saving lives

### Delivering C4I programmes worldwide

- Delivered capability to The Netherlands and Romania
- Key capabilities in tactical connectivity, interoperability and integration with existing systems

### Soldier-borne C4I systems

- Infantry and specialist systems

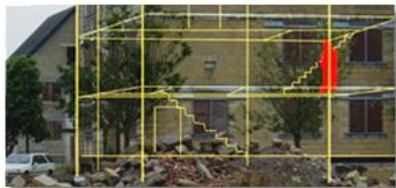


## Mission & Security Systems



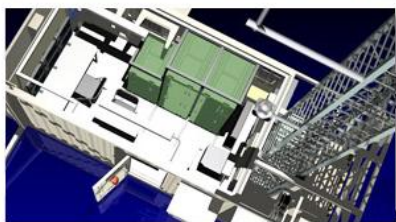
### Systems for faster, better information

- Airborne NEC
- ISTAR
- Avionics eg Eurofighter Typhoon, Tornado, Harrier and Future Lynx
- Information systems and networks for UK MoD, NATO, and export customers
- Logistics and transportation management



### Security & resilience capabilities for civil & military use

- Counter-terrorism
- Emergency Services
- Biometrics
- Urban ISTAR
- Oil and Gas security – leading global provider
- Transportation security





# Advanced Projects and Technologies

## Prime Systems Integrator for SV programme

Delivering highly protected, mobile troop carriers and specialist vehicles

Modern drivetrain offers the best performance, and the turret provides excellent ergonomics and fightability

ASCOD SV provides the best protection for troops whilst featuring the world's most advanced electronic architecture.

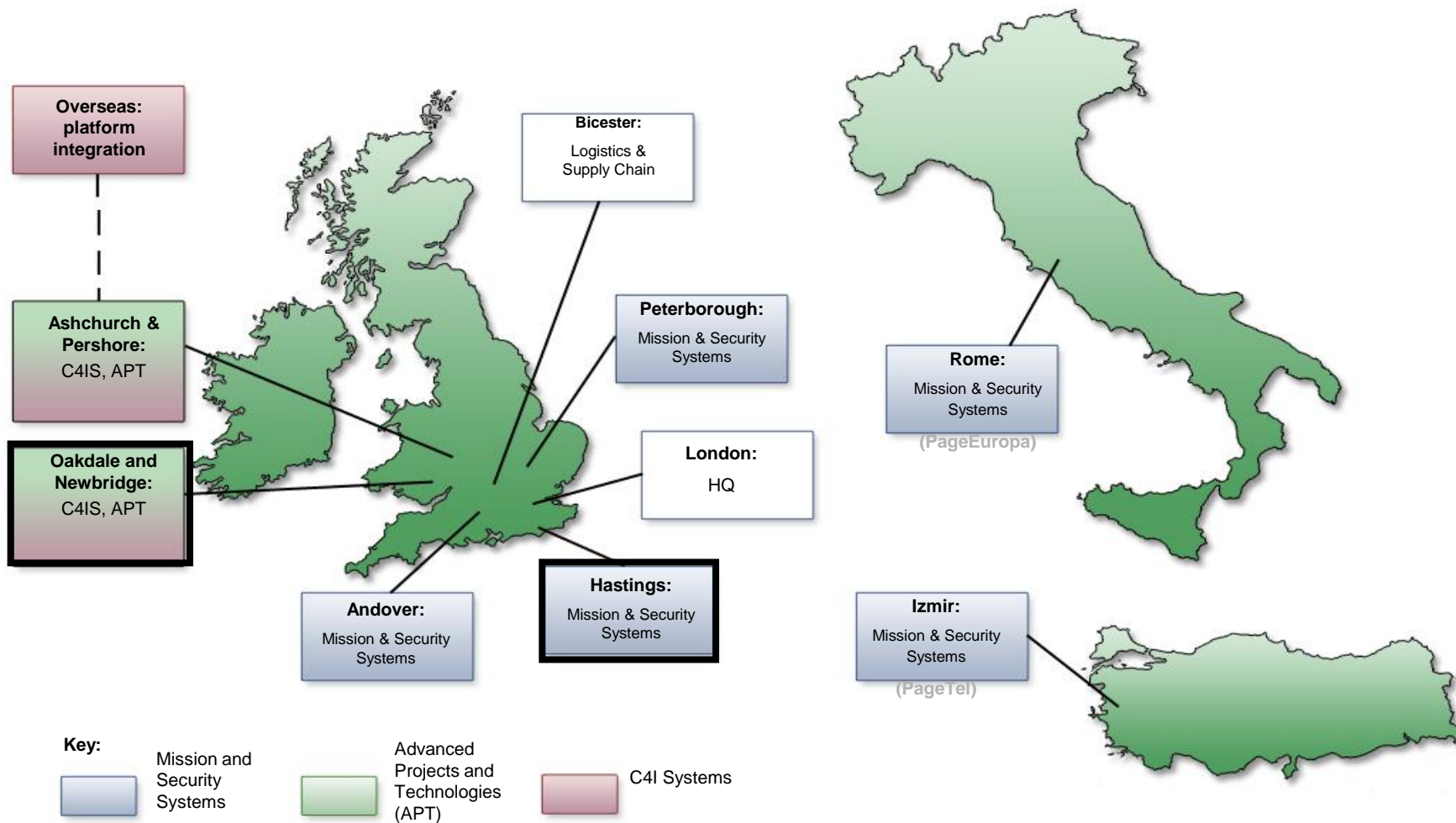
## Expertise in complex, scalable Electronic Architectures (EA)

## Expertise in Urgent Operational Requirements

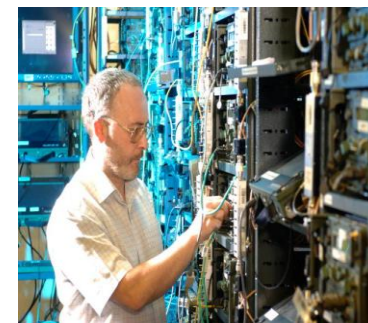
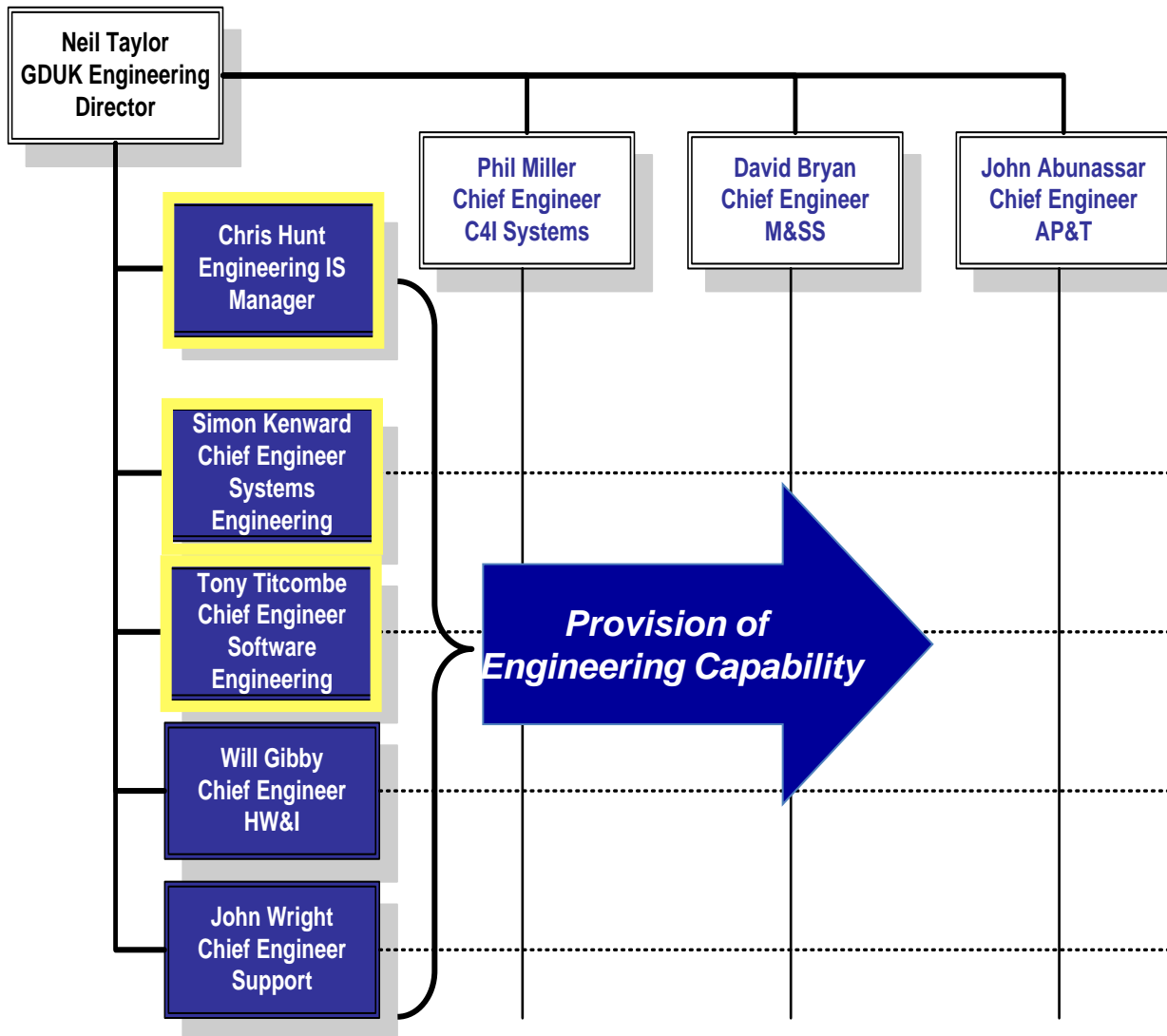
## Leading Research and Development.



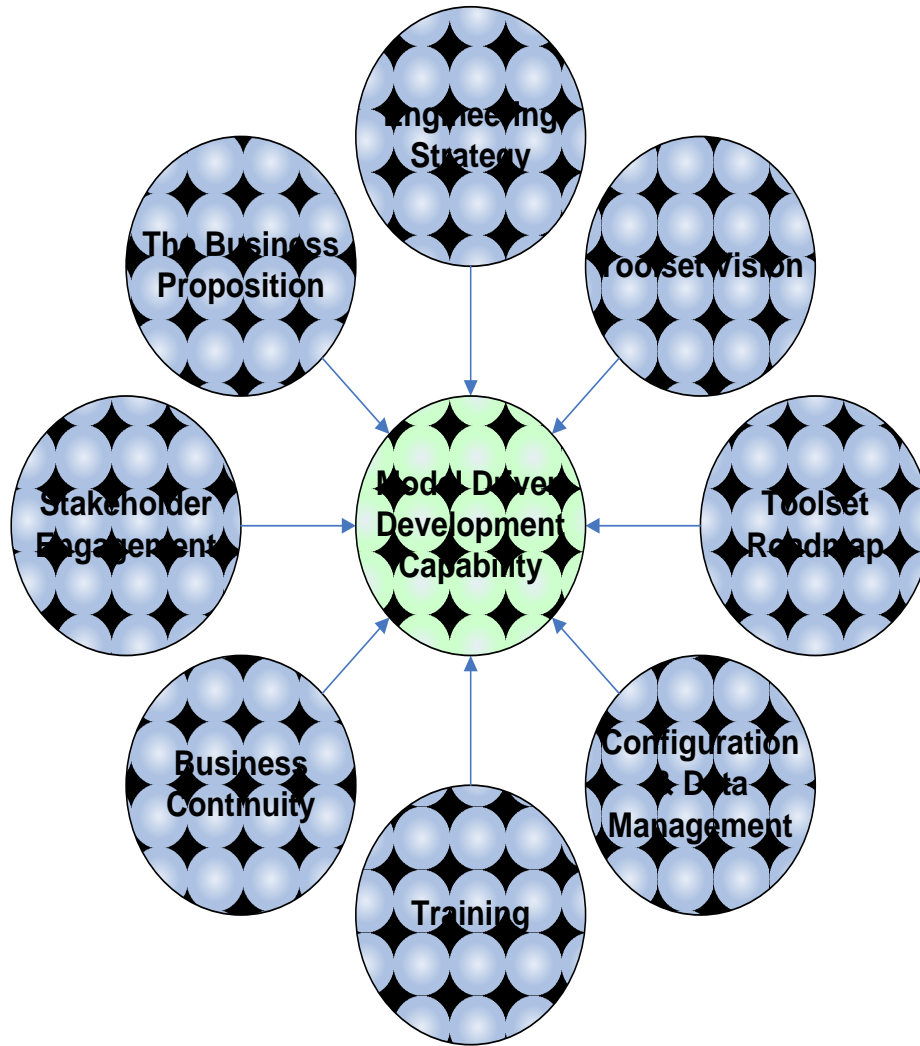
# Where we are



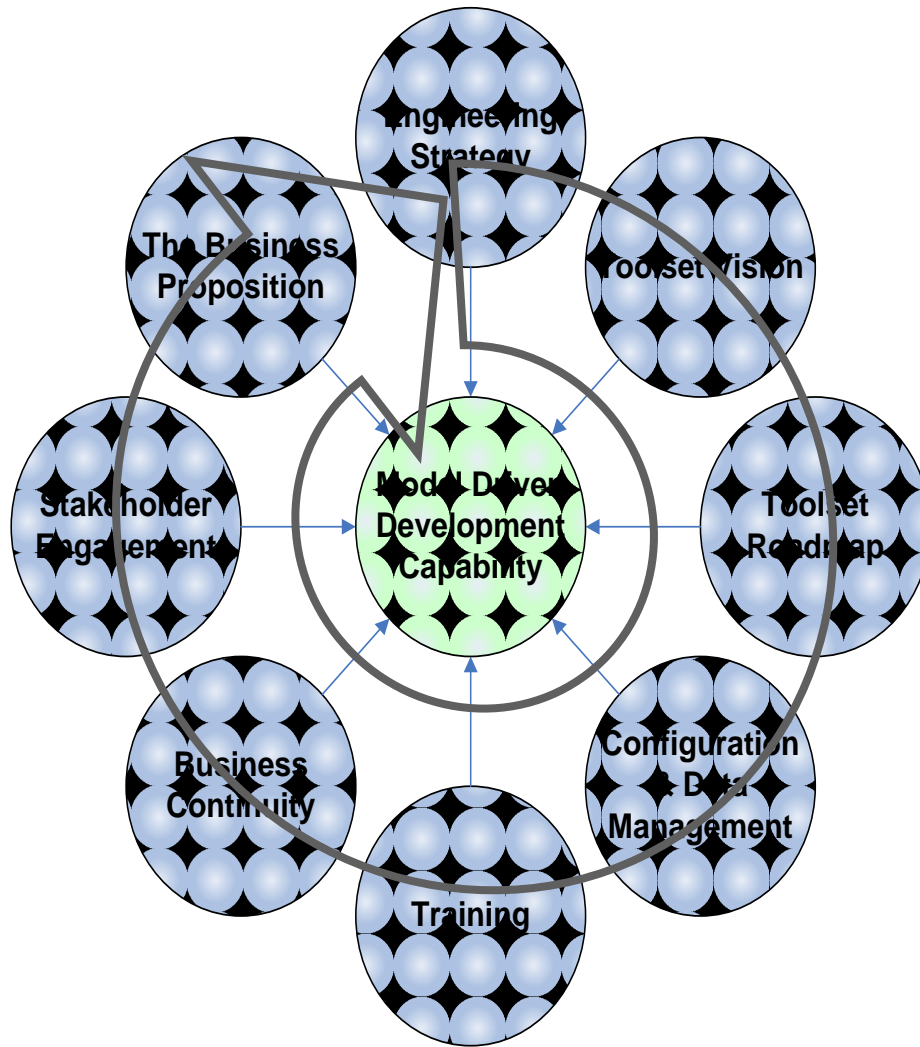
# General Dynamics UK Engineering Organisation



# The Journey

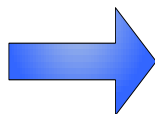
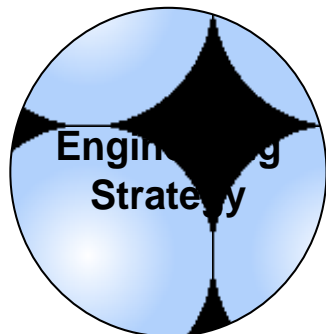


# The Journey



### Engineering Strategy:

- Should be entirely aligned to support General Dynamics UK Business Strategy
- Defines **The Vision** for where Engineering **will** be
- Defines **How Engineering** will **support** achieving the **Business** Strategy



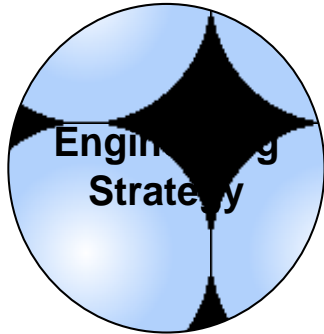
**Engineering Strategy**

Defines the Engineering Capabilities to be provided in order to satisfy the business needs.



## General Dynamics UK Engineering Strategy:

- Engineering Values are important – they help guide the you on this part of the journey.
  - World Class Engineering Through Agility And Excellence
  - Trusted To Deliver
  - Partner Of Integrity
- *Commitment to Model Driven Development across Systems/Software*
- **Solid foundation** upon which to develop Toolset Strategy and Vision



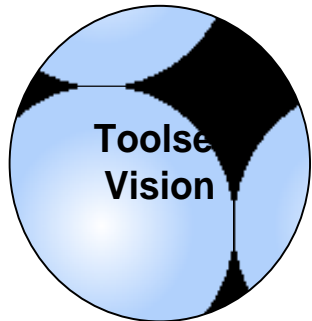
## Key Learning Points:

- This is the place to start the journey – if you can't **define what your intentions** are and **how they support your business** needs then you will fail later on.
- It is ABSOLUTELY **NOT about which tool to use** – it is ONLY about how you want your engineers to engineer your systems/products – **it is a PROCESS question.**



### Toolset Strategy/Vision:

- MUST support Engineering Strategy by pulling out specific
- Defines **The Vision** for the future Engineering Toolset
- Still not about the tools but about what the tools enable you to do.
  - But do need to know the ‘art of the possible’



### General Dynamics UK Vision

- Integrated, single pan-GDUK toolset that supports *Model Driven Development*
- Supports GDUK desire to unite sites and Systems and Software Engineering with a single tool:
  - Engineering efficiency, improved quality, resource utilisation benefits, toolset maintenance efficiency, training efficiency

### Key Learning Points :

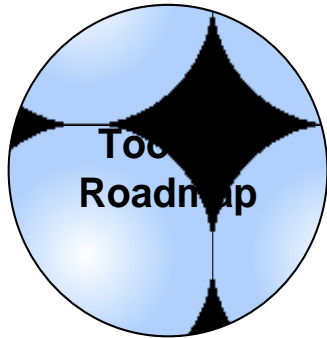
- **Focus** at this stage *on where you want to be.*

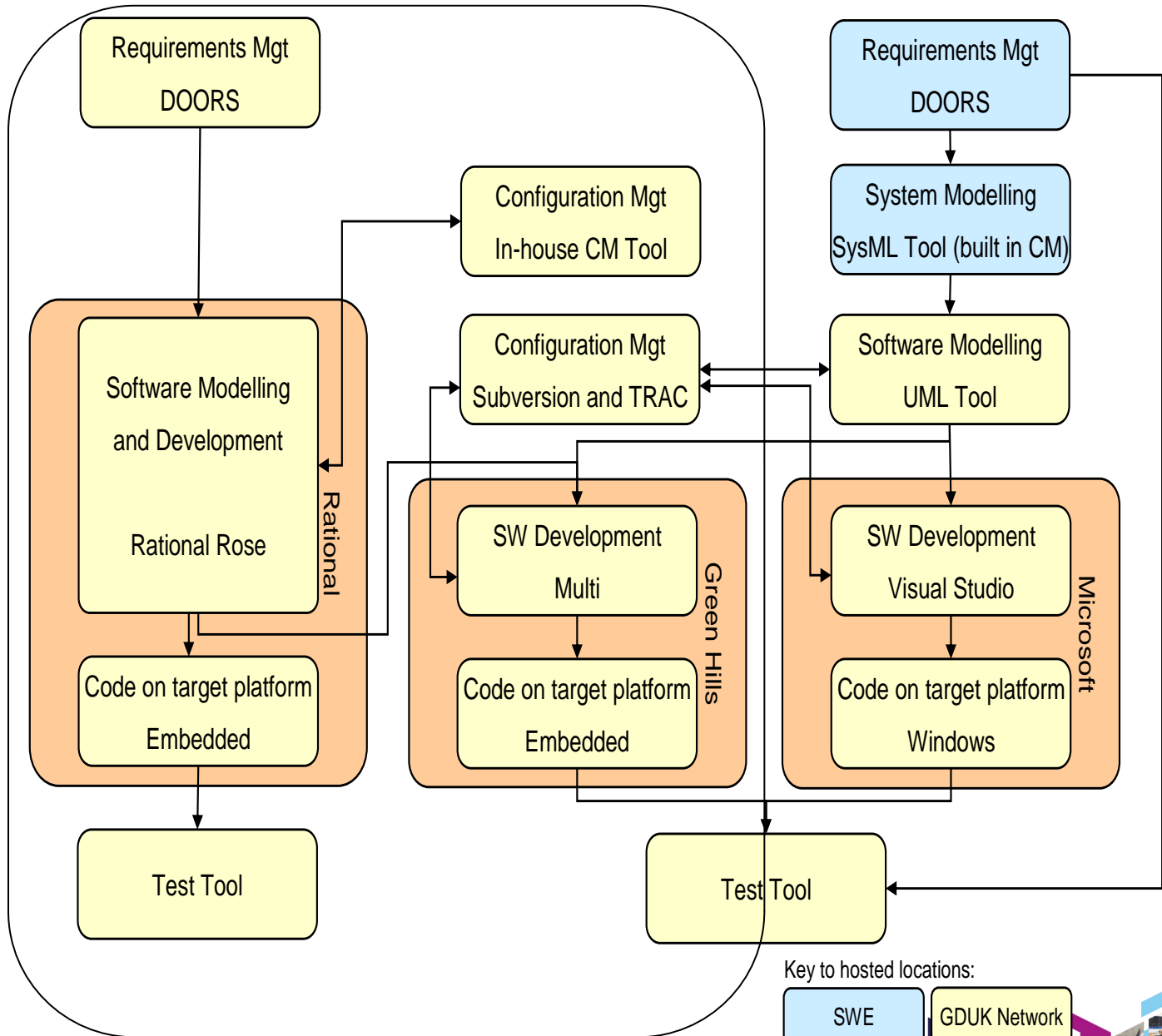
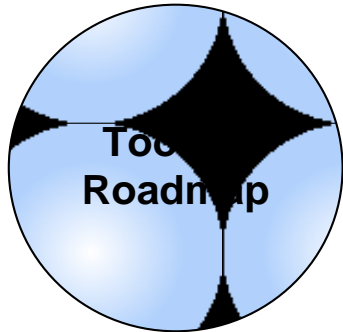




## Toolset Roadmap:

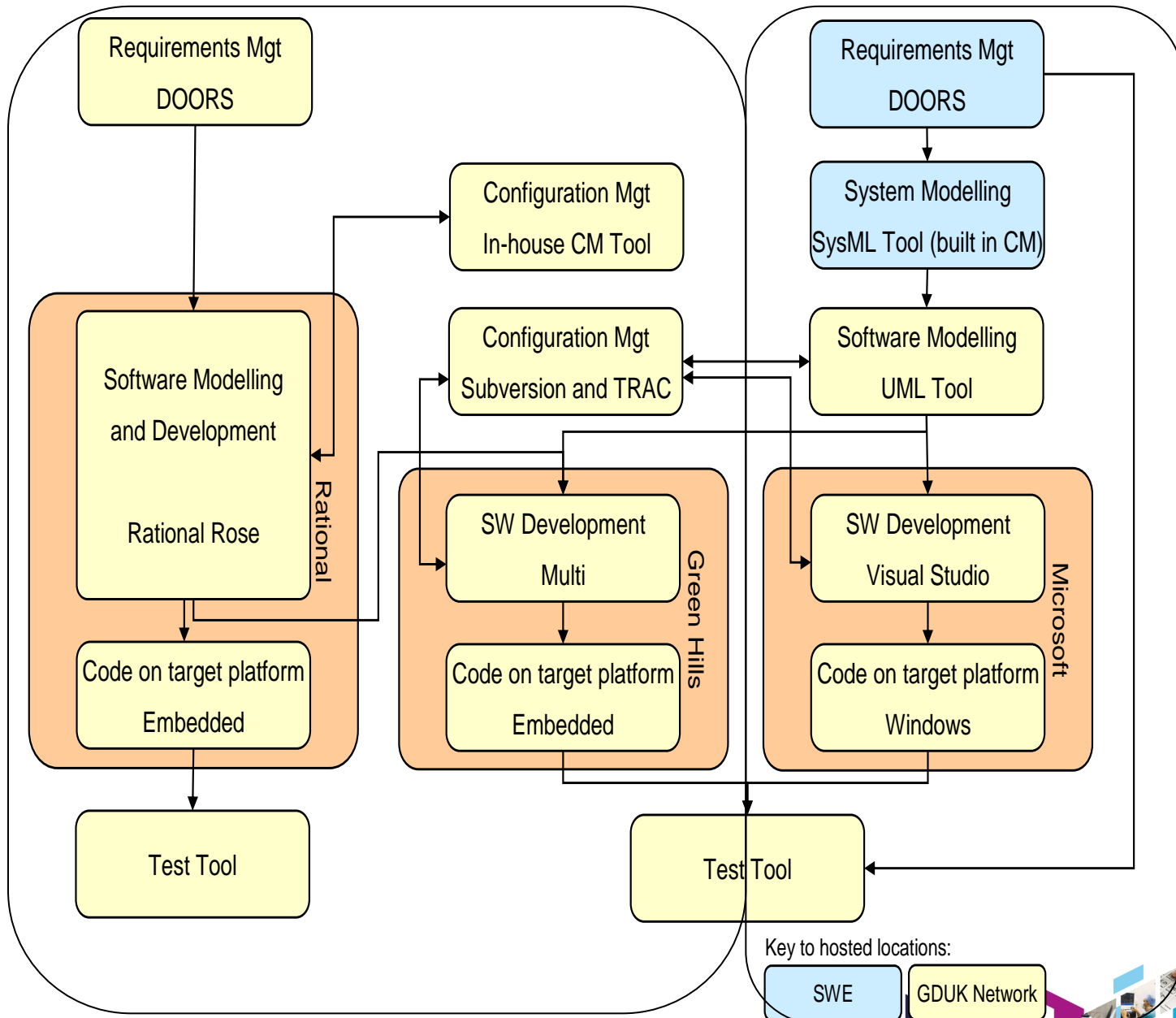
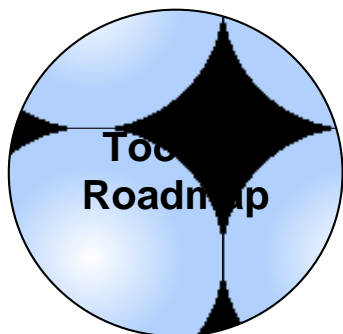
- Defines the 'tools of tomorrow', how and when they displace the 'tools of today'.
- Implied need to fully understand the situation 'today'
- 'Tomorrow' informed by conducting toolset evaluations to identify which tools best match against the requirements coming from the Strategy and Vision.
  - Execute and record as a Trade Study





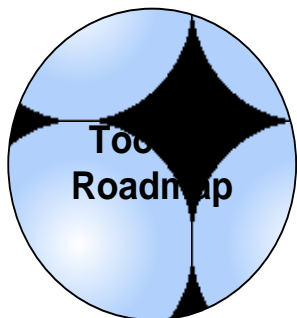
Key to hosted locations:  
SWE GDUK Network

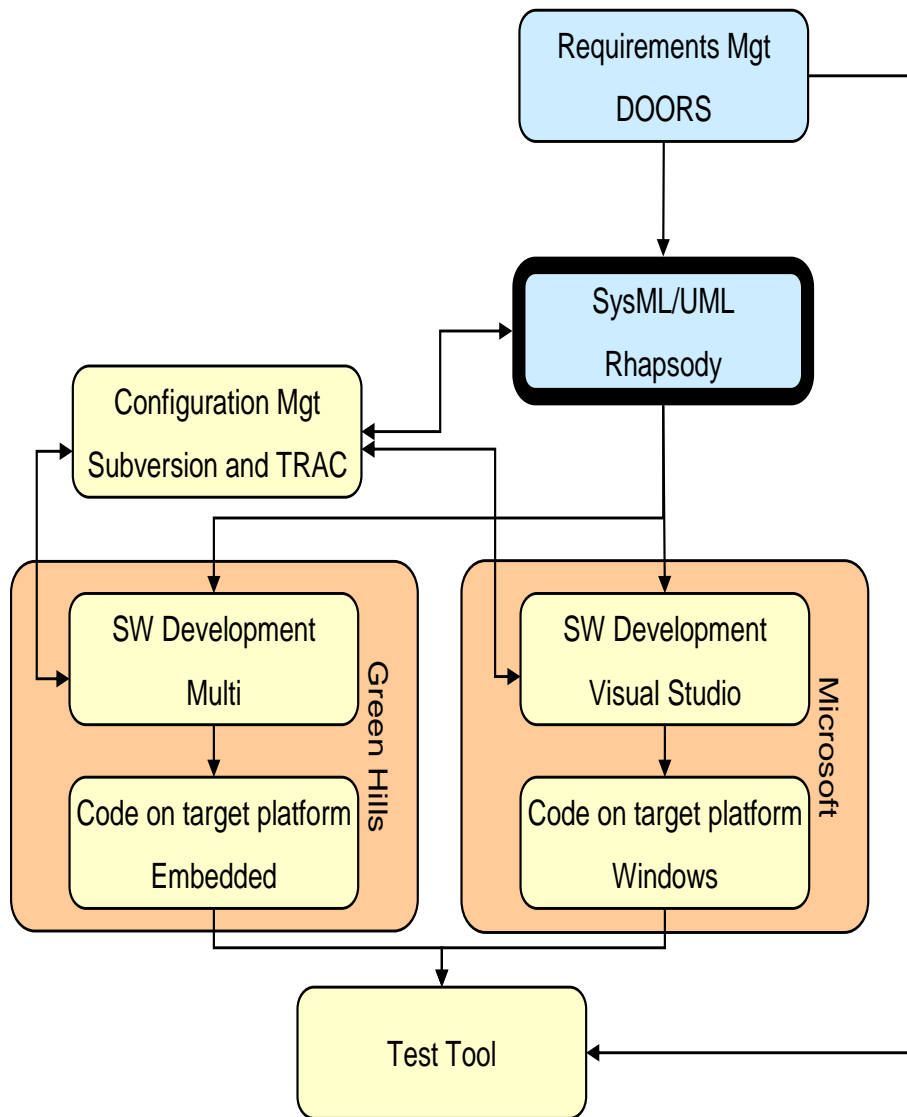
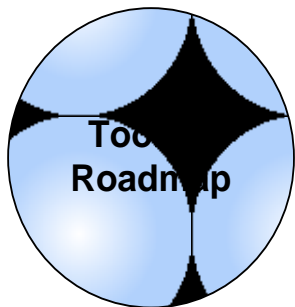




### Defining Tomorrow:

- IBM DOORS already identified
- Historically, 4 Trade Studies conducted
  - Systems Engineering modelling tool at both locations
  - Software Engineering modelling tool at both locations
- Needed to analyse historic results against requirements derived from Engineering Toolset Strategy
  - Trade of local preferences against larger business drivers
  - Update trade study data with specific further evaluations
- Plan migration path from 'old' tools to 'new' tools.
  - Be aware of contractual obligations



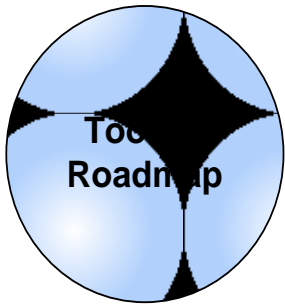


Key to hosted locations:



**IBM Rhapsody** was the tool that best satisfied our business requirements.





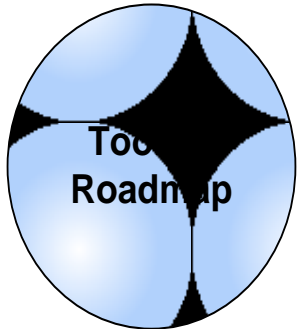
### The 'Will Be' Scenario :

- IBM DOORS for requirements
- IBM Rhapsody with MODAF and SysML for Systems Engineering
- IBM Rhapsody Gateway for DOORS Integration
- IBM Rhapsody (C and Multi Language) for Software Engineering



### Key Learning Points :

- ***Today's status may surprise you*** - people may not actually be using the tools that you think they are using!
- You cannot please everyone – ***be guided by the strategy*** and business needs
- ***Don't underestimate the effort*** needed to get to an agreed company, cross discipline conclusion!
- You ***cannot*** fully ***understand a tool's strengths and weaknesses without using it in a representative way***, just installing it and 'playing' with it does not expose the 'golden nuggets'
  - Evaluate in a representative IT environment
  - Evaluate by using the tools to do 'real work'



### Configuration And Data Management:

- How will model elements be configured?
- Who needs to access the model, where are they located?
  - *Employees, Partners, Suppliers, Customers*
- How/when will baselines of the model be taken?
- How/when will the model be documented?



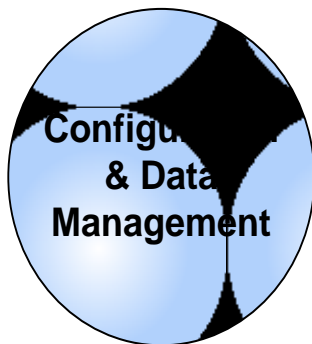
### General Dynamics UK Solution:

- Subversion (with PushOK plug in)
- Rational Publishing Engine to export documents
- Baseline documents and model at milestones



### Key Learning Points :

- ***Don't forget to consider this aspect***
- Can represent a cultural issue if your current tools have built in model CM



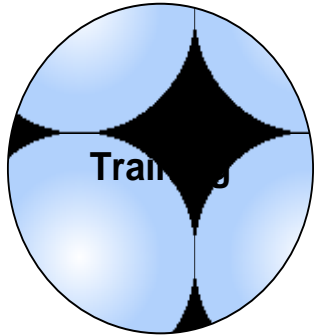


### Training:

- Need to define training approach.

### General Dynamics UK Solution:

- Widespread awareness training for 'all'
- Rhapsody for Systems Engineers
- Rhapsody for Software Engineers
- Train tool 'super users'



### Key Learning Points :

- The **awareness training was a key enabler in the change programme** (and was very cost effective).
- Training Super User's **provides confidence** to the stakeholder community.



### Business Continuity:

- Need to minimise roll out of a new tool does to avoid adversely effect on programme performance

### General Dynamics UK Solution:

- Working with IBM, develop capability to migrate data from existing tools into Rhapsody therefore minimising programme effort and schedule impact
- Plan work package to deliver updated process documentation reflecting the 'new ways of working' in Rhapsody and associated tools



### Key Learning Points :

- ***Data Migration Capability*** was key element of the overall success
- Remembering to include Process updates ***helped build confidence*** in the change programme



### Stakeholder Engagement:

- Identify the key stakeholders and engage with them to ensure the rollout is supported.

### General Dynamics UK Solution:

- Focused on Engineering Management Team, VP Operations and impacted programmes initially.
- Communication to wider audience only once decisions made.



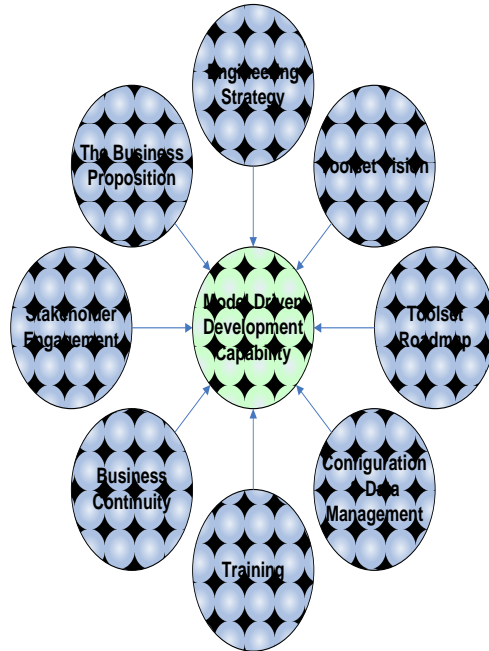
### Key Learning Points :

- Spending time on good stakeholder analysis will pay dividends!



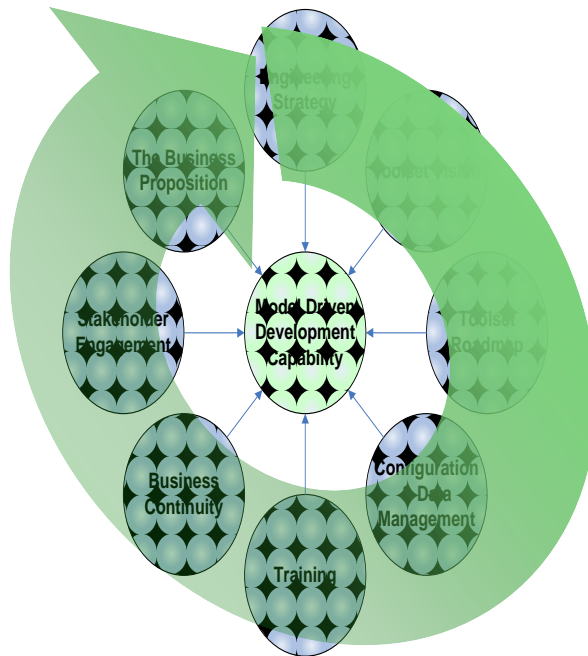
## The Business Proposition:

- Making a compelling case to secure funding.....



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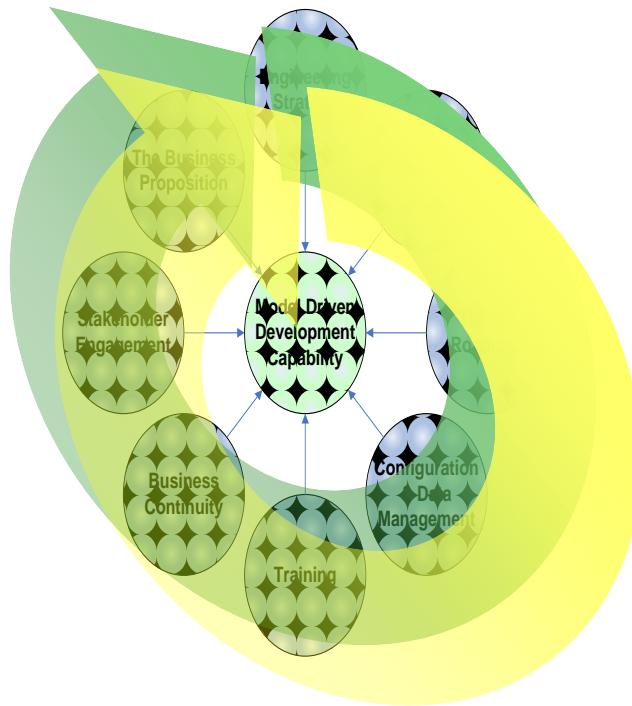
## Increment 1 :

- Intent: small scale deployment on one programme with no data migration needs
  - Low financial risk
  - Low technical risk
  - Demonstrable return on investment
- Reality:
  - Surprised at how much we learnt (linked to lessons on trade studies)
  - Delivered good success on programme, visible to customer
  - Provided financial arguments for next increment of deployment



## The Business Proposition:

- Making a compelling case to secure funding.....



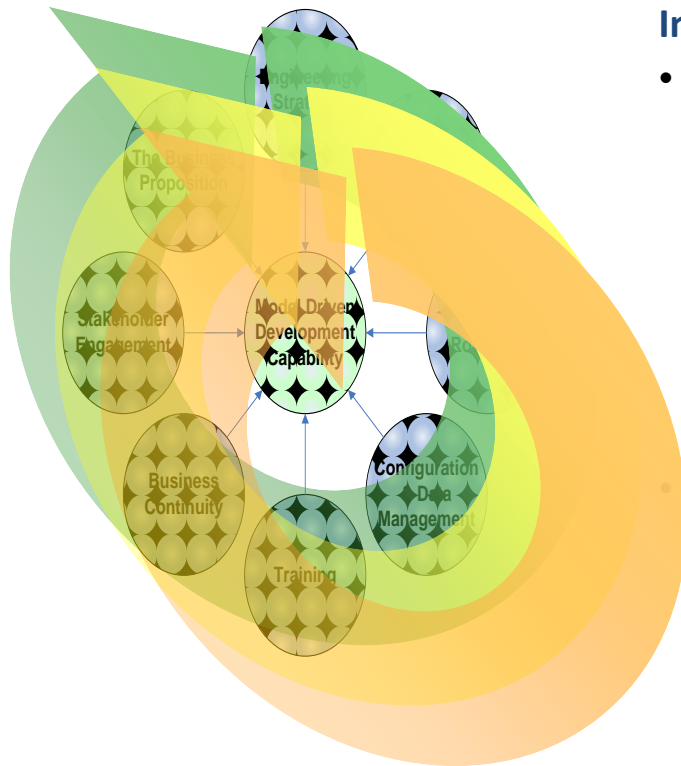
## Increment 2 :

- Intent: strategic R&D programme deployment with manual data migration
  - Still low financial risk
  - High profile programme within BU
  - Minimal ROI evidence likely
- Reality:
  - Approved, but not deployed as it was rolled up into Increment 3



## The Business Proposition:

- Making a compelling case to secure funding.....



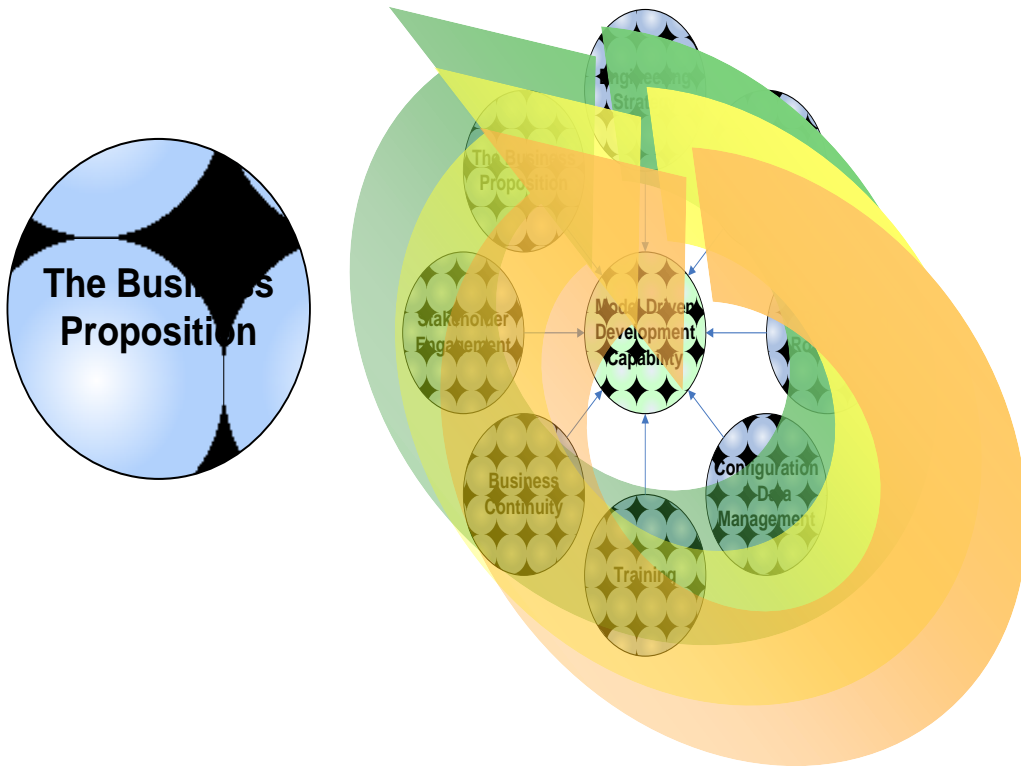
## Increment 3 :

- Intent: strategic R&D programme PLUS newly awarded SV programme with automated data migration
  - High profile programmes setting foundations of GDUK future
  - Challenge of transition on major new programme
  - Excellent ROI opportunity
- Reality:
  - Approved and deployed, to plan.



### The Business Proposition:

- Making a compelling case to secure funding.....



### Key Learning Points :

- Patience is a virtue!





## So Where Did That Leave Us?

### Defined 'strategic' toolset:

- IBM DOORS for requirements
- IBM Rhapsody with MODAF and SysML for Systems Engineering
- IBM Rhapsody Gateway for DOORS Integration
- IBM Rhapsody (C and Multi Language) for Software Engineering
- Rational Publishing Engine
- Subversion (with PushOK plug in)

### Initial Capability Deployed:

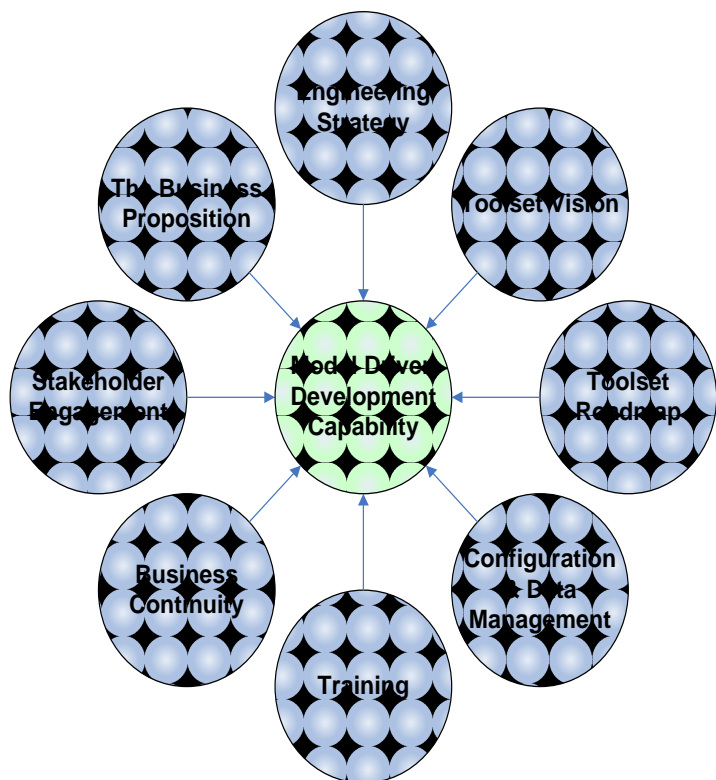
- Major programme successfully migrated and using new toolset
- Strategically Important R&D programme successfully migrated and using new toolset



But more to do in 2011...



## The Top Tips Slide



If you can't define what your Engineering and Toolset Strategy is and how it supports your business needs then you will fail to define a supportable business proposition.

Understand your options, conduct representative and informed trade studies against your business requirements, engage the relevant stakeholders in this.

Don't forget Configuration and Data Management.

Include your training costs and use awareness training to win over stakeholder communities.

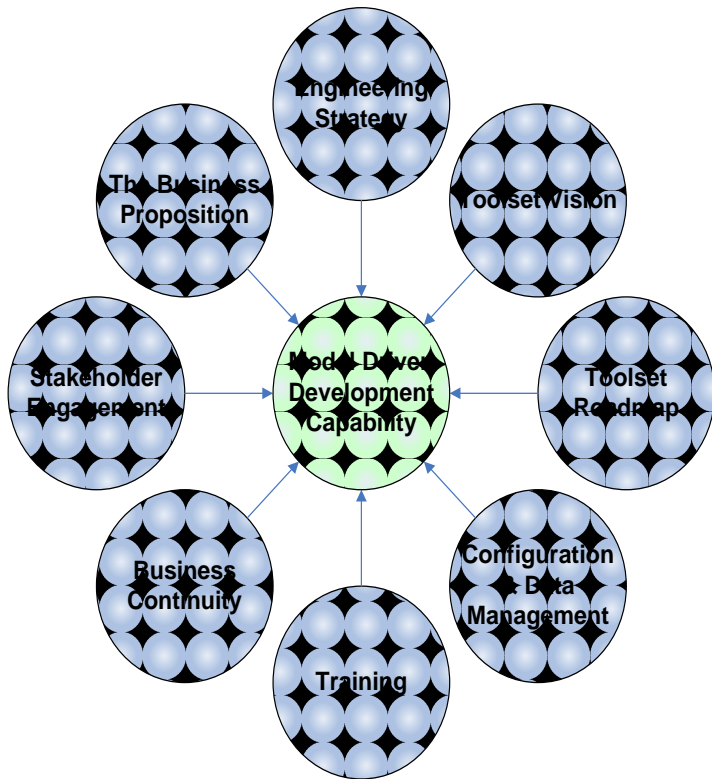
Plan how you will support business continuity – consider data and processes – it will increase stakeholder confidence and support.

Build a robust a compelling business justification, plan incremental introduction if necessary.

Be patient, stick to your strategy and use the support from the vendor.



## The 'take away' Slide



- Do lots and lots of getting ready, thoroughly plan the change
- Do lots of stakeholder management
- Get the “Green light”
- Deliver the new capability



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# Questions?

Simon Kenward

Chief Engineer – Systems Engineering

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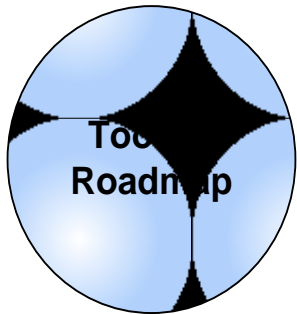
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# Spare Slides





### The 'As Was' Scenario - WEST:

- DOORS for requirements
- 1 MODAF Tool
- 2 SysML tools in use
- 1 UML tool in use
- Multiple configuration tools

### The 'As Was' Scenario - EAST:

- DOORS for requirements, but separate instance
- 1 different MODAF Tool
- No formal SysML tools in use
- 1 predominant UML tool – but not the same as the 'west'
- Multiple configuration tools









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