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PRIORITISATION OF RESEARCH PROGRAMMES USING PORTFOLIO ANALYSIS

BY

J M COYLE

HVR CONSULTING SERVICES LTD
ALTON
HAMPSHIRE

THE FOURTEENTH INTERNATIONAL SYMPOSIUM ON
MILITARY OPERATIONAL RESEARCH, RMCS SHRIVENHAM
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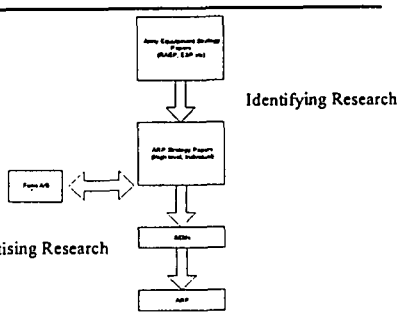
Prioritisation Of Research Programmes Using Portfolio Analysis

Introduction

1. Need For Research Prioritisation
2. The Study Approach

The Management Process



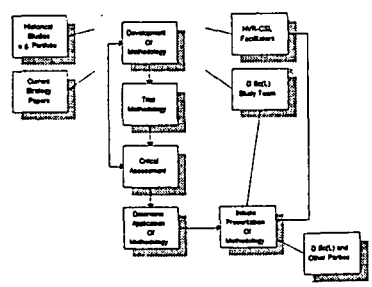
Difficulties In Managing Research

- Pace of technological change
- The activity/ability of commercial sectors
- Interactions with Downey cycle
- Projects always laying claim to importance
- Inertia/momentum of research
- The savings and enhancements debate
- Interpreting strategy papers etc.
- Quantifying the value of research
- Different types of research (direct & indirect)

Types Of Research

- Direct Research
  - Primarily contributing to concept definition, ST
- Indirect Research
  - Primarily supporting research
  - e.g. Design and test methodologies

Overview Of Study



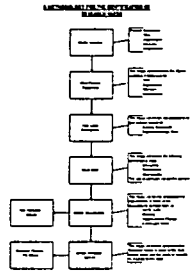
The Methodology

Introduce The Overall Methodology:

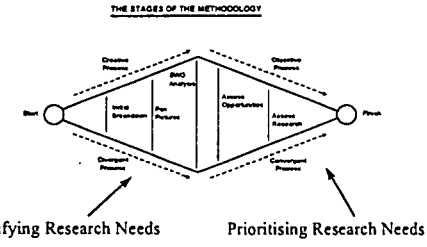
a) Identifying New Research Needs

b) Prioritising Research Needs

Overall Methodology (1)



Overall Methodology (2)



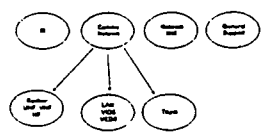
Identifying Research Needs

Identifying Research Needs

- Step 1
  - Pose The Master Question:
    - » e.g. "What research is necessary to achieve maximum exploitation of a core BMS on a Bowman Brigade by 2002/5?"

Identifying Research Needs

- Step 2/3
  - Initial Problem Breakdown, High Level Descriptions:
    - » e.g.



Identifying Research Needs

- Step 4
  - Apply SWO Analysis:
    - » This is supported by use of a set of tables to act as a checklist, audit trail
    - » Tables used are Capability Pull and Technology Push
    - » A brainstorm activity

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Identifying Research Needs

Attribute	Strengths	Weaknesses
Situational Awareness		
Decision Support		
Timeliness Of Information		
Interoperability		
Staffs		
Vulnerability		
C2W		
Other		

Attribute	Strengths	Weaknesses
Technology Availability		
Capacity		
COE		
Hardware		
Software		
HCI		
Other		

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Identifying Research Needs

Attribute	Strengths	Weaknesses
Situational Awareness	[illegible]	[illegible]
Decision Support	[illegible]	[illegible]
Timeliness Of Information	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] LAN requires setting up time
Interoperability	[illegible]	[illegible]
Manpower	[illegible]	[illegible] LAN requires setting up effort
Vulnerability	[illegible]	[illegible] Key accountability
Other		

Capability Pull

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Identifying Research Needs

- Identify opportunities based on the previous stage
- Assess these to identify a research need
  - again a checklist will support this

Opportunities	COTS ?	Organisational Change?	Research Need?	Feasible? (R,A,G)	Notes

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Identifying Research Needs

Example Of Opportunity Identification

Broad Area	Opportunities
Situational Awareness - Range, Terrain, HF	SATCOMs, UAVs, "bouncing" off ionosphere, improving trunk/packet, ability to install relays, positioning forces to avoid range limits Predict and change freq. use of smart modems (scan, predict, "squirt" data while possible)
Interoperability	ensure backwards compatability - Clansman promote standards complete programmability in radio - more flexible (Speakeasy in US) switch between systems/emulation buy US crypto/develop own
Timeliness	impose doctrine to set procedures for use "intelligent" radio to monitor environment and duties
Capacity	ability to change operating environment (freq, modulation, trans rates, compression, prioritisation) speech recognition packet/voice boxes data bursts (importance of successful delivery)

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Identifying Research Needs

- The Benefits
  - Provision of a structured framework
    - » audit trail
    - » a forum for debate
  - Useful in assessment of strategy papers etc.
  - Looks to future research needs rather than management of today's problems alone

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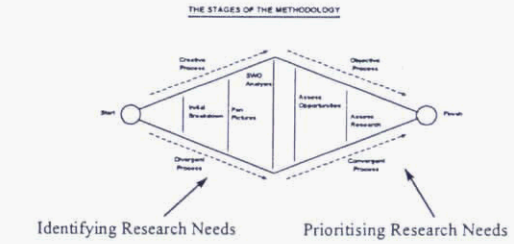
Research Prioritisation

Overall Methodology (2)



Research Prioritisation

- Need to "score" research
- Scoring Research ?
  - Urgency
  - Cost
  - A Military Benefit
  - Advances In Technology
  - Risk
  - Retention Of Research Expertise
  - Maintaining A "Balance" Of Research

Portfolio Analysis

- ***A Technique For Charting Or Categorising The Different Businesses In A Firm's Portfolio And Determining Implications For Resource Allocation***

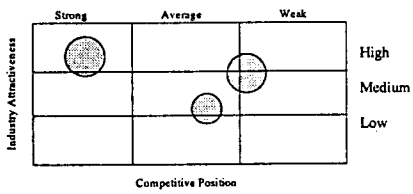
Portfolio Analysis History

- Boston Consulting Group 1960s
  - BCG Matrix (Plots Market Share Against Market Growth)
- GE Matrix Mid 1970s
  - Plots Industry Attractiveness Against Competitive Position
  - Preferred Industry Approach (Used By 75 % Of Large US Firms By 1982)

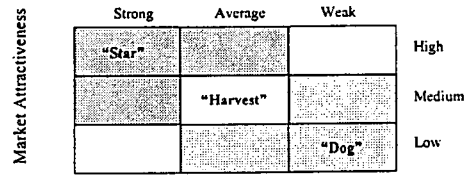
Subordinate Factors

Attractiveness Of Industry	Competitive Position
Market Size.	Market Share.
Potential Rate Of Market Growth.	Competitive Ability.
Industry Profitability.	Knowledge Of Customer & Market.
Competitive Structure.	Technical capability.
Cyclicality.	Calibre of management.
Technical Requirements.	Business Unit Size.
Social & Environmental Factors.	Business unit growth.
Opportunities.	Profitability & margins.
	Technology & Weaknesses.
	Image.
	Pollution.
	People.

A Worked Example



Implications



Competitive Position

Star - Target for growth and development
Harvest - Monitor but make no radical changes
Dog - Examine to see if it is worth continuing

Application To ARP

- How can this be applied to military research?
  - The "attractiveness" corresponds to the military return that research can deliver
  - The "strength" corresponds to the balance between defence and commercial research capability
- Develop a set of sub-factors and metrics to score these

The Chosen Factors

- Military Return
  - needs to address the benefit that the research will offer e.g. urgency, filling an identified weakness
- Technology Stream
  - needs to address the strength of commercial sectors in delivering the required research aims
- Also can consider Cost, Risk separately

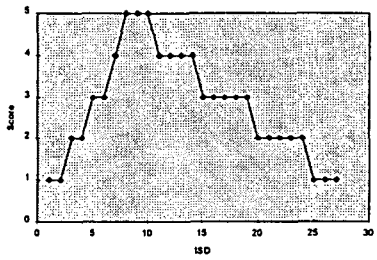
The Sub Factors

MILITARY RETURN	TECHNOLOGY STREAM
Urgency	# Active Companies
Dependency	Barriers To Entry
Identified Military Weakness	Economies Of Scale
Interoperability	Skill Base
	Cyclicality

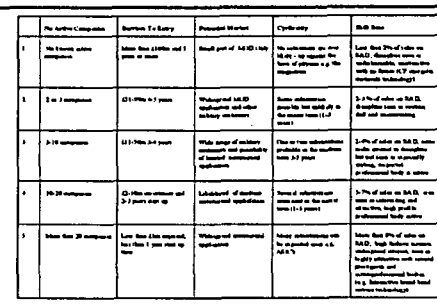
Military Return Metrics

	Urgency	Dependency	Interoperability	Identified Military Weakness
1	>25 yrs or >2 yrs to ISD	Non-standard Not Lynchpin Stand alone system	Bespoke Army system	No identified military weakness
2	2-4 yrs or 20-25 yrs to ISD	Non-standard Not Lynchpin Little support of other system	Bespoke Army wide	Some evidence of weakness Capability replacement
3	15-20 yrs to ISD 4-5yrs	Some implications for standards Supports some systems	Limited mil. and joint interoperability. Achievement through work round	Non-critical audited weakness (ESP) or known future weakness 5-10yrs
4	10-13yrs 3-4 yrs to ISD	Lynchpin system Supports many othe systems/components	Adequate mil. and joint interoperability.	Non-critical audited weakness (ESP) or known future weakness < 5yrs
5	6-10yrs from ISD	Fundamental standard	Supports full mil. and joint operations.	Significant Critical military weakness identified in ESP now

The Urgency Metrics

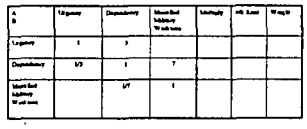


Technology Stream Metrics

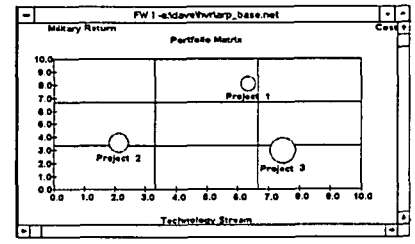


Weighting Sub-Factors

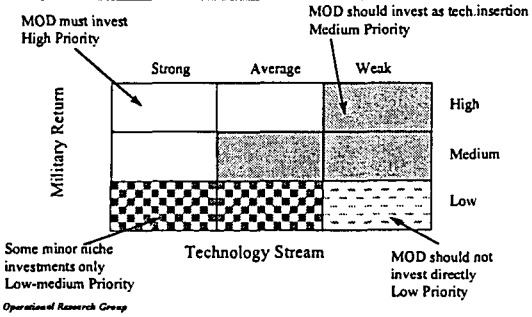
Apply Saaty weighting to combine sub factor scores



A Portfolio Matrix



The Military Return/Technology Matrix



Summary Of Approach

- Has a proven pedigree
  - industry, DRA Malvern
- Provides a structured, auditable approach
- Offers a decision support tool to aid debate
  - sensitivity analysis
    - » weights
  - trends i.e. in which direction are research assignments moving on the portfolio matrix

Applying Portfolio Analysis

Scoring An Assignment

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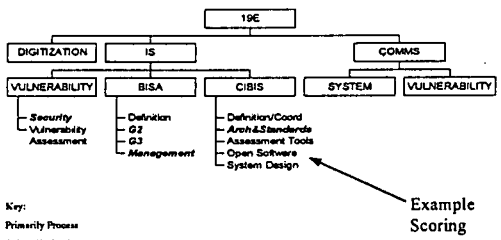
19e Package



Key:
Primarily Process
Primarily Product

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Scoring Military Return

	Urgency	Dependency	Interoperability	Identified Military Weakness
1	>25 yrs or <2 yrs to ISD	Non-standard Not Lynchpin Stand alone system	Bespoke Army system	No identified military weakness
2	2-4 yrs or 20-25 yrs to ISD	Non-standard Not Lynchpin Little support of other system	Bespoke Army wide	Some evidence of weakness Capability replacement
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4	10-15yrs 5-6 yrs to ISD	Lynchpin system Supports many othe systems/components	Adequate intl. and joint interoperability.	Non-critical audited weakness (ESP) or known future weakness < 5yrs
5	6-10yrs from ISD	Fundemental standard	Supports full intl. and joint operations.	Significant Critical military weakness identified in ESP now
Open Software	?	?	?	?

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Scoring Technology

	No Active Companies	Barriers To Entry	Potential Market	Cyclicality	Skill Base
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Open Software	?	?	?	?	?

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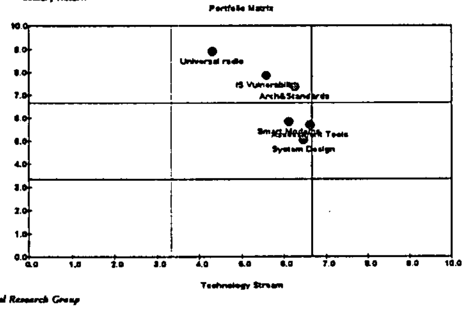
Will Add Example To The Portfolio



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Interpreting The Portfolio

- Assess the balance of investment across the assignments
- Can carry out sensitivity analyses on the sub-factor weights
- May identify areas of research which deserve further scrutiny

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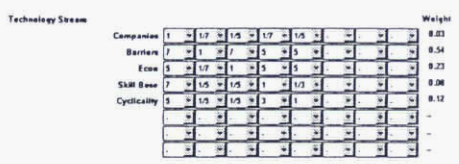
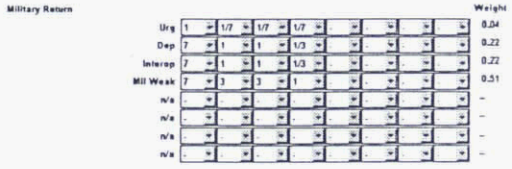
Technology Weighting



Military Weighting



Assessing The Methodology

- Who should carry out the scoring?
- What are the strengths of the approach?
- Is the approach particularly useful for some packages?
- What are the current limitations to the approach?
- What is the ideal forum in which the methodology could be applied?

Conclusions

- Have developed a methodology which:
  - could be applied to identifying future research needs
  - provides a route to discriminate assignments as a way of prioritising research
- Potentially useful decision support tool
- Have applied this to part of the 19e package