

Developing the Concept – Innovation Readiness Levels (IRL)

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Structure of this presentation

- Background
- Introduction
- Existing Theories
- Approach
- The Framework

Background

- The BATP Project

(Business Appraisal for Technology Potentials)

- Aims

To provide manufacturing (and other) companies with the means to assess systematically the benefit of new technologies to their business

Background

- Why IRL?
 - Faster pace of innovation—shorter lifecycle
e.g. the lifecycle of desktop personal computer:
a decade ago—5 years; now—3 years
 - Fiercer competition
e.g. PC, Digital Camera, Automotive Industry, etc

So?

Background

- Why IRL?
 - IRL is intended to depict the development of innovation
 - IRL helps implement innovation over the lifecycle more effectively

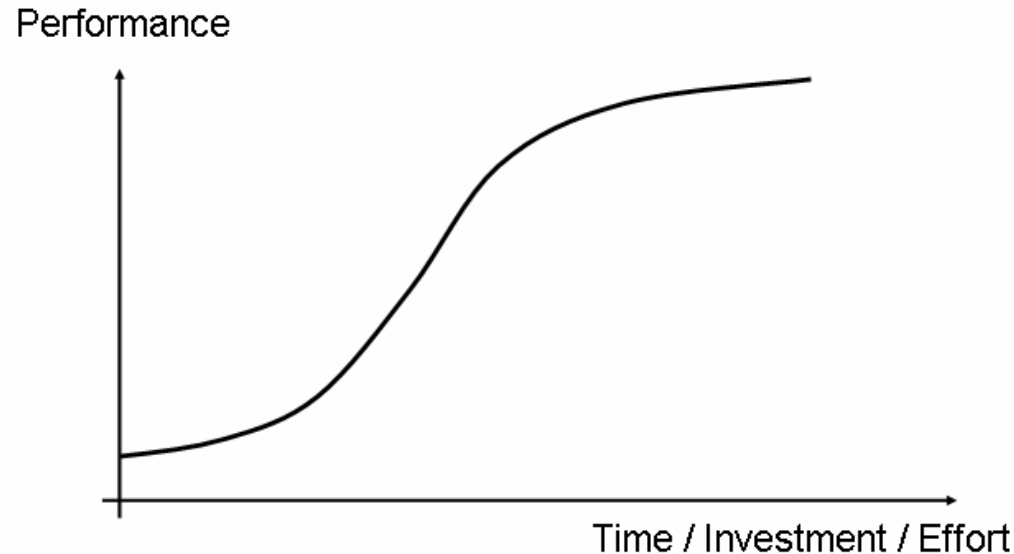


Introduction

- The notion of lifecycle in IRL

The S-curve?

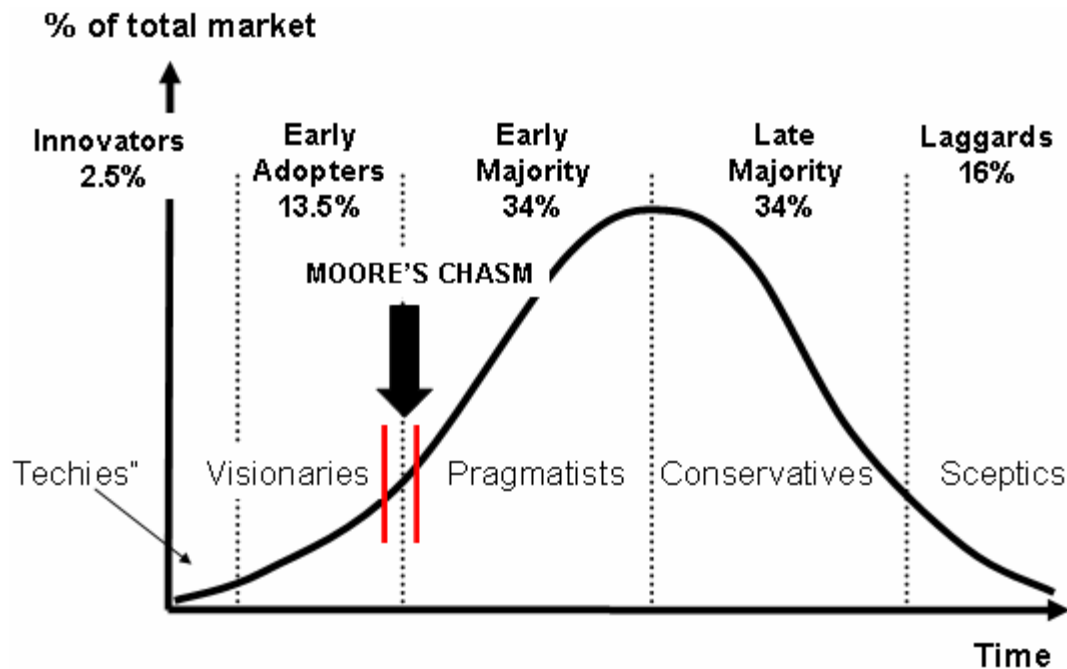
Technology evolution - the 'S-curve'



Introduction

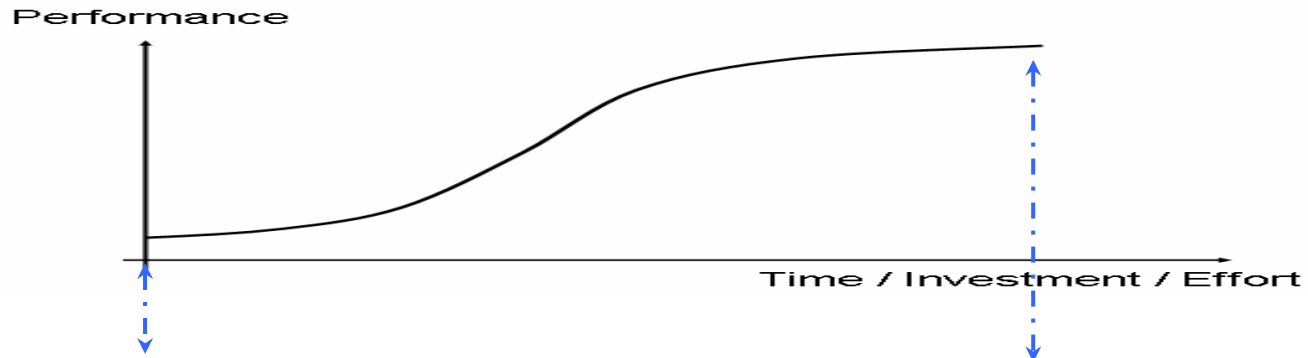
- The notion of lifecycle in IRL

The market adoption model (Moore 1998)?



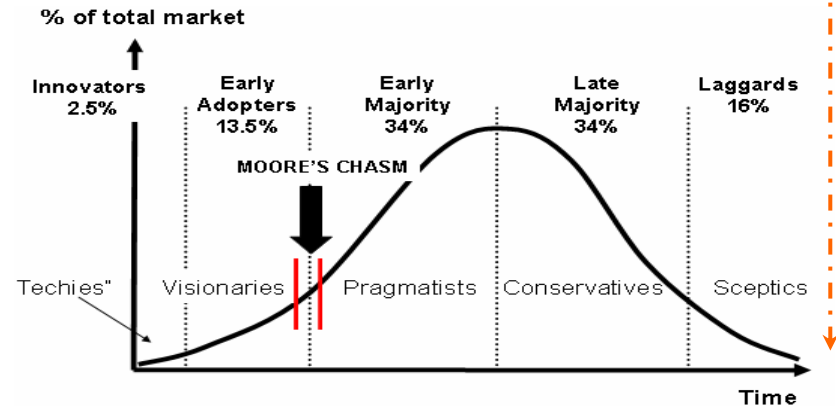
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Technology evolution - the 'S-curve'



Innovation Readiness Levels	IRL1	IRL2	IRL3	IRL4	IRL5	IRL6
Title	Concept	Components	Completion	Chasm	Competition	Changeover/ Closedown

IRL—a 6 'C' Scale



Introduction



- The 5 key aspects of IRL
- Key activities

Innovation Readiness Levels Aspects	IRL1 Concept	IRL2 Components	IRL3 Completion	IRL4 Chasm	IRL5 Competition	IRL6 Changeover/ Closedown
Technology						
Market						
Organisation						
Partnership						
Risk						

Existing Theories

■ The generations of innovation

First generation 1950s and early 1960s	R&D-based technology push, in a sequential process
Second generation 1970s	Need-pull with R&D as reactive to market trends and needs, in a sequential process
Third generation 1980s	Coupling mode of integration of R&D and marketing, in a sequential process with feedback
Fourth generation Late 1980s and 1990s	Integrated mode, with parallel and integrated development, based on strong user-producer links, non-sequential processes
Fifth generation 1995- Present	Systems integration and networking model

Source: Rothwell (1992) and Savage (1996)

Existing Theories

- The fifth generation of innovation

	Character
Core Strategy	Collaborative Innovation System
Change Factors	Kaleidoscopic Dynamics
Performance	Intellectual Capacity/Impact
Structure	Symbiotic Networks
People	Self Managing Knowledge Workers
Process	Cross-Boundary Learning and Knowledge Flow
Technology	Intelligent Knowledge Processors

Source: Amidon (1996) and Kahlil (2000)

Existing Theories

Reminder

Innovation Readiness Levels Aspects	IRL1 Concept	IRL2 Components	IRL3 Completion	IRL4 Chasm	IRL5 Competition	IRL6 Changeover/ Closedown
Technology						
Market						
Organisation						
Partnership						
Risk						

Existing Theories

- The process of innovation
 - Technology Readiness Levels (TRL, NASA)
 - System Readiness Levels (SRL, MOD)
 - The ISAEP Model (Gregory, 1995)
 - Stage Gates (Cooper, 2001)
 - Others, e.g. Gaynor (1996), Khalil (2000)

Existing Theories—TRL

■ The TRL Summary (NASA)

TRL 1 Basic principles observed and reported

Concept

TRL 2 Technology concept and/or application formulated

TRL 3 Analytical and experimental critical function and/or characteristic proof-of-concept

TRL 4 Component and/or breadboard validation in laboratory environment

Components

TRL 5 Component and/or breadboard validation in relevant environment

TRL 6 System/subsystem or prototype demonstration in a relevant environment (ground or space)

TRL 7 System prototype demonstration in a space environment

Completion

TRL 8 Actual system completed and “flight qualified” through test and demonstration

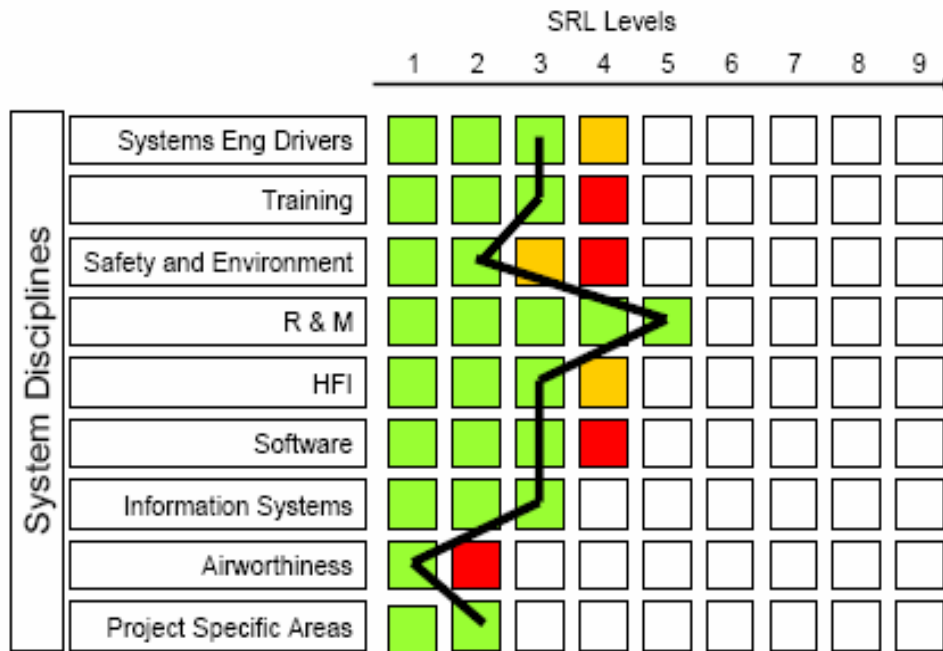
TRL 9 Actual system “flight proven” through successful mission operations

Reminder

Innovation Readiness Levels Aspects	IRL1 Concept	IRL2 Components	IRL3 Completion	IRL4 Chasm	IRL5 Competition	IRL6 Changeover/ Closedown
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Market						
Organisation						
Partnership						
Risk						

Existing Theories—SRL

■ SRL (MOD)



Acronyms:

R & M: Reliability & Maintainability
HFI: Human Factors Integration

Note:

Each box on the matrix represents a key output for that system discipline.

The colours represent:

Green: full achievement of the required outputs;
Amber: some shortfalls in the required outputs;
Red: significant shortfalls in the required outputs.

Existing Theories—The ISAEP Model

- The ISAEP Model (Gregory 1995)

Technology management processes



Existing Theories—Stage Gates

- Stage-Gate Process (Cooper 2001)

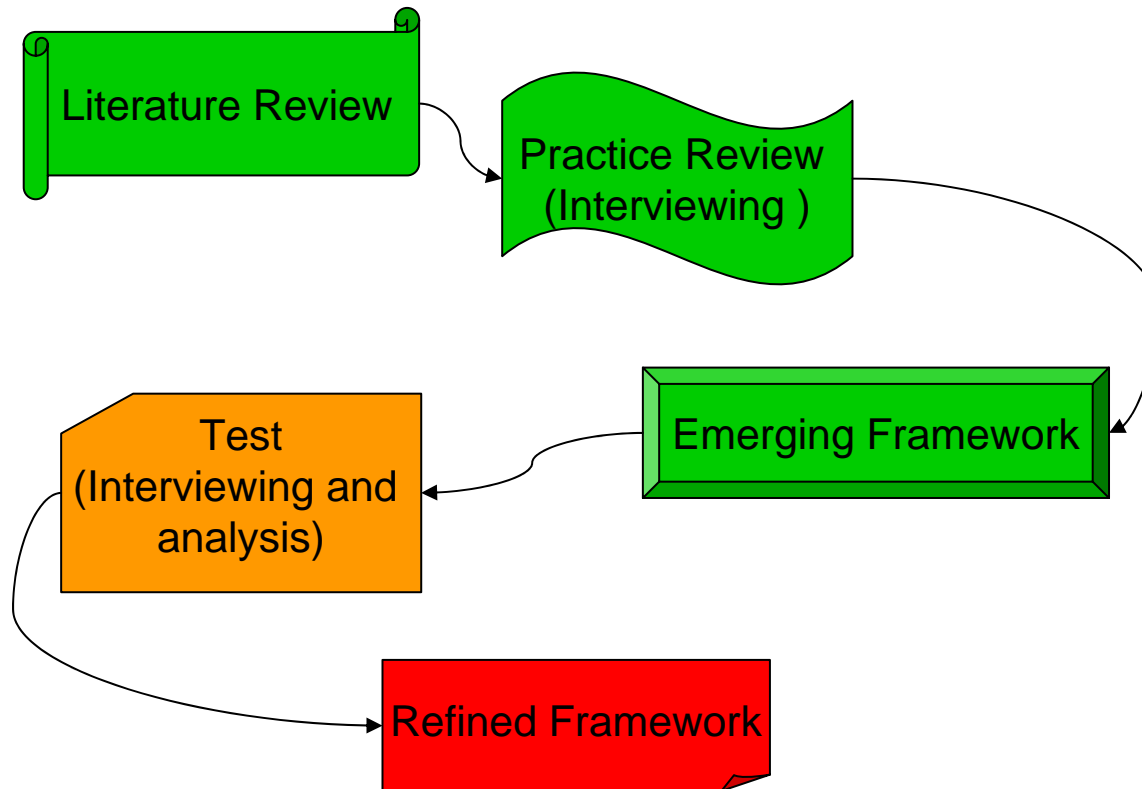


Approach








- Qualitative Research
 - Interviewing
 - Content analysis

Approach

- Research steps



Approach—Companies involved

	Companies	Industrial Sectors
<i>Practice Review</i>		Mobile Phones/Multimedia
		Aviation
		Consulting
<i>Developing the Preliminary Framework</i>		Printing and Copying
		Chemicals (paint)
<i>Testing the Framework</i>		Defence
		Digital Imaging



The Framework

	Technological Development				Market Evolution		
Innovation Readiness Levels Aspects	Pre-IRL	IRL 1 Concept	IRL 2 Components	IRL 3 Completion	IRL 4 Chasm	IRL 5 Competition	IRL 6 Changeover/ Closedown
Technology		<ul style="list-style-type: none"> -Basic scientific principles observed and reported; -Technology feasibility confirmed <i>For radical innovation:</i> <ul style="list-style-type: none"> - Determine the innovation is radical -Unique advantage identified; -Progressive identification of technical goals 	<ul style="list-style-type: none"> -Individual components tested; -Prototypes demonstrated; -IP protected 	<ul style="list-style-type: none"> -Actual system demonstrated; -External test completed; -IP protected; -Technology/product documented; -Launch 	<ul style="list-style-type: none"> -Expertise formed; -General availability to the whole market; -Aftersales supports 	<ul style="list-style-type: none"> -Lower R&D activities; -Technology maintenance enabled; -Technological service provided 	<ul style="list-style-type: none"> -Disruptive innovation identified; -Learning from experiences and re-innovate or exit
Market	<ul style="list-style-type: none"> -On-going market research; -Identify and develop the opportunities 	<ul style="list-style-type: none"> -Working with leading customers; -Customer need and demand observed <i>For radical innovation:</i> <ul style="list-style-type: none"> - Locate the initial market 	<ul style="list-style-type: none"> -End-customer identified; -Detailed market launch plan issued 	<ul style="list-style-type: none"> -Specific needs and requirements of customers known; -Market segment, size and share predicted; -Pricing & Launching issued 	<ul style="list-style-type: none"> -Positioning in the market; -Business model established; -Customer-intimate marketing (feedback); -Competitors identified; -Use partnership to break into market 	<ul style="list-style-type: none"> -Differentiate products; -Provide service and solutions; -Periodical review; -Business model refined -Use partnership to compete 	<ul style="list-style-type: none"> -Declining market confirmed; -Market research for approval to re-innovate or exit
Organisation	<ul style="list-style-type: none"> - For radical innovation: Place responsibility in an independent organisation 	<ul style="list-style-type: none"> -Strategy fit confirmed; -Informal, loose structure (mainly R&D team) <i>For radical innovation:</i> <ul style="list-style-type: none"> -Define the strategic significance of the radical innovation; -Free communication channels 	<ul style="list-style-type: none"> -Business analysed and plan issued; -Key individuals involved 	Formalising organisation	Form established (e.g. dynamic network)	<ul style="list-style-type: none"> -Improved effectiveness and cooperation; -Necessary re-structure made 	
Partnership		Potential partners identified	<ul style="list-style-type: none"> -Partners selected; -Calibration established 	Partnership formally established	<ul style="list-style-type: none"> -Cooperation within dynamic network; -On-going management 		<ul style="list-style-type: none"> -Cease partnership; -(Academic partners sought)
Risk		Technology risk considered	<ul style="list-style-type: none"> -Technological risk assessed (Alternative solution considered); -Organisational risk considered (Investment plan initiated and investment started) 	<ul style="list-style-type: none"> -Technological risk assessed; -Organisational risk assessed (Profit predicted Large investment issued) 	Organisational risk periodically assessed (especially financial indicators)	Organisational risk periodically assessed (especially financial indicators)	<ul style="list-style-type: none"> -Consideration of the two options; -Changeover or closedown plan issued

How to use IRL?

- Company level
- Project level

Responsible functional department for the key aspects of IRL:

Key aspects	Suggested responsible functional department
Technology	R&D
Market	Sales & Marketing
Organisation	Strategic planning group, Human resources
Partnership	Outsourcing group, Research liaison group, Sales
Risk	Finance and accounting, strategic group

Further Work

- More maturity models
- Generalisation of the research findings
- Recommended methodology:
Participant observation

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Questions and Comments Welcome



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