Project Management Indicators for the New COTS Component System Development Paradigm

Michael Looney
DSTL ISS
DERA Land Based Test Site
Southwick Road
Portsmouth, PO6 3RU, UK
Tel: +44 (0)23 92 312 650

DSTL

Presentation

- Background
- Paradigm Shift
- Basic Process
- Project Management Issues
- Summary

DSTL

Combat Management System (CMS)

- CMS real time knowledge-based applications
  - Integrated Support Environment
  - Situation Assessment
  - Resource Allocation

DSTL

Software Problems

- Intangible
  - invisible,
  - flexible ‘easy to change,
- Discontinuous Failure Modes
  - single error can cause system failure
  - 100% correctness required
- Complex
  - many levels
  - many modules
  - millions of lines of code
- Hardware first
  - traditional systems started with hardware first
  - software was expected to take up the slack

DSTL

Traditional Project Cycle

Project Initiation

Requirements

System Design

Software Development

Integration & Testing

Fielding

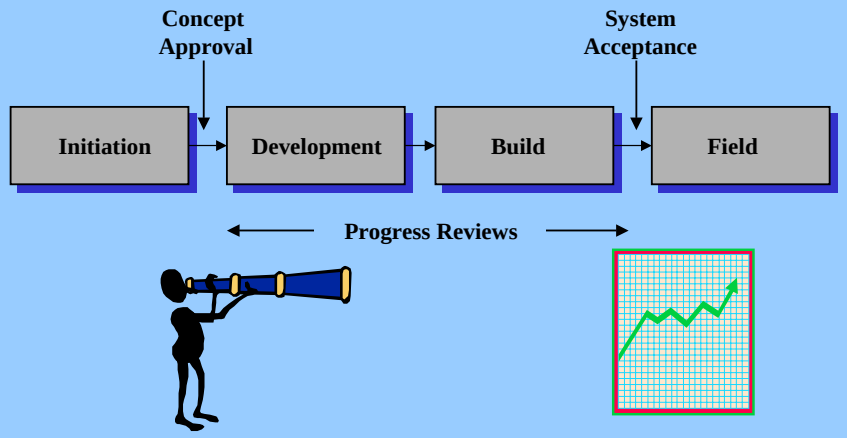
DSTL

Traditional Approaches

- Design Methods
  - Top down
  - Bottom up
  - Evolutionary
- Approaches
  - Functional decomposition
  - Data Flow
  - Structure Charts
- Programming
  - Procedural
  - Functional
  - Logical
  - Object Oriented

DSTL

Traditional Review Process



DSTL

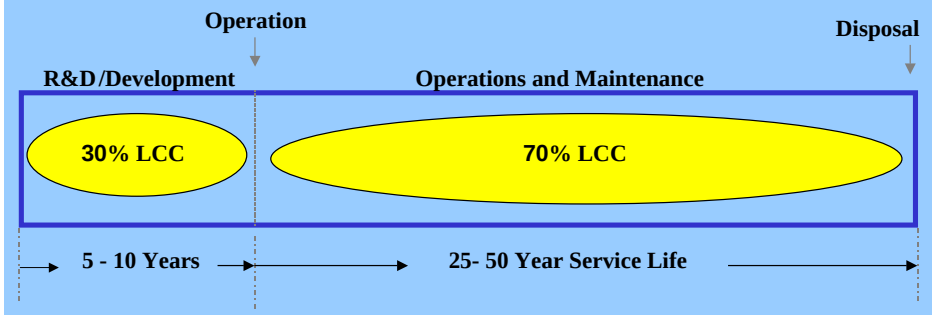
Total Through Life Costs

Contributory Stages

- Demonstration
- Manufacture
- In Service Support
- Disposal

DSTL

Lifecycle Timeline



DSTL

Presentation

- Background
- Paradigm Shift
- Basic Process
- Project Management Issues
- Summary

DSTL

New Paradigm

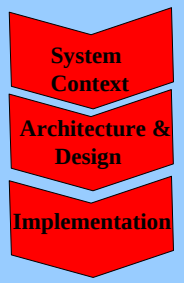
Move to Component Based Development has introduced new problems with increased risk

- Process is less well understood
- More need for 'trade offs'
- Commercial market influences
- Product v Project lifecycles

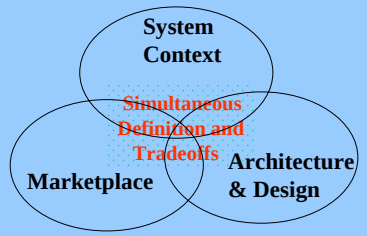
DSTL

A Necessary New Way of Doing Business

Traditional Development Approach



Required Approach for COTS Based Systems



Adapted from Oberndorf & Foreman, SEI, 1999

DSTL

Presentation

- Background
- Paradigm Shift
- Basic Process
- Project Management Issues
- Summary

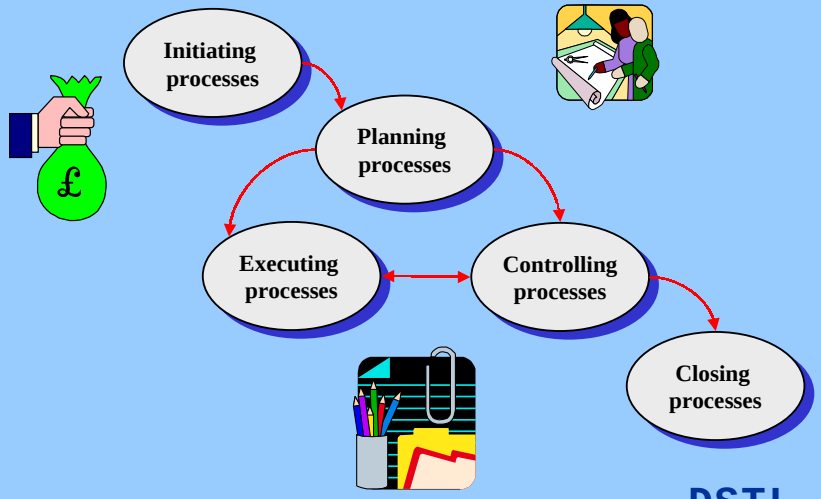
DSTL

Scene Setting

- A process has principles that contribute to an objective. It should not be followed blindly but the principles should be used as guidance in achieving the objective
- Processes → Activities → Tasks
- Project Core Constraints
  - Schedule
  - Performance
  - Budget

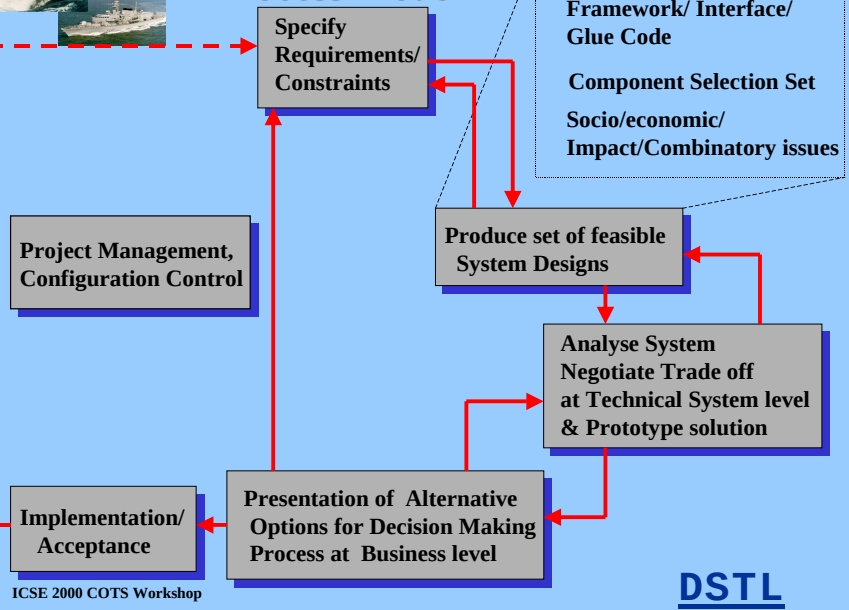
DSTL

Management Process



DSTL

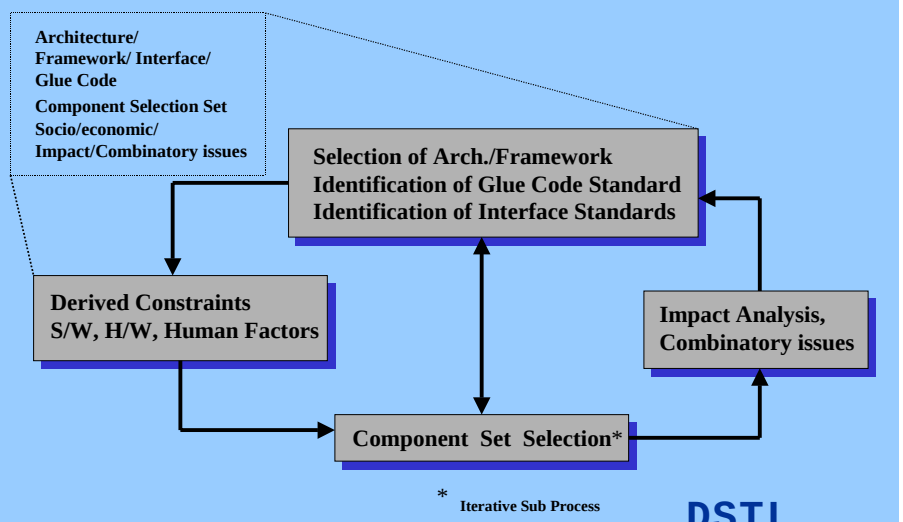
Process Model



ICSE 2000 COTS Workshop

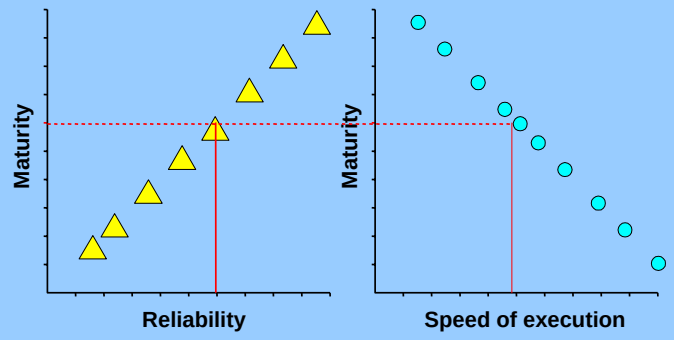
DSTL

Sub Process Model



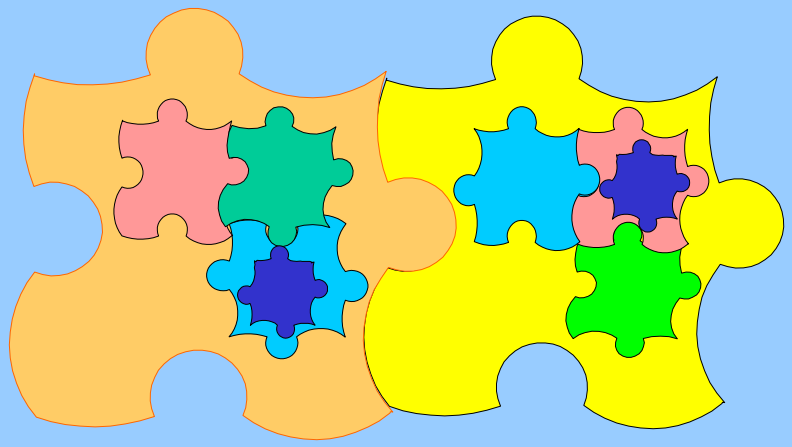
DSTL

Component Selection



DSTL

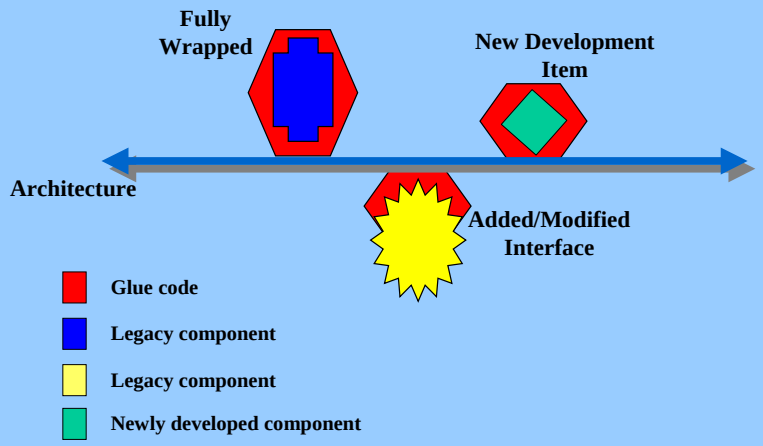
Systems Integration of Components



Real World Systems of Systems

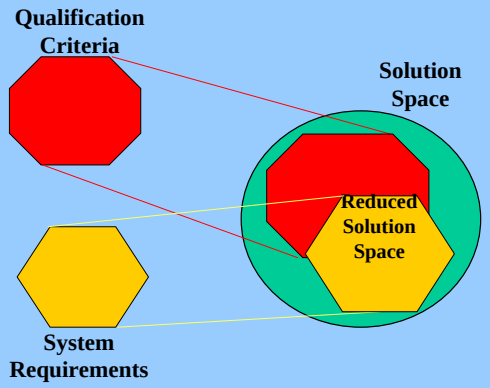
DSTL

Architecture/Interface/Glue Code



DSTL

Component Based Development



DSTL

Presentation

Background

Paradigm Shift

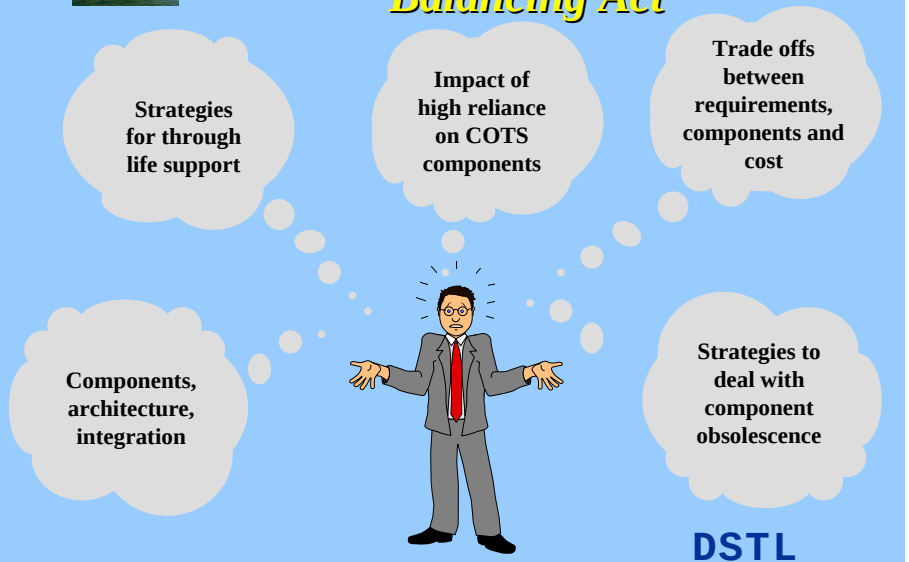
Basic Process

Project Management Issues

Summary

DSTL

Software Project Managers' Balancing Act



DSTL

Procurement

Acquisition is a whole life process, covering requirements setting, initial procurement, in-service support and disposal

DSTL

Smart Procurement

Through

Teamworking

Whole life approach

Using best practice

Capability Acquisition will be

Faster

Cheaper

Better

DSTL

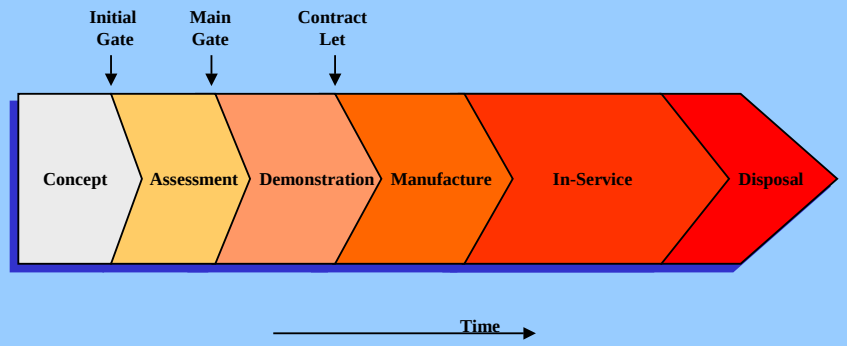
Mythical or Real ?

Better, Cheaper, Faster ?

Adapted from an NUWC presentation

DSTL

Smart Procurement



DSTL

Smart Procurement Stages

- Concept Stage : First stage which forms the integrated team and produces the user requirements. The business case is assembled for Initial Gate approval.
- Assessment Stage : Begins after Initial Gate, risk is reduced to a level consistent with delivering an acceptable level of performance to a controlled time and cost. The business case is assembled for Main Gate approval.
- Demonstration Stage : During this stage the ability to produce an integrated capability is demonstrated. The prime is selected and a contract based on the system requirements placed.
- Manufacture Stage : The integrated team deliver the solution to the military requirement, completing system development and production. System acceptance is conducted.
- In-Service Stage : The line management provide effective front line support and carries out approved upgrades or improvements, refits and acquisition increments
- Disposal Stage : Efficient,effective and safe disposal of the system

DSTL

Smart Procurement

Progressive Acceptance

User and System requirements

↓

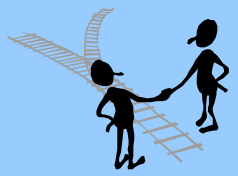
Design Certification

↓

System Acceptance

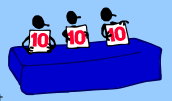
↓

In-Service Date



DSTL

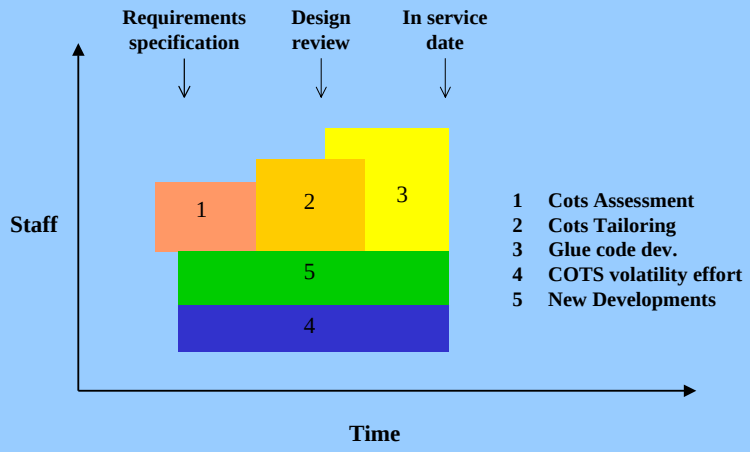
Smart Procurement Definitions



- **Initial Gate**
  - A relatively low approval hurdle, between Concept and Assessment, intended to encourage early and full exploration of a wide range of options for meeting a particular capability.
- **Main Gate**
  - An exacting approval hurdle, between Assessment and Demonstration. A business case case at Main Gate should recommend a single technology and procurement option.

DSTL

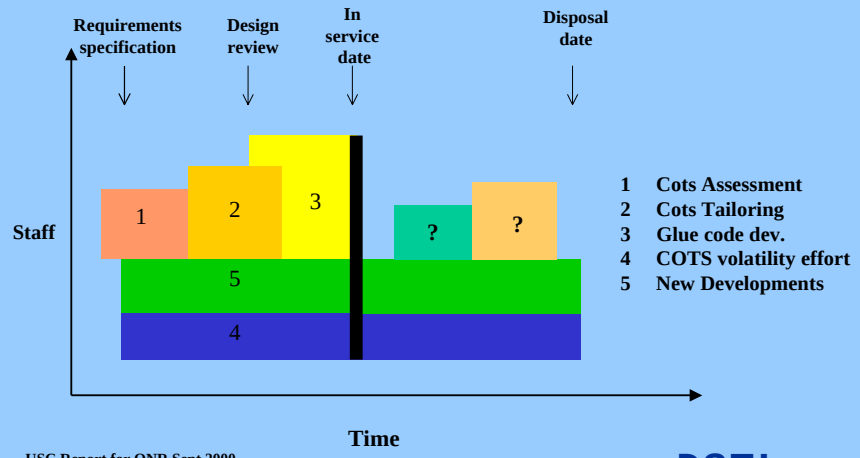
Development Cost Model



USC Report for ONR Sept 2000

DSTL

Through Life Cost Model



USC Report for ONR Sept 2000

DSTL

Risk Situation

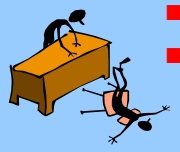
- All projects have risks.
- A risk is anything which might impact the cost, schedule or quality of the result of a project.

- No matter how hard we try they can not all be eliminated.
- The solution is to manage the risk.

DSTL

Risks Areas

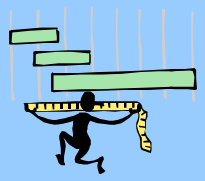
- Rapid changes in the market place
- Change of technology direction
- Limited visibility of components
- No control over products
- No common architectural paradigm
- Interdependencies
- Oversight on ‘business issues’
- Long term support
- …...



DSTL

Activities Involved

- Identification
- Categorisation/prioritisation
- Quantification/evaluation
- Documentation
- Management



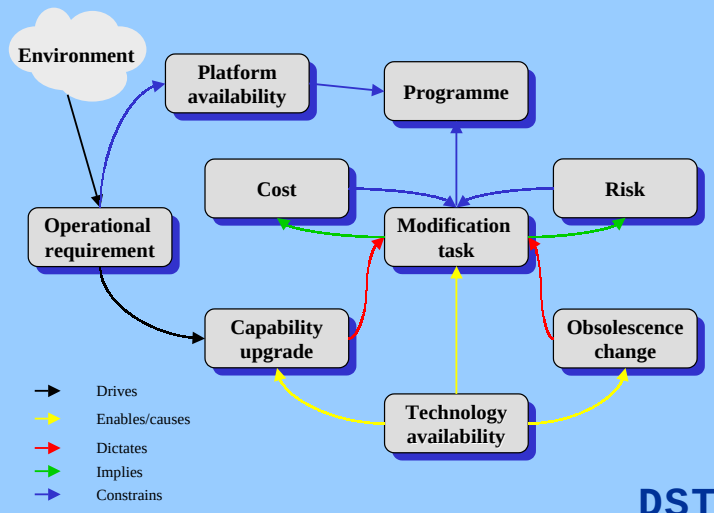
DSTL

Identification

- External factors
- Undocumented assumptions
- Loss of resources
- Estimates of time and cost
- New technology
- Assessment of the ‘unknown’

DSTL

Maintenance/Upgrade Issues



DSTL

Change Drives/Rates

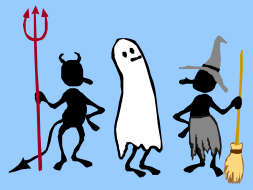
Package	Change	Rate
Application	Operational requirements	4/5 years
Operating Systems (1)	Upgrade release	6 months
Operating systems (2)	New version	2/3 years
Graphics package	New version	2 years
Data Base package	New version	2 years
Communications package	New version	18 months
Middleware	New version	12 months
Device drivers	New versions	18 months

DSTL

Support Paradigms

Solution Routes

- COTS
- Bespoke
- Modified COTS



DSTL

Support Paradigms

Test & Integration Options

- Concept Demonstrator
- Technology Demonstrator
- Conformance Testing
- Shore Based Trials
- Ship Based Trials

DSTL

Supported Process Model

DSTL

Life Cycle

Disposal

- Take out of operation

DSTL

Presentation

DSTL

Points of Change

- Flexibility at the requirements level.
- Vendor role is significant at all times.
- Less effective estimation and tracking.
- More complexity and less adherence to any set process.

DSTL

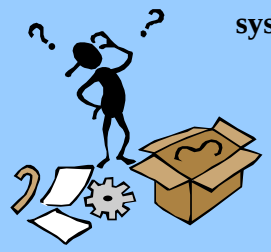
Critical Identifiers

- Component selection criteria
- Architecture, standards, & interfaces.
- Short or long term support
- Support paradigm

DSTL

Comments

In a dynamic environment following a fixed plan can produce the system intended but not necessarily the system needed

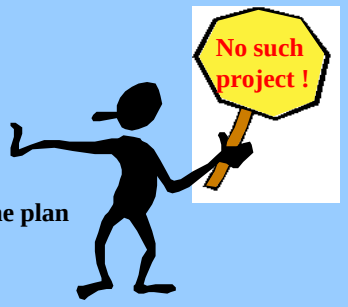


DSTL

Comments

'Do it right first time'

- No uncertainty
- No experimentation
- No deviation from the plan



DSTL

Conclusions

- Development and support are very similar but not necessarily the same.
- Frequency of change is significant
- Understanding the market is essential
- Fielding and acceptance could be main cost driver
- Risks are different
- Project management is different

DSTL