

# *Enterprise-wide requirements management*

*Richard Stevens*

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# *Introduction*

- For the last 2-3 years, QSS/Telelogic has been heavily involved in applying systems principles at the director level. Now we interact with 3-4 companies per month at CEO level in the UK alone
- The principles of systems engineering (and requirements management) apply throughout the organization - now this is becoming well-understood
- Making a success of the individual project is very limiting - the company needs interoperability, re-use, program management and outsourcing
- Current management information systems are simplistic reporting systems, disconnected from any corporate objectives
- Y2K was the turning point in making senior management aware of the revolutionary business changes that are happening
- We don't need to change the systems engineering message - but we have to explain it in management terms

quality

In a knowledge economy, 'things' are worth less, while ideas, IP, and information are worth more - for everyone, not just dotcom companies

information

'Time to market with the right product' is critical - we have to shrink development times, reduce risk, improve quality

weeks not years

Constant mergers/acquisitions, process automation taken for granted, reduced manpower

globalization

Globalized competition, destruction of national trade barriers (*no local hiding places*), - companies must look outwards

quality

Increased customer knowledge of quality and functionality demands a richer product offering

software

Software as the dominant force of change in everything

Outsourcing

Outsourcing of non-critical components, and use of bought-in 'transferred technology' and existing commercial components

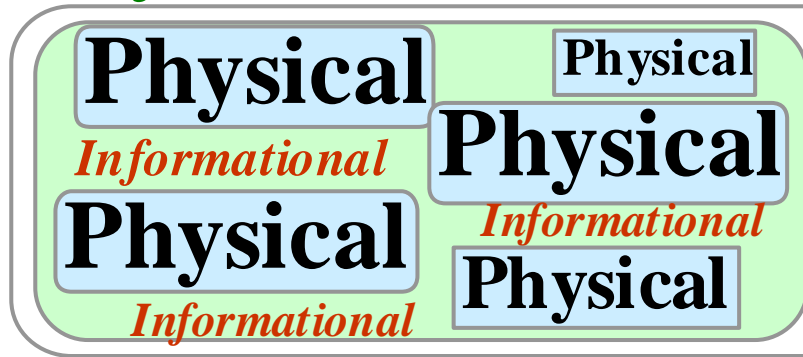
information

The company and its products are becoming knowledge-based through software - control is now through electronic information not paper

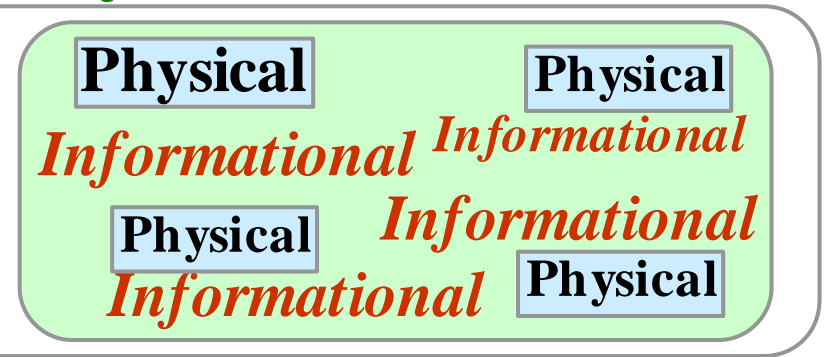
**An industrial revolution that is changing the world ... rapidly**

- Products and services must be deconstructed and re-shaped for a virtual world
- This applies everywhere e.g. IT systems, planes, weapons, communications & commercial products

*Before*



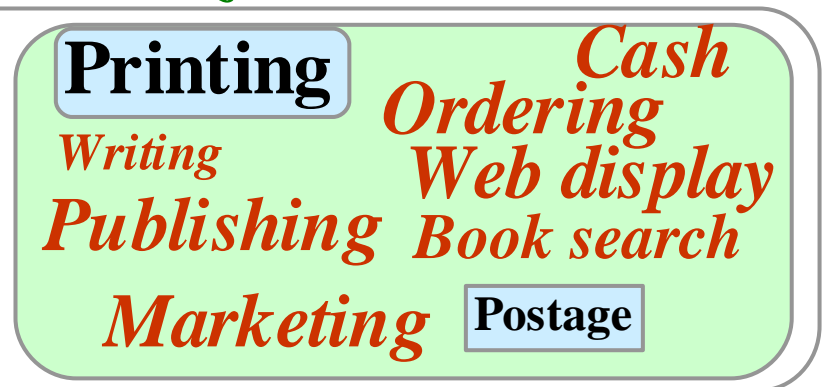
*After*



*Local bookstore*



*Amazon*

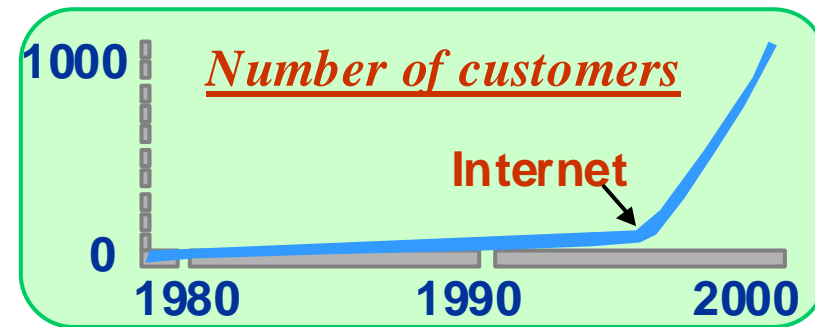


**The new nature of products**

*<1978*

**Manual system**

**Paper-based system**



*1978-95*

**Mainframe computerization**

**After 18 years, 10% of customers use mainframe EDI system for ordering. 5 day/week 8 hours per day system.**

*1996*

**Internet front-end**

**Customer numbers double to 20% within 3 months of Internet front end. 24 x 7 day operation**

*1998 -*

**e-business**

**Customer interactions create new applications, most customers now on-line**

*2000 and beyond*

**Integration of e-business processes**

**Integration of internal and partner processes**

**Case study - Boeing (PART) System**

# *Requirements as the foundation*

**Everything is a project**

**Requirements are the basis of all project work**

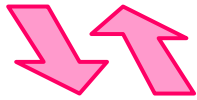
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**Investment levels**  
**Return on investment**  
**Time horizons**  
**Business rules**

**Business strategy**



**Commercial reality**

**Business objectives**

**User requirements**

**Systems requirements**

**Number of customers**  
**Market share**  
**Maximum investment**  
**Customer retention targets**

**Time to complete an order**  
**Web site availability**  
**Ease of use**  
**Range of payment types**

**Maximum downtime**  
**Performance metrics**  
**Maximum expected load**  
**Security against hackers**

**Requirements and responsibilities**

# The reality of development

## *Low success rate*

16% successful  
31% partial  
53% failed

## *Planning is unrealistic - therefore it doesn't exist*

Average cost over-run 89%  
Average time over-run 122%

## *No, thanks*

45% of functions  
never used once

## *Serious money*

\$81bn cost of failed projects  
\$59bn cost over-runs

## *Why projects fail*

- |                                     |              |
|-------------------------------------|--------------|
| <i>1: Incomplete requirements</i>   | <i>13.1%</i> |
| <i>2: Lack of user involvement</i>  | <i>12.4%</i> |
| <i>3: Lack of resources</i>         | <i>10.6%</i> |
| <i>4: Unrealistic expectations</i>  | <i>9.9%</i>  |
| <i>5: Lack of executive support</i> | <i>9.3%</i>  |
| <i>6: Changing reqs/specs</i>       | <i>8.7%</i>  |
| <i>7: Lack of planning</i>          | <i>8.1%</i>  |
| <i>8: Didn't need it any longer</i> | <i>7.5%</i>  |

## *Small is beautiful*

The larger the project,  
the longer the schedule,  
the bigger the chance  
there is of failure

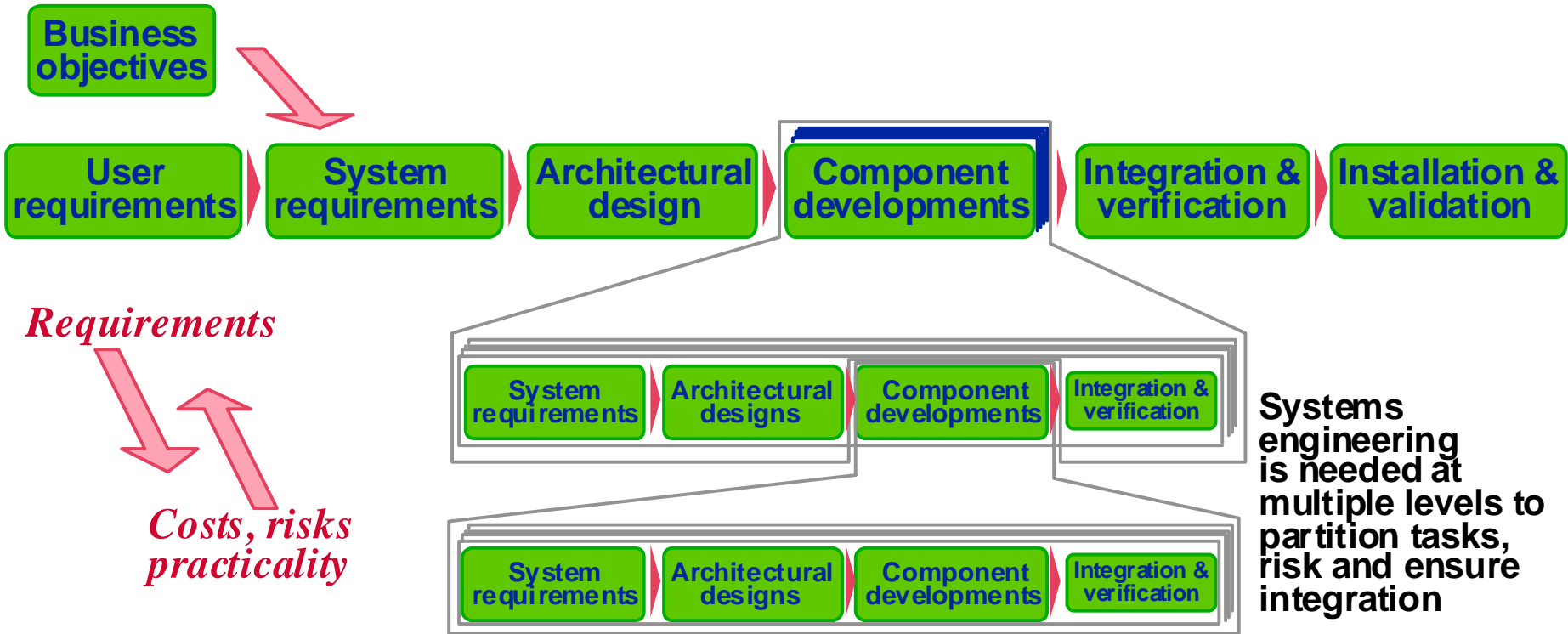
## *Nature of problems*

5 Requirements  
3 Management  
0 Technical

# *A systems approach at the organizational level*

*Outsourcing, innovation, program  
management, portfolio management,  
re-use, interoperability,  
technology management*

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**Recursive decomposition of large projects**

## Outsourcing = requirements, systems engineering and contracting

- Outsourcing is a key, ubiquitous skill for companies struggling to speed products to market and focus on core strengths
- Outsourcing is completely based on requirements management, uses systems engineering, and adds contract management
- Outsourcing is typically ad-hoc and ripe for improvement

**Outsourcing =**

**Contract  
management**

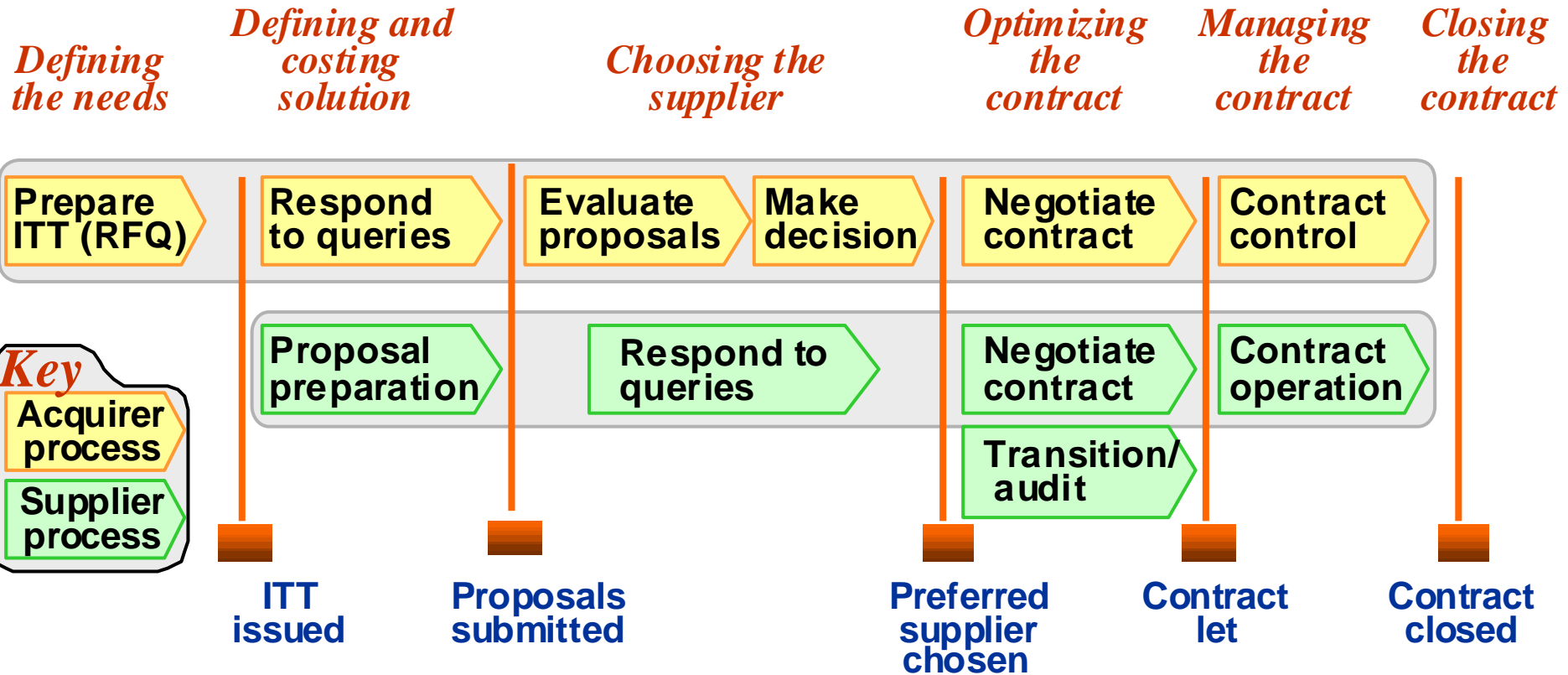
*Defines the contractual  
rights of both parties*

**Systems  
engineering**

*Organizes across the  
company, projects, people  
& information*

**Requirements  
management**

*Defines what is needed  
to satisfy the customer*



# The outsourcing process

# Tender (RFP)

Systems requirements

Management & contractual requirements

Invite external tenders

Choose from proposed architectures

Choose and amend winning bid

Criteria for choosing supplier

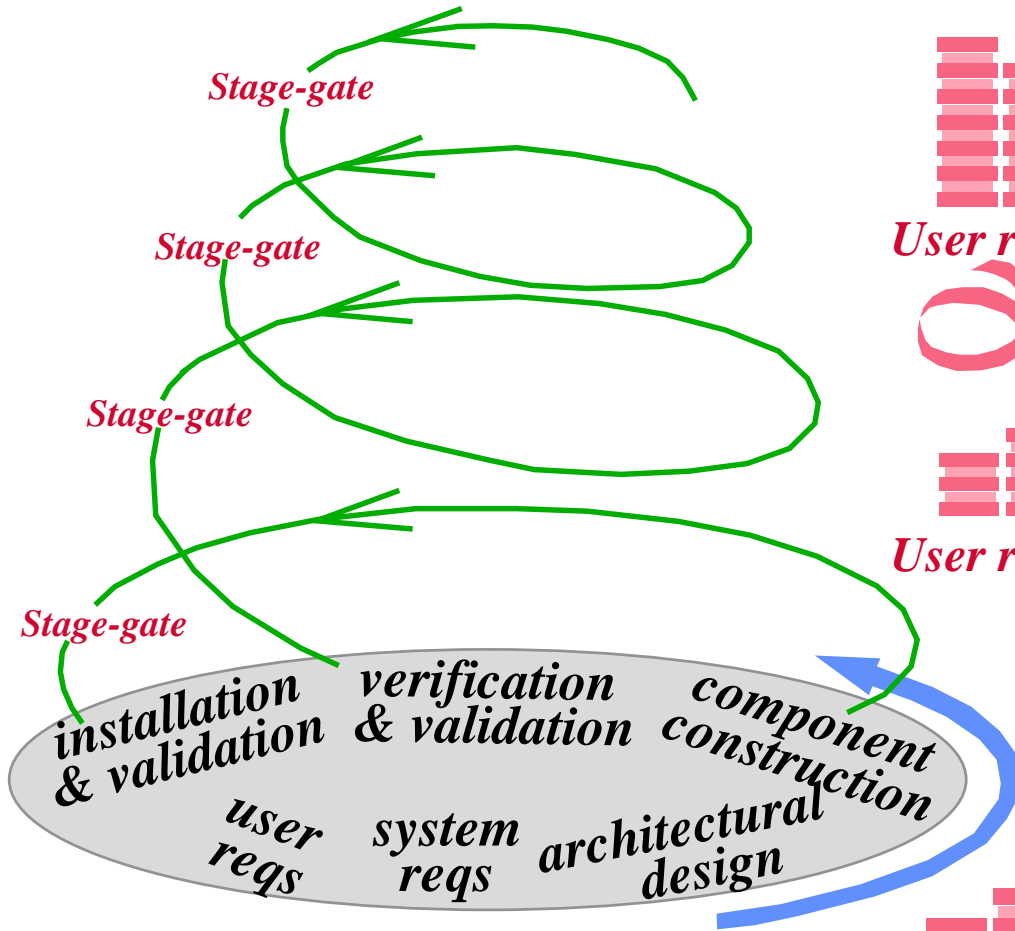
Proposed architectural designs

*The criteria synthesize the overall requirements and trace back to them*

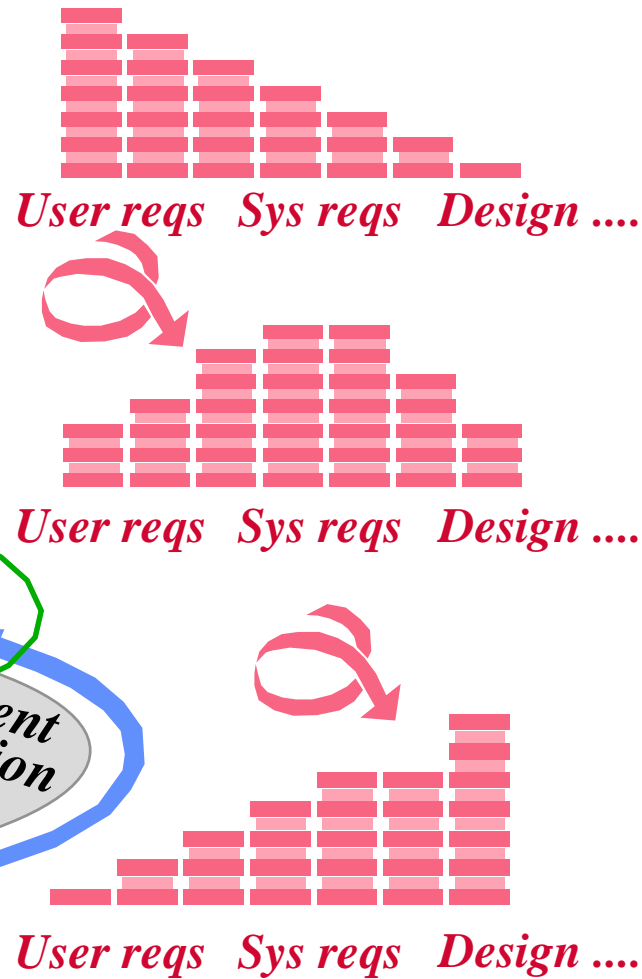
**Choosing the outsourcer**

# Innovation and commitment

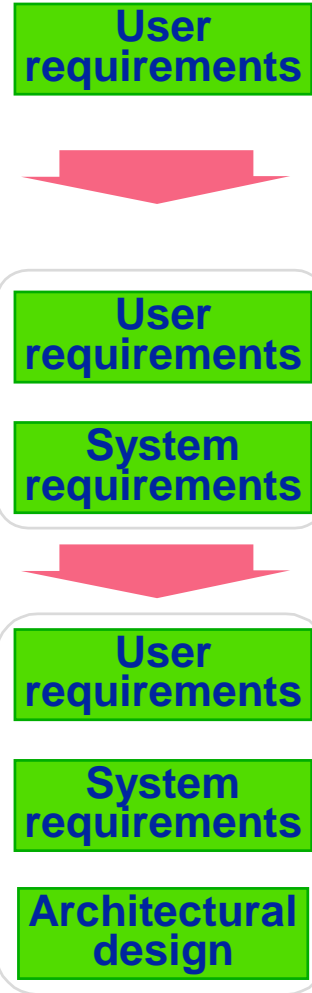
## Lifecycle exploration through stage-gates

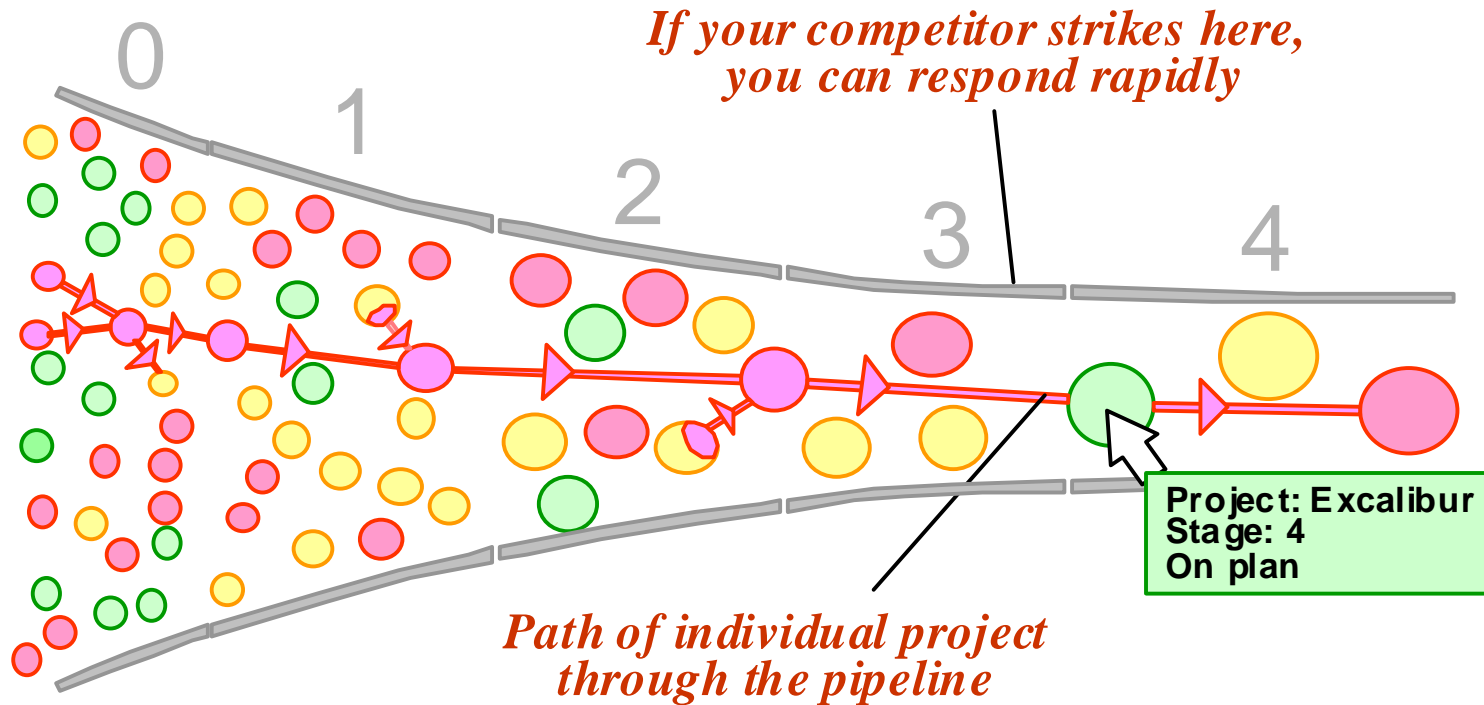


## Effort



## Progressive commitment





### Early stages

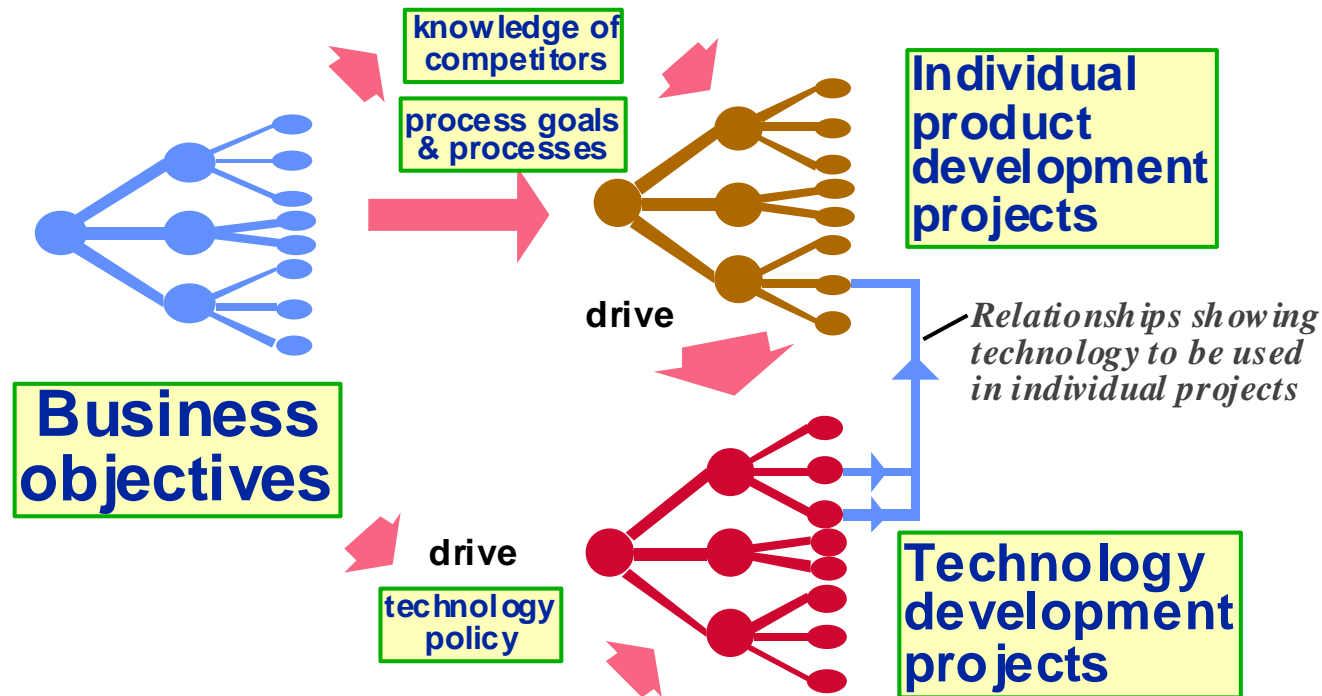
Risk is acceptable  
 Overlapping  
 Innovatory  
 Reviewable independently  
 Low cost  
 Delivers information and decisions

### Later stages

Lowest acceptable risk  
 Interoperable  
 Delivers product  
 Reviewed comparatively  
 High cost

**A systems approach to managing innovation**

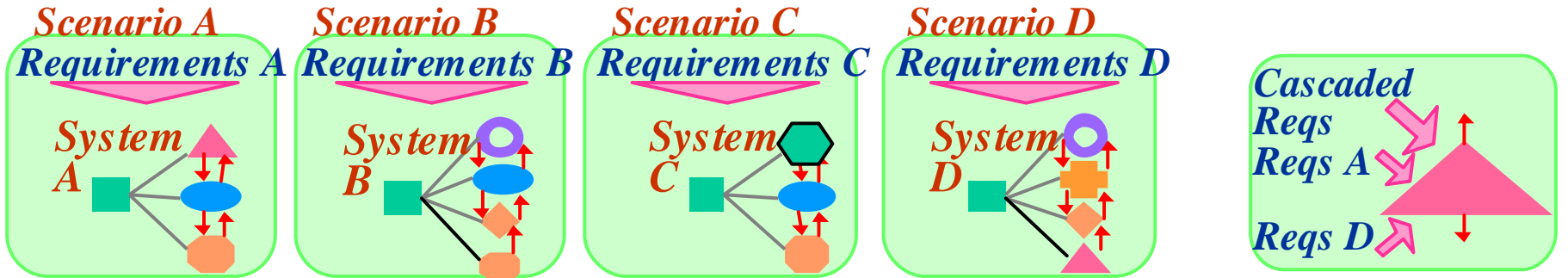
- There must be traceability between business objectives, product developments, and technology development
- Business objectives cover factors such as market areas, market penetration goals, commonality, key product requirements, price, schedule, competition, and technology risk
- This is knowledge management - control of your key assets
- Tools based on DOORS, methods and training have been developed with Motorola since 1995, and are now rolling out



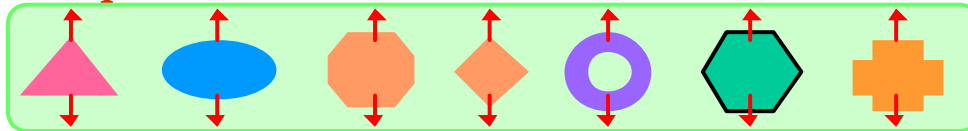
## Technology management through requirements

In many industrial and military situations, the need is to rapidly assemble new systems out of existing 'components'

Building a minimum set of re-usable components requires a component architecture



*Component architecture*



*Organizational level reqs*



*The components we build*



*Separate system level definition for each system*

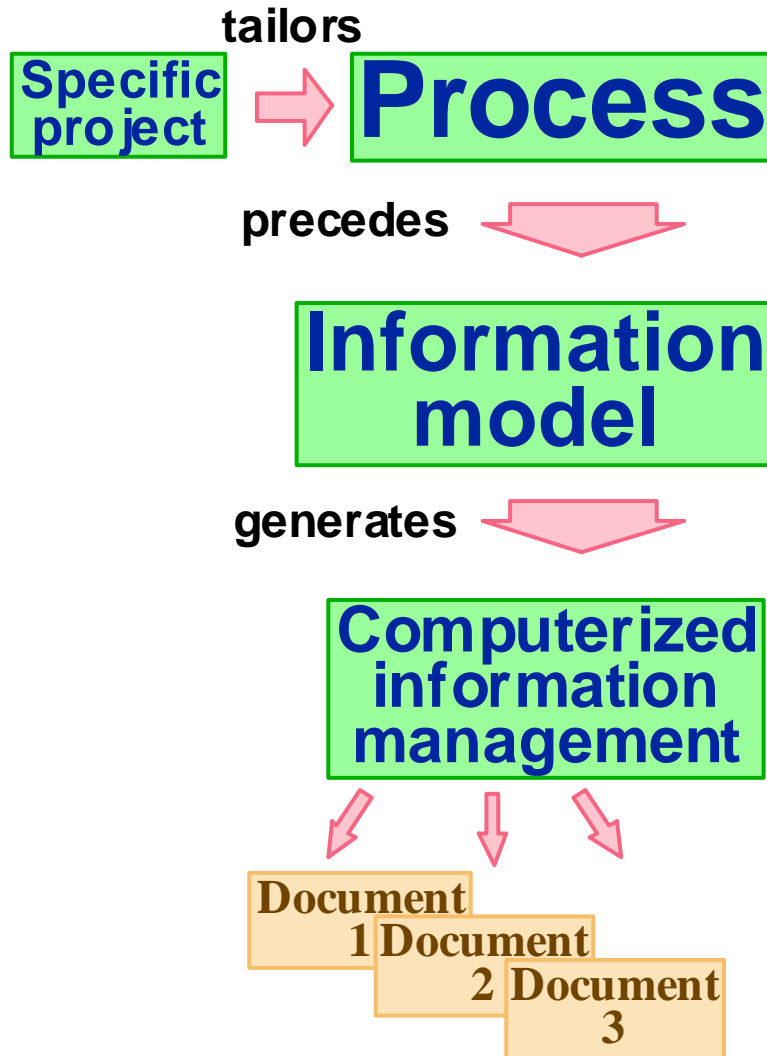


Populates

# *Summary*

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# The project in information



## Provides

*Definition of deliverable information*  
*Necessary order of generating information*  
*Quality standards for information*

*Logical model of the deliverables and their inter-relationships*

*Implementation of information structures, their inter-relationships, and dynamic controls*  
*Programmable access to information*

*Documents become partial views generated from the data base of some project information*

<b>Fit with organization's processes</b>	<b>Bad</b>	Use a heavyweight team within the existing organization	Use a heavyweight team in a separate spinout organization
	<b>Good</b>	Use a lightweight or functional team within the existing organization	Development can occur in-house through a heavyweight team, but commercialization almost always requires a spinout
	<b>Good</b> (sustaining innovation)	<b><u>Fit with organization's values</u></b>	
			<b>Poor</b> (sustaining innovation)

- When the project fits with the company values, but not with its processes, it requires a heavyweight (dedicated) team within the existing organization
- When the project doesn't fit the organization's processes or values, it requires a spinout and a heavyweight (dedicated) team
- For example, Digital couldn't compete in the PC world because their minicomputer development processes took too long and used internal component production

# Systems principles and corporate success

- The world is changing rapidly due to the Internet, globalization, virtualization, greater customer awareness. These changes affect every organization
- To remain competitive, organizations need to automate (as far as possible) development for 'time to market with the right product'
- Systems principles that work at the project level are essential for organizational management of outsourcing, program management, technology management, re-use, interoperability and innovation
- This is a cultural change which will take several years, but its time to get stuck in - this is happening now at companies like Motorola, United Technologies, Lockheed
- A new generation of managerial tools - directly connected to the real information - is becoming available.
- Telelogic has the skills (tools, consultancy, processes) to help you to make this transition quickly and efficiently

*Write information once, use it many times  
The value of information is in its relationships*