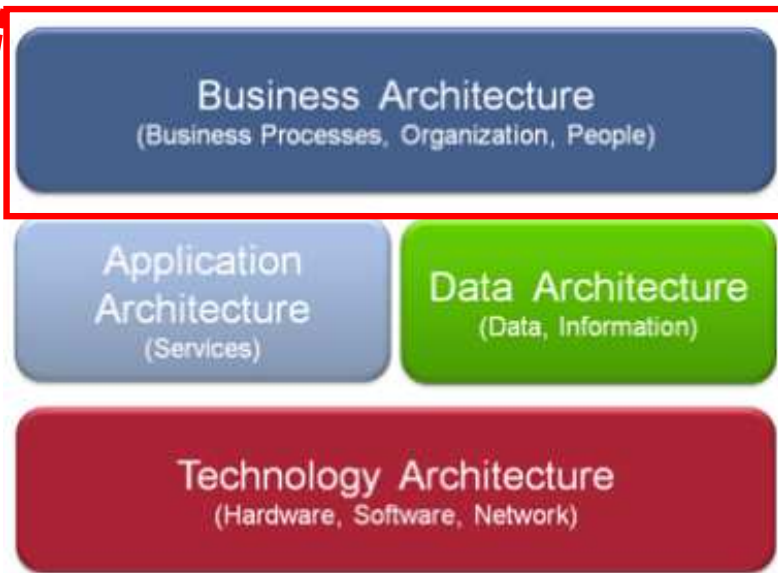


# ***LECTURE 4:* BUSINESS ARCHITECTURE ASPECTS: BUSINESS PROCESS REDESIGN/ REENGINEERING**

# Lecture Contents

- Where are we now?
- Business Process Management Timeline
- Recap & More on Business Processes
  - Dimensionality & Different levels of change
- Process Change in Theory - BP Redesign/ Reengineering:
  - Hammer's Theory of Process Change
  - Davenport and Short's Methodology for Process Change
  - IT & Business Processes
- Success & Failure in BPR Projects:
  - Examples in practice: Private & Public Sector
  - What Good Ol' Meaty Statistics tell us about BPR Success...

# Components of Enterprise Architecture: Where Are We Now?



## The Open Group Architecture Framework (TOGAF)'s Perspective of Enterprise Architecture

### Business Architecture.

- Business processes and workflows. 👍
- Stakeholders and their roles and relationships. 👍
- Business model, strategy, drivers, goals, policies, and operating model. ✎
- Business rules that capture the assigned authorities, responsibilities and policies relevant to the BPs. ✎
- Functional decompositions, business capabilities and organizational models. ✖
- Funding and operational cycles. ✖
- Third-party suppliers of hardware, software, and services; their roles and responsibilities. ✖

→ +A lot about Process Change (BPR, the Quality Movement etc), BPMN, UML Use Case Models 👍

# ***SECTION 4.1: INTRODUCTION***

# BPM Timeline

- *Origins in manufacturing (1700s):*
  - Originally one person making an item from start to finish
  - Development/Specialisation: division of labour (Adam Smith)
  - Analysis of Specialised Tasks/ 'Time & Motion' Studies (1900s)
- *Workflow (mid-1970s):*
  - Document-based at a departmental process level
- *The Quality Era (1980s):*
  - Continuous improvement (Total Quality Mgmt (TQM)- Deming & Juran)
- *Business Process Reengineering (BPR) (1990s)*
  - Revolution V Evolution (Hammer & Champy)
- *Business Process Management (2000s)*
  - Multilevel, whole organization process integration & modelling

## Recall: What is a Business Process?

- A collection of inter-related work tasks, initiated in response to an event, that achieves a specific result for the customer of the process.

achieves a specific result

for the customer of the process

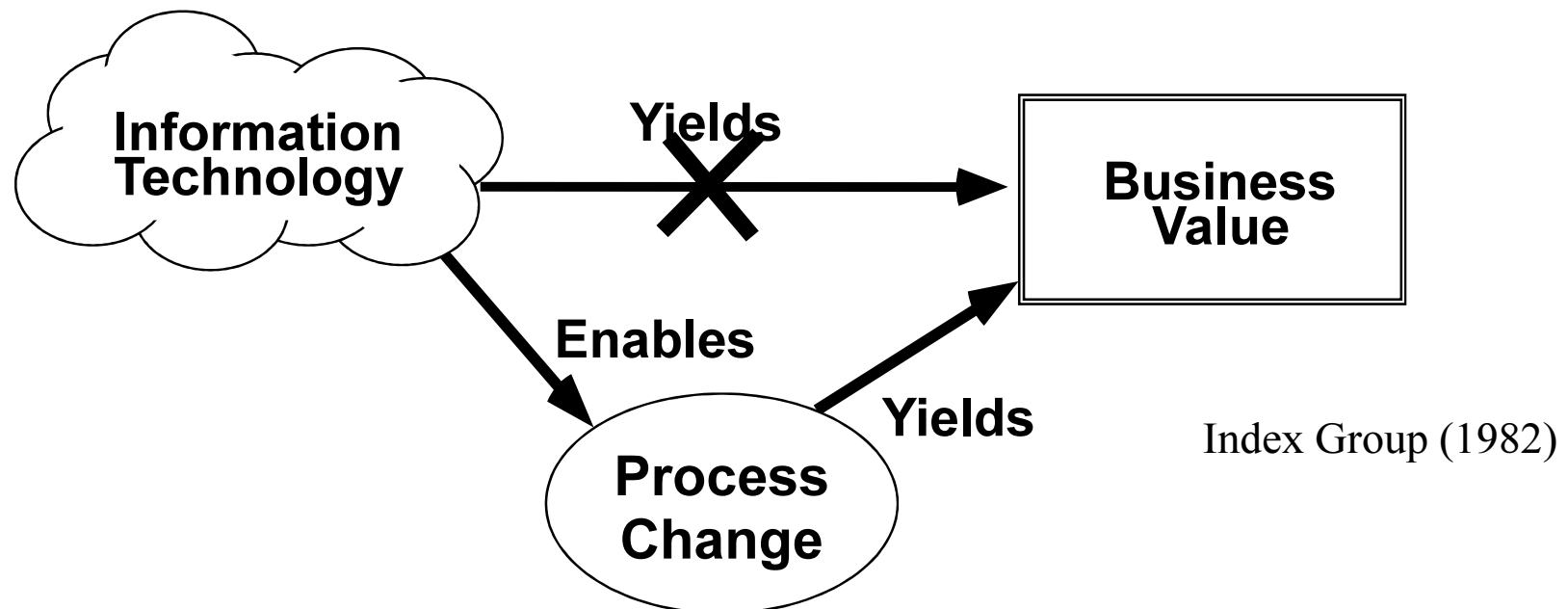
initiated in response to a specific event

work tasks

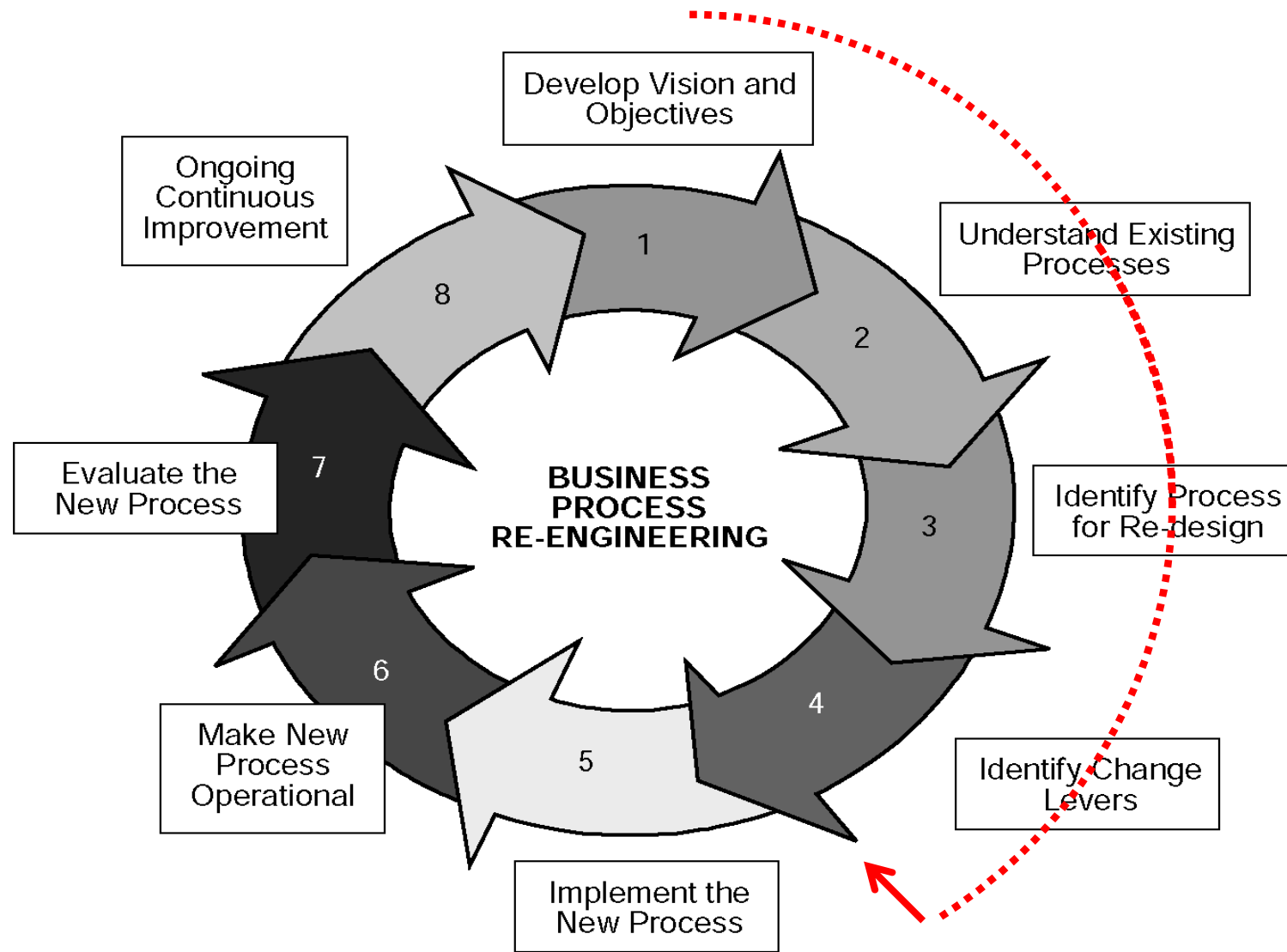
a collection of inter-related

# Fundamental Question: Why Change a Business Process?

- *Business Process Management (BPM):*
  - Body of principles, methods & tools to design, analyse, execute & monitor BPs
  - BPM bridges IT and business, as many/most IT projects in enterprises are ultimately aim at improving a BP



# Stages in Business Process Change



Source: Vakola *et al.* (1998)

This is where we got to  
with Workflow Modelling



# Recap Aside : Some Examples of What is and What is Not a Business Process

Suggested Process?	Actually Called	If not a Business Process, why not?
Customer Relationship Management	<i>Process Area</i>	Doesn't deliver a single, specific result.
Acquire new Customer	<i>Business Process</i>	Delivers a single, specific result and meets all other criteria. End-to-end BP.
Setup new Customer	<i>Subprocess</i>	Too small – delivers specific results but they are intermediate results in an end-to-end BP.
Calculate Credit Limit	<i>Activity/ step/ task...</i>	Much, much too small – a single step or instruction. Possibly one line in a procedure or step in a use case.
“Oracle CRM Process”	<i>System</i>	Doesn't deliver a single, specific result; a system that supports multiple Business Processes.
“Our e-business process”	<i>Technology</i>	Doesn't deliver a single, specific result; technology employed by multiple BP's.

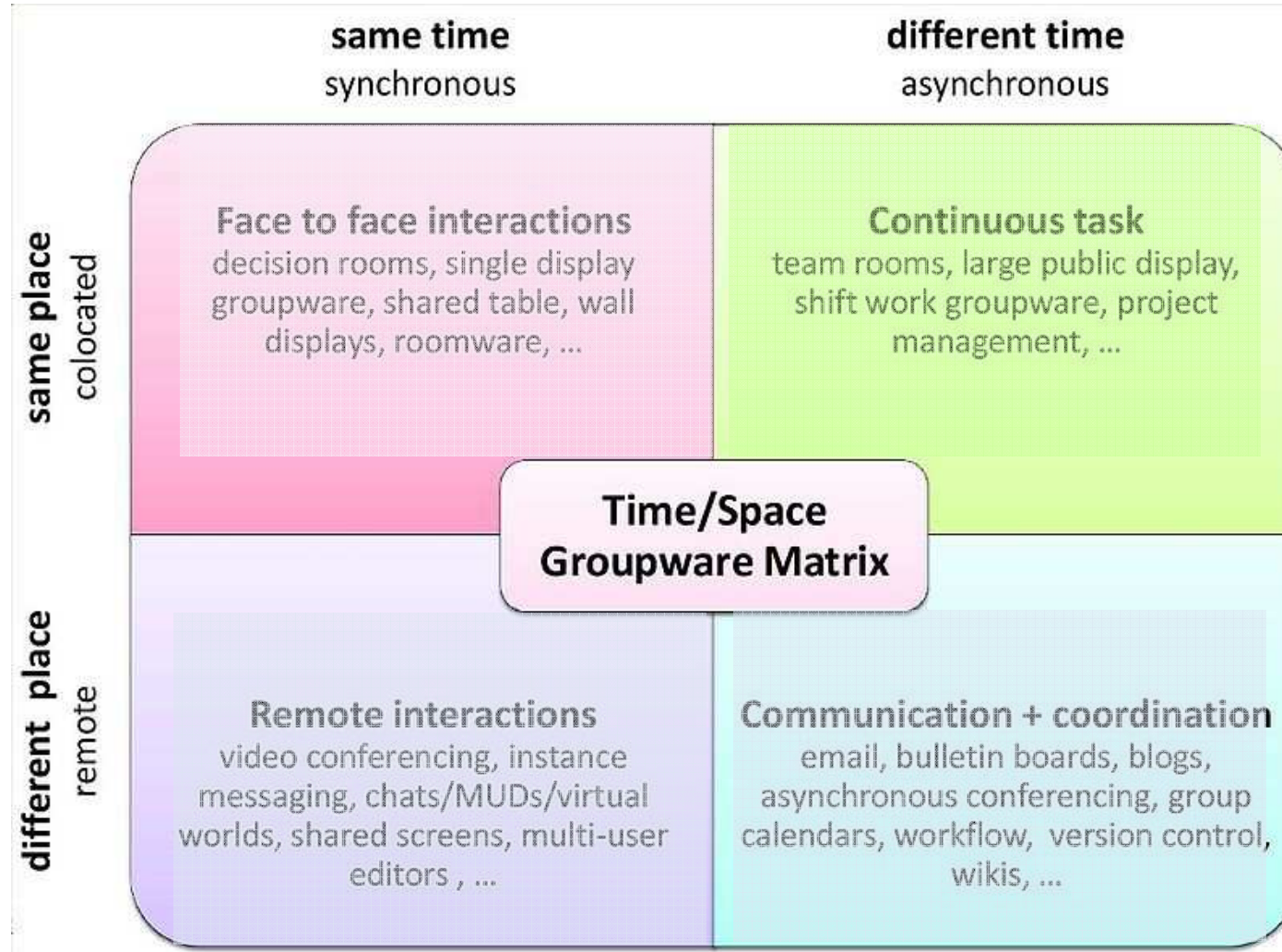
# Dimensionality of Processes

- Processes are identified in terms of:
  - Beginning/ end points, interfaces, organisation units (esp customer-facing)
- They can be defined based on three dimensions:
  1. *Entities:*
    - Processes happen between organisational entities
    - i.e. Interorganisational (e.g. e-Commerce), interfunctional or Interpersonal
    - Heavily reliant on shared IT (known as *Groupware* (over))
  2. *Objects:*
    - Processes result in manipulation of objects.
    - These objects could be *Physical* or *Informational*.
  3. *Activities:*
    - Processes could involve two types of activities:
    - i.e. Managerial (e.g. develop a budget) and Operational (e.g. fill a customer order).

# Dimensionality of Processes (/2)

## Groupware

- Now many forms depending on space and time synchronicity



By Momo54 at English Wikipedia <https://commons.wikimedia.org/w/index.php?curid=6404249>

## ***SECTION 4.2: PROCESS CHANGE***

# Process Change

- *Levels of process change*

Three levels at which to consider process change:

- Business Process re-engineering (BPR)
  - Used at strategic level and at high risk
  - Often when major threats/ opportunities in external environment
  - Usually prompts a basic re-think of large-scale core processes critical value chain.
- Business Process redesign (also BPR)
  - Intermediate scale change, apt for medium-sized BPs requiring extensive change.
  - Efforts often result in changed job descriptions and intro of some automation.
- Business Process improvement/ Continuous Process Improvement (CPI)
  - Tactical level, incremental technique that is appropriate for developing smaller, stable, existing processes.
  - It can often be undertaken using a Six Sigma approach.

## Process Change (/2)

- For efficient & effective process change, it is important that the level of process change is appropriate to the process concerned.
- However, the level of process change required is also likely to reflect the process capability maturity of the business
  - For a business with mature process capabilities, Process Improvement efforts are more or less continuous, undertaken by managers and process teams.
  - If a business has a low degree of process maturity then a Process Redesign effort might be required to establish the initial process capabilities.
  - With Process Reengineering should really only consider carrying out process change on 10-15% of processes at any given time, given risk & disruption

# Michael Hammer's Principles of Reengineering

- As a key enabler of BPR should use IT to challenge the inherent assumptions from before the advent of modern ICT
- Core of reengineering is "discontinuous thinking -- or recognising and breaking away from dated rules/ assumptions underlying operations..."
- Key Principles:
  - Organise around outcomes, not tasks;
  - Have those who use the output of the process perform the process;
  - Subsume info-processing work into the real work producing the info;
  - Treat geographically dispersed resources as if they were centralised;
  - Link parallel activities instead of integrating their results;
  - Put decision point where work is done & build control into process;
  - Capture information once and at the source.

# “The new industrial engineering” (Davenport & Short)

- BPR requires broader view of both IT and business activity, and relationships between them:
  - IT — more than an automating or mechanising force: to fundamentally reshape the way business is done.
  - Business activities — more than a collection of individual or even functional tasks.
- IT and BPR have a recursive relationship:
  - IT capabilities should support business processes,
  - Business Processes should be in terms of potential capabilities of IT.
  - Shouldn't ask: how can we automate the process?
  - But: what can new forms of IT bring to the BP?



# “The new industrial engineering” (Davenport & Short) (/2)

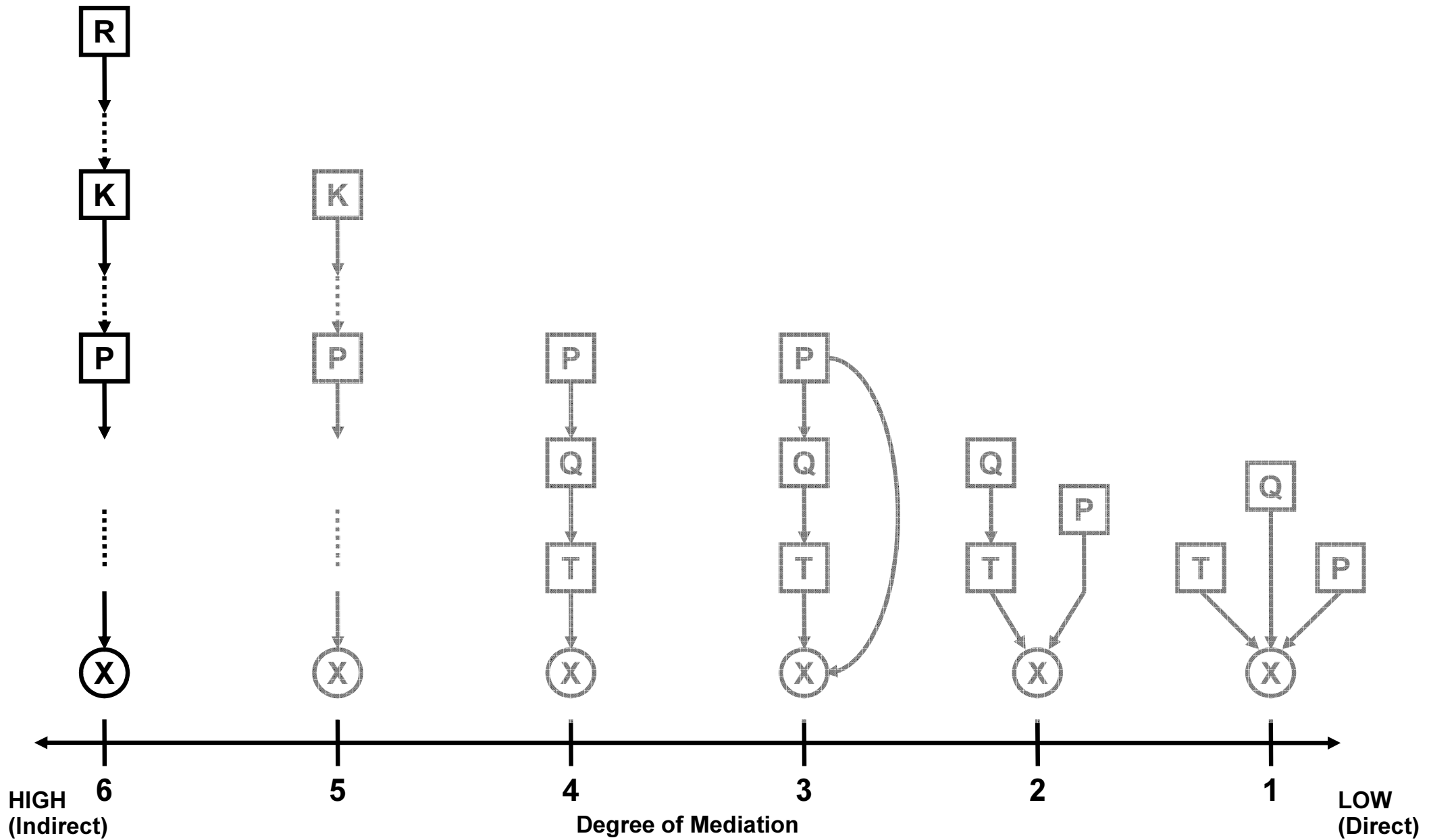
- *How IT capabilities can affect the organisation*

- *Transactional* — transform unstructured BPs into routinized transactions
- *Geographical* — transform info quickly/ easily across large distances
- *Automational* — replace or reduce human labour in a BP
- *Analytical* — bring complex analytical methods to bear on a BP
- *Informational* — bring vast amounts of detailed data into BP (i.e. Big Data)
- *Sequential* — can enable changes in the sequence of tasks
- *Knowledge Management* — allows capture/ dissemination of knowledge
- *Tracking* — allows detailed tracking of task status
- *Disintermediation* — can be used to connect two parties within a process that would otherwise communicate through an intermediary (more later)

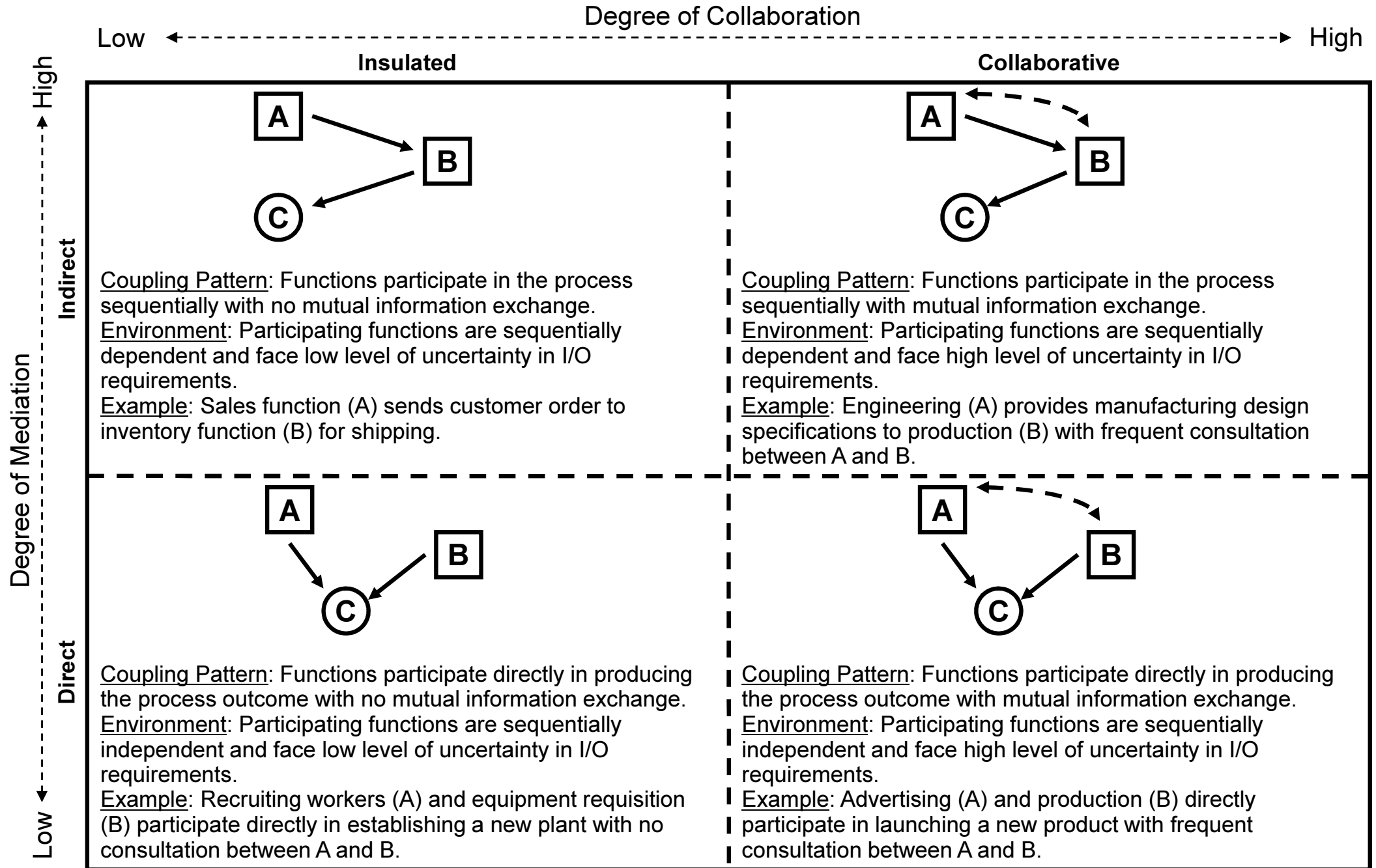
# More on Business Process Redesign & IT

- According to Teng, the way related functions participate in a BP (functional coupling of a process) can be differentiated along two dimensions:
  - *degree of mediation* - the extent of sequential flow of input and output among participating functions
  - *degree of collaboration* - the extent of information exchange and mutual adjustment among functions when participating in same BP.
    - Frequency & intensity of info exchange between two functions ranges from none (completely insulated) to extensive (highly collaborative).
    - Many BPs can be improved by increasing the degree of collaboration.
    - This frequently involves extensive use of Groupware (as seen above)

# Degree of Mediation (Teng)



# Functional Coupling Framework of Business Processes



# Functional Coupling Framework of BPs(/2)

- IT reduces Degree of Mediation & enhances Degree of Collaboration.
- Innovative ICT facilitate new, coordination-intensive structures:
  - Making use of Cloud Storage and virtualization
  - Utilising Expert systems, Big Data etc
  - Groupware
- This enables them to coordinate their activities in ways that were not possible before to develop business advantage.
- Such coordination-intensive structures may raise the organization's capabilities and responsiveness, can lead to strategic advantages.

# Power of Information Technology (aka ICT)

- IT creates a “public good” i.e. a resource that can be accessed by many functions.
  - Shared info resource not used up by usage, retains value for others
  - Provides comprehensive info that facilitates accomplishment of process objectives on a more global basis.
  - Caveat: have to be very careful of data (not the same as info!):
    - Nowadays data can be huge (PB), multi-dimensional and noisy
    - So information from this is a huge challenge to draw conclusions from even for modern computing resources (Big Data, Cloud, HPC)
    - Also lots of messy ethical, proprietorial issues in data use, storage

# Davenport and Short's BPR Methodology.

- Assuming Organizations want to change a process, how to execute?
- Davenport & Short's five-step (fairly generic) approach to BPR\*:
  1. Develop the Business Vision and Process Objectives:
    - Prioritise objectives and set stretch targets
  2. Identify the Processes to be Redesigned:
    - Identify critical or bottleneck processes
  3. Understand and Measure the Existing Processes:
    - Identify current problems and set baseline
  4. Identify IT Levers:
    - Brainstorm new process approaches
  5. Design and Build a Prototype of the New Process:
    - Implement organisational and technical aspects

# ***SECTION 4.3:* BUSINESS PROCESS RE- ENGINEERING IMPLEMENTATION IN PRACTICE**



# What this Topic Focuses On

- Background History to BPR
- Case Studies of BPR Implementation in the Private Sector
  - Case Study 1: Ford Procurement
  - Case Study 2: IBM Credit
- Motivations for Change in Public Sector
- Reasons for differences between Public Sector Organizations (PSOs) and their Private Sector Counterparts
- Characteristics of Public Sector Organizations
- Case Studies of BPR Implementation in PSOs
  - Case Study 3: Housing Development Board in Singapore
  - Case Study 4: PubliCorp in Brazil
- Summary

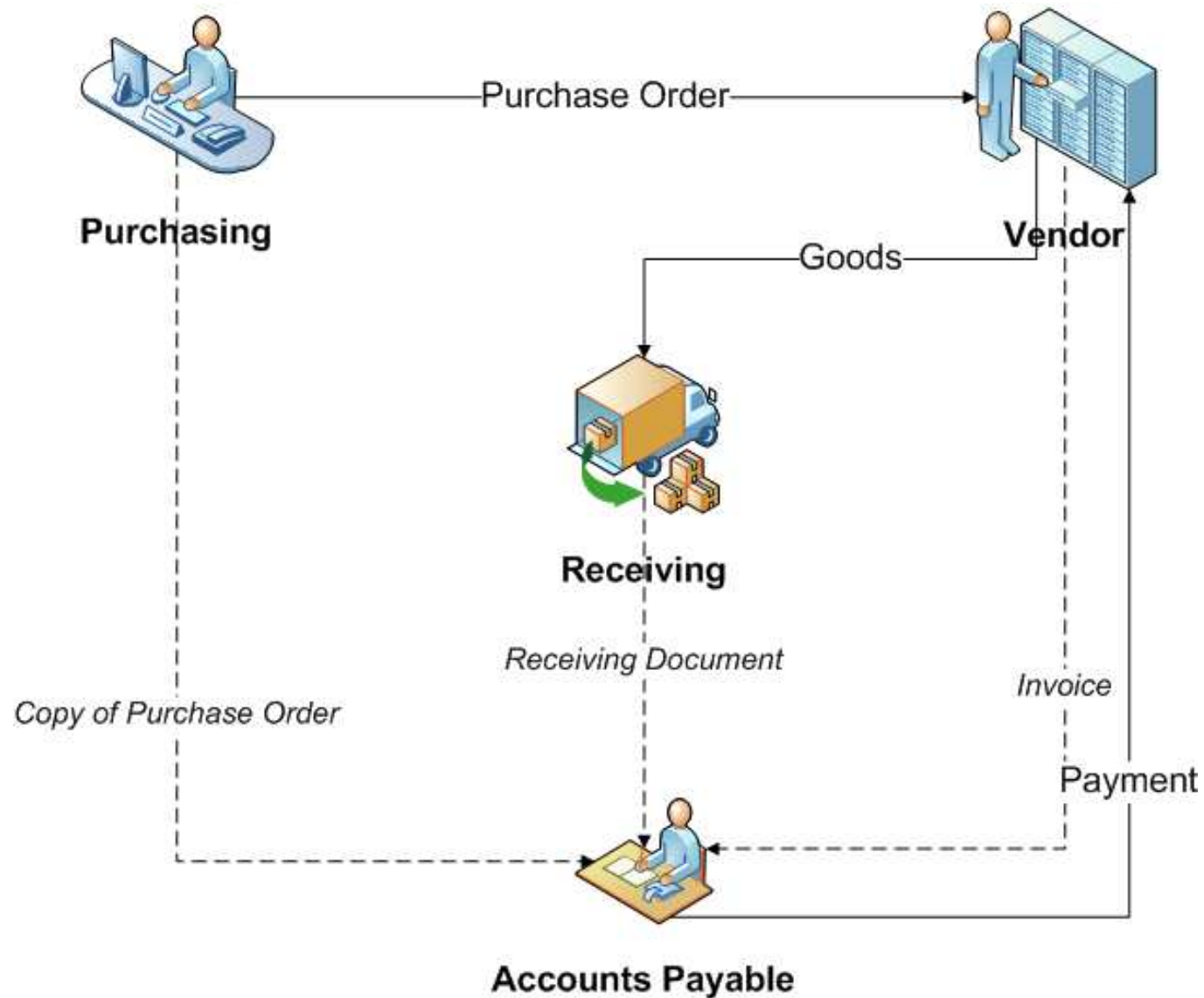
# Background: Some History

- BPR has been widely adopted by private businesses and has been a focus of research since the 1990s.
- Many private sector examples of (not always successful) BPR implementation over last two decades (we will look at two).
- As we will see, BPR still one of the top five management concerns for information technology (IT) executives globally.
- However, public sector adoption of BPR, (especially in developing economies), is relatively recent and little researched.
- We will look at two examples of this (in this lecture)

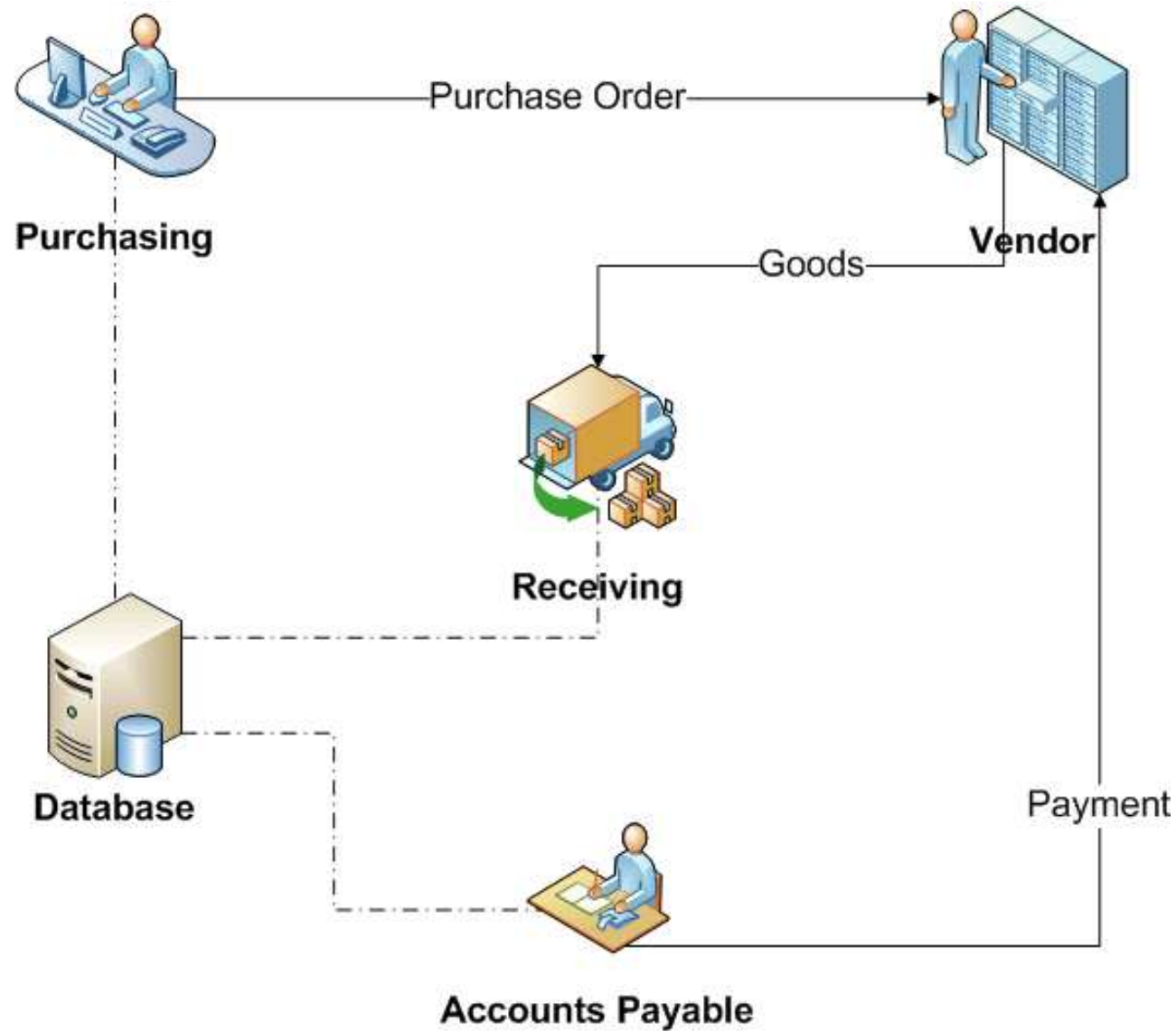
# Case Study 1: The Ford Case Study [1]

- Background/Problems:
  - Ford needed to review its procurement process to:
    - Do it cheaper (cut costs)
    - Do it faster (reduce turnaround times)
    - Do it better (reduce error rates)
- Accounts payable in North America alone employed > 500 people
- Turnaround times for processing POs/invoices O(weeks)
- Possible Fix:
  - Automation would bring 20% saving but Ford chose not to - Why?
    - technology needed for automation not available?
    - cannot develop the technology to automate the process?
    - not enough computers/computer-literate employees at Ford?
  - Correct answer: Mazda showed how to do it with 15 people!

# Case Study 1: Ford As-Is Process (cont'd)



# Case Study 2: Ford To-Be Process (cont'd)



# Case Study 1: The Ford Case Study (cont'd)

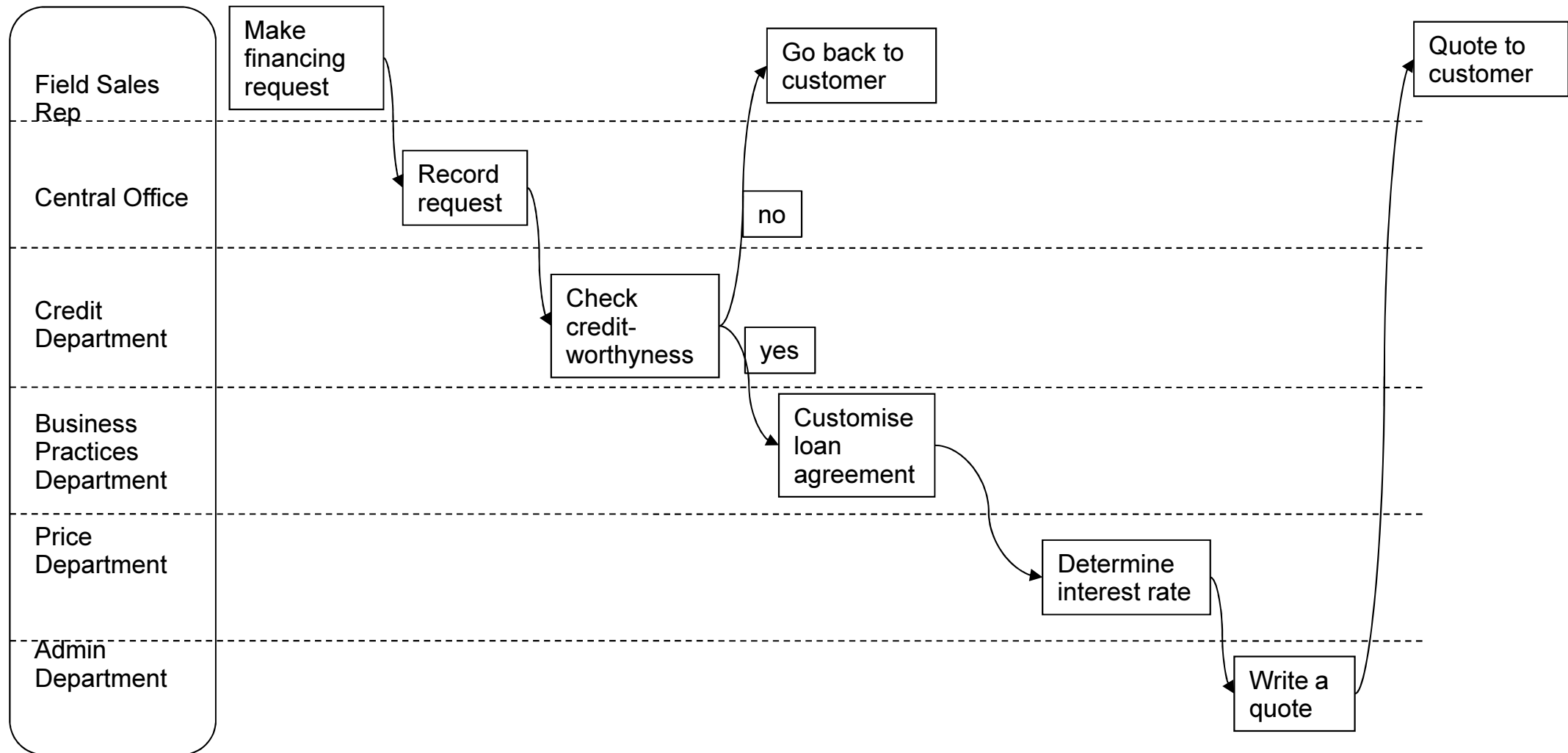
- **Ford Motor Corp.**
  - **Old process** involved 3 functions - purchasing, receiving and accounts payable
  - All participated *indirectly*
  - Sequential document flow
  - **New process** uses shared database
  - Every function participates *directly*
  - 75% reduction in work-force (500 -> 125)

This is an example of reducing mediation through IT

## Case Study 2: IBM Credit [2]

- *IBM Credit Corp*
  - Finances goods and services that IBM sells.
  - Five steps:
    1. On a request from an IBM field sales rep an operator in the central office wrote down the request on a piece of paper.
    2. Request sent to Credit Dept where specialist checked client's creditworthiness, wrote the result on the piece of paper and sent it to Business Practices.
    3. Business Practices customised the standard loan covenant to the client. Special terms attached to the request if necessary.
    4. Request went to Price Dept where Pricer assigned interest rate.
    5. Administration department wrote a quote letter for the field sales rep.

## Case Study 2: IBM Credit (cont'd)





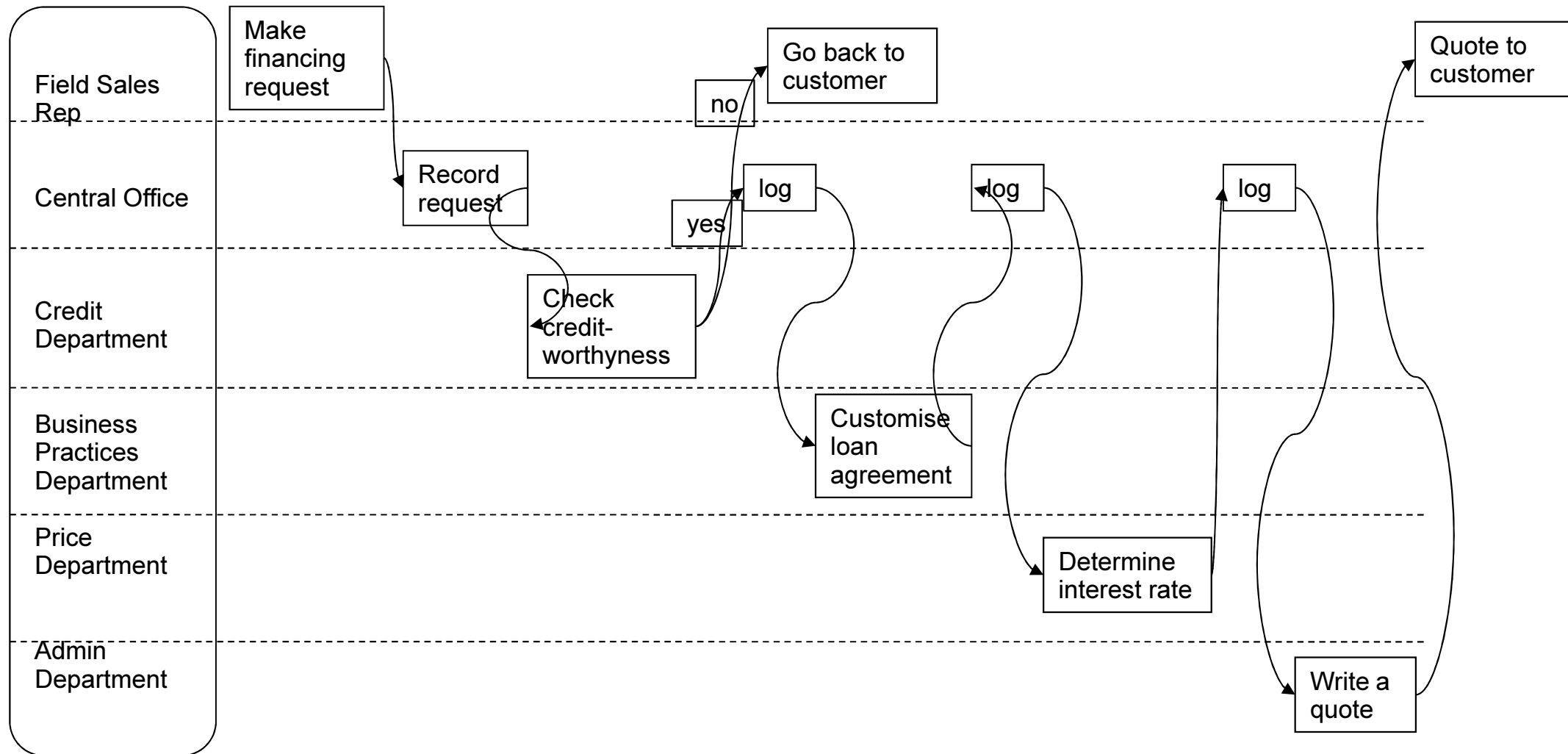
## Case Study 2: IBM Credit – Problems & Attempted Fix

- 1 Process took six days on average.
- 2 Meantime customer could be seduced by another vendor.
- 3 Request couldn't be tracked.

### Attempted Fix

- Install a control desk, so they could answer the sale representative's question about the status of the request.
- Request not forwarded to the next step in the chain,
- Instead, each department returned the request to the control desk for logging before sending out the request again.
- Solved tracking problem, but took yet more time.

## Case Study 2: IBM Credit (cont'd)



## Case Study 2: IBM Credit (cont'd) – Investigation & Solution

- 2 IBM senior managers walked a request thro all 5 steps.
- Performing the actual work took ninety minutes.
- The problem wasn't in the tasks/people performing them, but in the structure of the process.
- IBM Credit replaced its specialists (credit checkers, pricers) with generalists who process entire request from start to finish.
- Old process design assumes every bid request was unique and difficult to process. WRONG! most simple & straightforward:
  - Find credit rating in DB; Plug numbers into a model; Pull clauses from a file.
- Easily done by single individual supported by an easy-to-use computer system which IBM Credit developed.
- In most cases, the system provides guidance and data to generalists.
- Otherwise, a few real specialists working in the same team can help.

## Case Study 2: IBM Credit (cont'd) - gains

- Turnaround reduced from six days to four hours.
- Dramatic performance breakthrough by making a radical change to the process - i.e. reengineering.
- IBM Credit didn't ask, "how do we improve the calculation of a financing quote? How do we enhance credit checking?"
- Instead, it asked "How to improve entire credit issuance process?"
- In making its radical change, IBM Credit shattered the assumption that every request needed specialists.

# Motivations for Change in the Public Sector

- Recently many Public Sector Organizations (PSOs) are following in footsteps of Private Orgs:
  - Due to competitive pressures (direct competition with Private Orgs)
  - Demands from general public for (e.g.) better accountability, increased efficiency, greater level of customer satisfaction, calls for 'reinvention of govt' etc
  - Developments in IT (Cloud, Data Analytics, 'Big Computing', PDAs....)
- “While PSOs may not operate in the same competitive envt, changes in management philosophies are causing them to think and act like private orgs” [3]
- “Competitive pressures and changes in IT constantly force orgs to re-evaluate their business strategies” [4]

# Differences Between PSOs & Private Sector Counterparts

- *Rainey [5] summarized differences between these 2 groups:*
  - Environmental Factors:
    - PSOs generally tend to have less market exposure, resulting in lack of incentive for productivity & efficiency
    - Also tend to have lower availability of market information
    - Hierarchical, external, political & legal constraints (e.g. no 'hire & fire')
  - Organization-Environment Transactions
    - PSOs interact more frequently with the public due to nature of org
    - PSOs come under heavy scrutiny from public/private officials
    - High levels of 'red-tape' & responsibilities across org boundaries
    - Frequent turnover of admin/support staff (=> loss of org memory)

# Differences Between PSOs & Private Sector Counterparts (cont'd)

- **Internal Structure and Politics:**
  - Most PSOs have conflicting and intangible politics
  - Top managers tend to be more politically motivated (=> their decisions)
  - Can often be little incentive for employees to take part in BPR effort
- **Rainey [5] concluded that unique characteristics of PSOs have a considerable impact on BPR in these organizations, esp in:**
  - Deciding on implementing BPR
  - Setting objectives for BPR
  - Carrying out BPR action

# Further Characteristics of PSOs

- *Culture (From Harrington et al [6]):*
  - PSOs find it hard to implement BPR due to prevailing culture & politics
  - Problems arise as changes BPR causes are affected by culture & politics
- *Authority (From Eccles [7]):*
  - During BPR many PSOs don't empower employees, authority pushed down
  - “BPR empowerment can become little more than delegation: responsibility pushed down but staff don't gain empowerment”
  - No apparent inconsistency in BPR where delayering is advocated through implementation of hierarchical/dictatorial methods!
- *Obstacles (From Hutton [8])*
  - Traditional Attitudes emphasize continuity, predictability & fairness
  - Lack of senior mgmt buy-in/willingness to take risks, Not seeing business needs.
  - Other obstacles: communication with staff, initiative fatigue



# Case Study 3: Housing Devpt Board in Singapore

- *Case Study from Tong et al [9]*

- HDB est'd Singapore, 1960 to provide high quality housing to Singapore Public
- 1947 Singapore had 'world's worst slum', >0.5M in slums as lack of good homes
- HDB increased housing: 8% to 86% by 1998, gave financial/admin services

- *Why was BPR initiated for HDB in 1998?*

- Pre-98, HDB was organised around District Branch Offices (DBOs) with a complex structure with multiple layers of authority
- DBOs had 5 specialized counters: finance, carparks, renovation, maintenance and Lease/Tenancy spread over separate floors
- Visits to HDB were Tedious:
  - Repairs: Apply at Renovation Counter, then queue at Finance Counter to pay finally, return to Renovation Counter to collect permit
  - Reported counter waiting time up to 40 minutes! Up to 200 people per queue!

# Case Study 3: HDB in Singapore (cont'd)

- *Solution:*
  - Neutral Mgmt Services Team in model Branch Office for 1 year intensive study
  - Studied the workflow of the as-is process.
- *After BPR:*
  - 'One stop service' created by merging five specialized counters into just two:
    - Housing Finance & Housing Services
  - Extensive use of:
    - IS e.g. 'groupware' to support new processes
    - Flatter management structure with fewer middle management roles
  - Dramatic improvements post BPR:
    - Waiting times at HF counter down 97%; unanswered calls down 85%
    - Mean time to process maintenance request down 78% in two weeks
    - Savings of S\$1M annually, staff morale up etc

## Case Study 3 (cont'd)

- *Lessons for PSOs from HDB Case Study*
  - Most PSOs are v. resistant to change => social/political pressures are main pressures for BPR change (social from press, political from legislative change).
  - Press publicity is a powerful change agent and emphasizes the importance of BPR change to staff due to public attitudes.
  - Neutral staff in BPR team draws on expertise from other departments and helps overcome resistance.
  - Higher management support/approval is essential. In the HDB case, this was confirmed by interviews of staff post-BPR.
  - Hard to assess PSO improvements, so pilot site impln is useful to get public/political buy-in (political/ financial) for further project resources

# Case Study 4: PublicCorp Case Study from [10]

- Background to PublicCorp (a pseudonym)
  - PublicCorp (PC) was a large Civil Engineering Org in Brazil
  - Had technical/clerical side with politics behind 10-20% of management posts
  - Aim of BPR was deregulation in building industry (due to standards eg ISO9000)
  - PC had a monopoly in local regulatory & related enforcement, e.g. land & building inspection, that were compulsory and closed to competition.

⇒ Current processes faced obsolescence
- Prior to BPR
  - To help with BPR, PC got two big companies to support technical, methodological sides
  - BPR methods from multi-national Management Consulting Company (OR)
  - IT company (with previous experience in the construction industry) tasked with setting up new IT systems for PC, & support of BP changes proposed by OR

# Case Study 4: PublicCorp(cont'd)

- Implementation of BPR: IT Company's Findings:
  1. Central Processing Dept was main process bottleneck
  2. Must run jobs on central mainframe to meet other depts' info intensive needs
  3. Number of internal points of contact in core processes
  4. Negatively affected efficiency & quality of services PublicCorp provided, due to many separate organizational sub-groups involved in execution of core BPs.
- Implementation of BPR: OR Group's Findings:
  1. OR's work hindered by opposition from PC staff who hindered OR analysis of BPs, adding uncertainty to BPR proposals and related structural change
  2. Some BPR proposals failed on legal issues (e.g. common process of setting up public bids found to be complex/ cluttered with unnecessary activities)
  3. Frustration led OR to shift focus to other activities, e.g. helping understaffed departments with some critical activities like setting up bids and contracts

## Case Study 4: PublicCorp(cont'd)

- Reasons for BPR Failure in PublicCorp:
  1. CEO's levelling of political interests with objective goals; started with hard success measures; later any other 'apparently' positive results.
  2. Gradual shift of the focus of the OR group from core business process redesign to problem solving and automation of existing processes.
  3. Hiding of failure signs; consciously at first, for self-preservation then unconsciously.
- Lessons that can be learned from PublicCorp Case Study:
  - Immediate outcome can be misleading.
  - Success/Failure viewed differently by separate entities.
  - Effort can stray from original plans for apparently valid reasons.
  - Political issues can influence BPR in public sector more than private.

# Summary

- More literature/experience of BPR in the Private Sector
- This doesn't mean it's always successful!
- As we will see, success depends on putting effort into changing the right areas
- Significantly more challenges in Public Sector BPR implementation
  - Motivations for change
  - Organizational structures
  - Politics (internal and external)

# ***SECTION 4.4:* SUCCESSFUL RE-ENGINEERING PROJECTS**

Based on: Teng, Jeong & Grover, Profiling Successful Reengineering Projects.

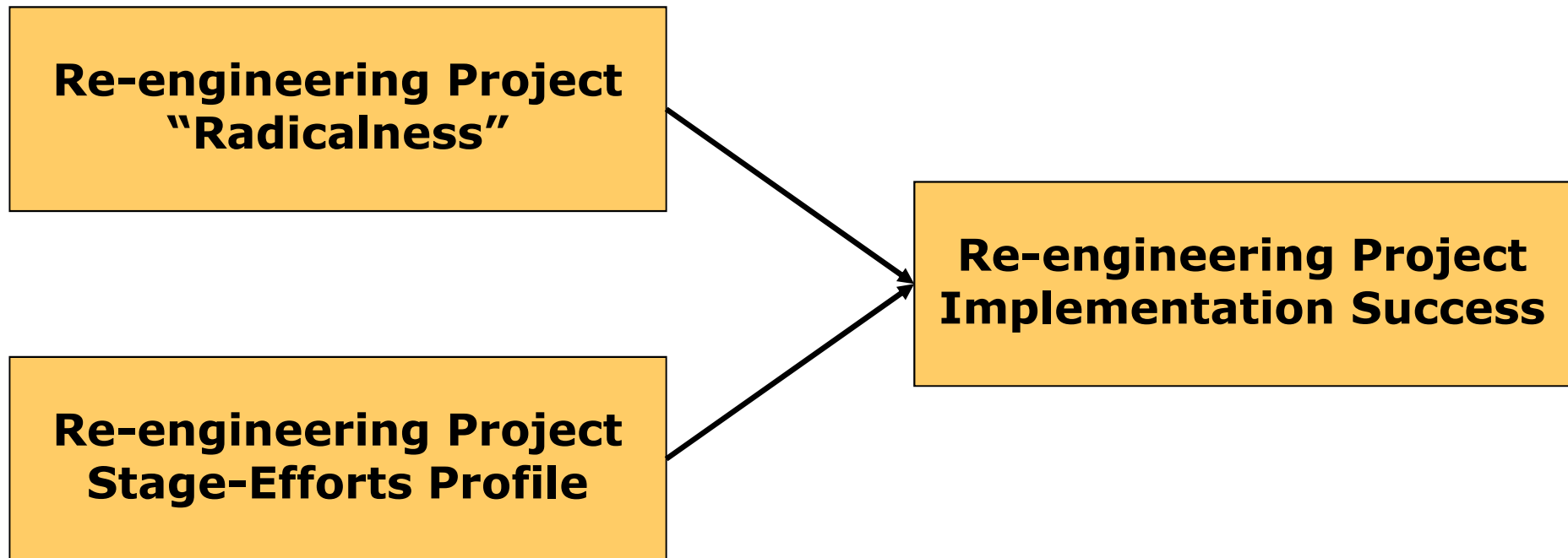
Communications of the ACM, Vol 41. No. 6 June 1998



# The questions

- Are reengineering projects aimed at more radical change resulting in higher implementation success?
- If limited attention and resources must be allocated among the different stages of a reengineering project, which stage (or stages) should receive more emphasis in order to achieve higher implementation success?

# Research Model



## Comparison of variables:

- Re-engineering project radicalness
  - Measured in seven dimensions
- Re-engineering project stage-efforts profile
  - Eight typical stages in a project
- Re-engineering project implementation success
  - Perceived level of success
  - Goal fulfilment.

# Project stages and tasks (see Klein)

## Stage 1: Identification of BPR opportunities

- Establish a steering committee
- Secure management commitment
- Align with corporate and IT strategies
- Identify major business processes with an “business model”
- Understand customers’ requirements
- Prioritise processes and select one for implementation

## Stage 2: Project preparation

- Plan for organisational change
- Organise a BPR team for the selected process
- Train the team members
- Plan the project

## Stage 3: Analysis of existing process

- Analyse existing process structures and flows
- Identify value-adding activities
- Identify opportunities for process improvement

## Stage 4: Development of a process vision

- Understand process customers requirements
- Identify process performance measures
- Set process performance goal
- Identify IT that enables process re-design
- Develop a vision for the redesigned process

## Stage 5a: Solution: Technical design

- Develop and evaluate alternative process designs
- Detailed process modelling
- Design controls for process integrity
- IS analysis and design for the new process
- Prototype and refine the process design

## Stage 5b: Solution: Social design

- Empower customer contact personnel
- Define jobs and incentives
- Develop and foster shared values
- Define skill requirements and career paths
- Design new organisational structure
- Design employee performance measurement
- Design change management programme

## Stage 6: Process transformation

- Develop and test rollout plans
- Implement the social and technical design
- Train staff and pilot new process

## Stage 7: Process evaluation

- Monitor performance
- Continuous improvement

# Project Radicalness

- Extent of change to:
  1. Patterns of process workflow
  2. Rôles and responsibilités
  3. Measurements and incentives
  4. Organisational structure
  5. Information technology
  6. Shared values
  7. Skills

# Success

- Perceived level of success
- Goal fulfilment
  - Cost reduction
  - Cycle-time reduction
  - Customer satisfaction level increase
  - Worker productivity increase
  - Defects reduction

# Research sample

- Questionnaires sent to members of the Planning Forum, a professional association focussing on strategic management.
- 239 responses out of 853.
- 105 of the 239 had completed at least one BPR project
- 2/3 of respondents were in manufacturing, financial or service industries
- Most were large companies

## Research sample

- 3 most popular processes were:
  - Customer service (13.7%)
  - Product development (13.7%)
  - Order management (10.5%)
- Others were:
  - Business planning and analysis (5.7%)
  - Financial systems (4.8%)
  - Accounting processes (3.8%)



## Effort by Stage (averaged from 1 - 5!)

- Stage 3: Analysis of existing process 3.94
- Stage 1: Identification of BPR opportunities 3.80
- Stage 4: Development of a process vision 3.63
- Stage 2: Project preparation 3.46
- Stage 6: Process transformation 3.39
- Stage 5a:Solution: Technical design 3.37
- Stage 7: Process evaluation 3.21
- Stage 5b:Solution: Social design 3.09

# Correlation of radicalness with success

Project Success	Patterns of process workflows	Rôles and responsibilities	Performance measurements and incentives	Organizational structure	Information technology applications	Shared value (culture)	Skill requirements	Overall extent of change
<b>Overall success level</b>	.427***	.324***	.351***	.102	.280***	.173 *	.166	.409***
<b>Cost reduction</b>	.269 * .092	.159 .194	.231 .093	.260 * .030	.165 -.000	.139 .058	.129 .022	.291** .110
<b>Cycle time reduction</b>	.191 .127	.134 .050	.198 .194	.033 -.157	.033 -.021	.111 .029	.098 .008	.171 .052
<b>Customer satisfaction increase</b>	.258 .242	.187 .129	.282 * .366 *	.180 -.242	-.022 .039	-.019 .024	-.112 -.168	.182 .098
<b>Worker productivity increase</b>	.122 .061	.107 .197	.159 .431***	.131 .069	.011 -.187	.047 .053	-.043 -.132	.125 .134
<b>Defects reduction</b>	-.124 -.073	-.041 .109	.151 .044	.113 .011	-.091 -.380*	.058 -.133	-.218 -.272	-.015 -.173

# Correlation of radicalness with success

Project Success	Patterns of process workflows	Rôles and responsibilities	Performance measurements and incentives	Organisational structure	Information technology applications	Shared value (culture)	Skill requirements	Overall extent of change
Overall success level	***	***	***		***	*		***
Cost reduction	*			*				**
Cycle time reduction								
Customer satisfaction increase			*					
Worker productivity increase			***					
Defects reduction					*			

# Correlation of stage efforts with success

<b>Project Success</b>	<b>Identification of BPR opportunities</b>	<b>Project Preparation</b>	<b>Analysis of the existing process</b>	<b>Development of a process vision</b>	<b>Solution: technical design</b>	<b>Solution: Social design</b>	<b>Process transformation</b>	<b>Process evaluation</b>
<b>Overall success level</b>	.247**	.244**	.139	.242**	.199*	.390***	.432***	.547***
<b>Cost reduction</b>	.134 -.116	.103 .205	.013 .269 *	.095 .188	.165 -.000	.314** .203	.220 .339**	.386*** .577***
<b>Cycle time reduction</b>	.039 -.126	.042 .122	.072 .196	.219 .225	.033 -.021	.274** .108	.267 * .222	.342** .455***
<b>Customer satisfaction increase</b>	.248 .122	-.064 .147	.156 .280 *	.232 .392**	-.022 .039	.354** .360***	.211 .310**	.374** .404**
<b>Worker productivity increase</b>	.092 .000	.080 .115	.038 .261 *	.214 .193	.011 -.187	.294** .470***	.213 .299 *	.314** .619***
<b>Defects reduction</b>	.184 -.025	-.171 .154	.020 .285	.172 -.064	-.091 -.380*	.399** .071	.257 .275	.351 * .551***

# Correlation of stage efforts with success

Project Success	Identification of BPR opportunities	Project Preparation	Analysis of the existing process	Development of a process vision	Solution: technical design	Solution: Social design	Process transformation	Process evaluation
Overall success level	**	**		**	*	***	***	***
Cost reduction			*			**	**	***
Cycle time reduction						**	*	***
Customer satisfaction increase			*	**		***	**	**
Worker productivity increase			*			***	*	***
Defects reduction					*	**		***

## Stage efforts vs. impact on perceived project success

Stage	Average effort	Correlation with perceived success
•Stage 3: Analysis of existing process	3.94	.139 (8)
•Stage 1: Identification of BPR opportunities	3.80	.247 ** (4)
•Stage 4: Development of a process vision	3.63	.242 ** (6)
•Stage 2: Project preparation	3.46	.244 ** (5)
•Stage 6: Process transformation	3.39	.432 *** (2)
•Stage 5a: Solution: Technical design	3.37	.199 * (7)
•Stage 7: Process evaluation	3.21	.547 *** (1)
•Stage 5b: Solution: Social design	3.09	.390 *** (3)

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