

The Biography of the Enterprise System: Or How SAP Conquered the World

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How SAP conquered the world - impossible projects: like flying bumblebees

Advert in Shanghai International Airport



SAP —

“宝洁”成功之选。

THE BEST-RUN BUSINESSES RUN SAP



Overview of theoretical journey

- Criticise traditional view of technology as **universal exogenous** factor, that can be deployed **instrumentally** to **transform** work organisation
eg rhetorics of Technology Supply and technocratic traditions within engineering, strategic management, economics
- Review critical analyses - *technology studies, organisation studies and information systems* - predominance of interactionist accounts which emphasise role of 'the local' organisation/actors
- Propose evolutionary understanding of the development of workplace technologies
 - ◆ *Social Learning perspective*: addresses innovation in design, implementation and use
 - ◆ *Biographies of artefacts* - emergence of packaged software solutions

Overview of empirical journey

- 1987-1991 ESRC **PICT** study: the Implementation of Computer-Aided Production Management (CAPM) systems (Fleck, Webster & Williams)
- Various other studies leading up to:
- 2004-8 ESRC study: ***The Biography & Evolution of Software Packages*** of Enterprise Resource Planning and similar 'organisational technologies' (D'Adderio, Pollock, Procter, Williams)
- Neil Pollock and Robin Williams (2008)
*Software and Organizations:
The Biography of the Enterprise-Wide System
Or How SAP Conquered the World* : Routledge

Contemporary 'critical', action-centred view

- Uniqueness of organisational settings, c.f. standard 'best practice' organisational models embedded in packaged solutions;
- active role of organisation members in running information system: repair deficiencies of software through work-arounds, gatekeepers etc. (*domestication*)
- Under this view, standard packaged solutions require extensive customization or impose unwanted organisation adaptation to meet system requirements

Problems of existing studies

- Theoretical weakness of much research into technology and work organisation
- Empiricism; Simplistic methodologies; predominance of short-term studies (durations of typical awards)
- Failure to reflect upon how choice of research design may shape findings
- Disciplinary fragmentation of research: eg typical separation of studies of technology design (*eg information systems and technology studies*) from implementation (*eg business studies and organisation studies*)

Problems of existing studies

'SnapShot' Impact-Studies

- **OVERSTATEMENT:**
frequent conflation of managerial objectives/supplier claims with outcomes (eg both supplier/consultant case-studies and early critical studies)
- **SYSTEMATIC MISUNDERSTANDINGS:**
eg of skill/work organisation outcomes;
puts change in technology at centre
look for organisational impacts

Problems of (short-term) implementation studies

- **OVERSTATEMENT:**
address immediate aftermath of technology implementation;
- Highlight gulf between managerial objectives/promises and observed outcomes
- Emphasise local contingency and choice impinging on outcomes
- **UNDERSTATEMENT:**
fail to address protracted learning process needed to embed/realise the benefits of ICTs
- 'productivity paradox' or perhaps *lag* between technical and organisational changes (See Freeman 1988)
- Overlook structural effects of widely-adopted innovations

Problems of empiricism

- C.f. popularity of 'Flat ethnography' - single site studies
fairy cake epistemology (Adams 1976)
- Longitudinal research 1987 - 2007:
with a break in the middle
- **Strategic ethnography**; theoretically informed and opportunistic selection of sites at different stages and locales of the technology biography
- Orientation to theory
- *a tool not a machine for explanation*

Strategic ethnography

- Long-term longitudinal study through succession of contemporary qualitative studies AND historical review (NB yield different views)
- Supplier development strategies contrasting new start-up and established supplier
- Different locales/moments in artefact biography
 - ◆ supplier-customer links in new product development
 - ◆ Procurement
 - ◆ Post-implementation support
- New players/locales - role of industry analysts: complex alignments between suppliers, analysts & users around product assessments

Social Learning Perspective

- Focus on *innofusion* and *domestication* processes in technology implementation and use
- Supplier offerings are inevitably *unfinished*; must be reworked to get them to operate and be useful in particular circumstances
- Innovation processes dispersed across a wide range of: players; sites; moments
- Multiple design:implementation cycles

Towards an evolutionary understanding

Innofusion = innovation in diffusion

Fleck (1988a:3) Artefacts not fixed as they emerge from technology supply but evolve in their implementation and use.

- . . . *user needs and requirements are discovered and incorporated in the course of the struggle to get the technology to work in useful ways, at the point of application.*
- Artefacts often unpicked when implemented; may be further innovated - useful innovations can feed into future technology supply.
- **Domestication** of information systems
 - active role of user in developing work and information practices (workarounds etc)

Endogenous or exogenous?

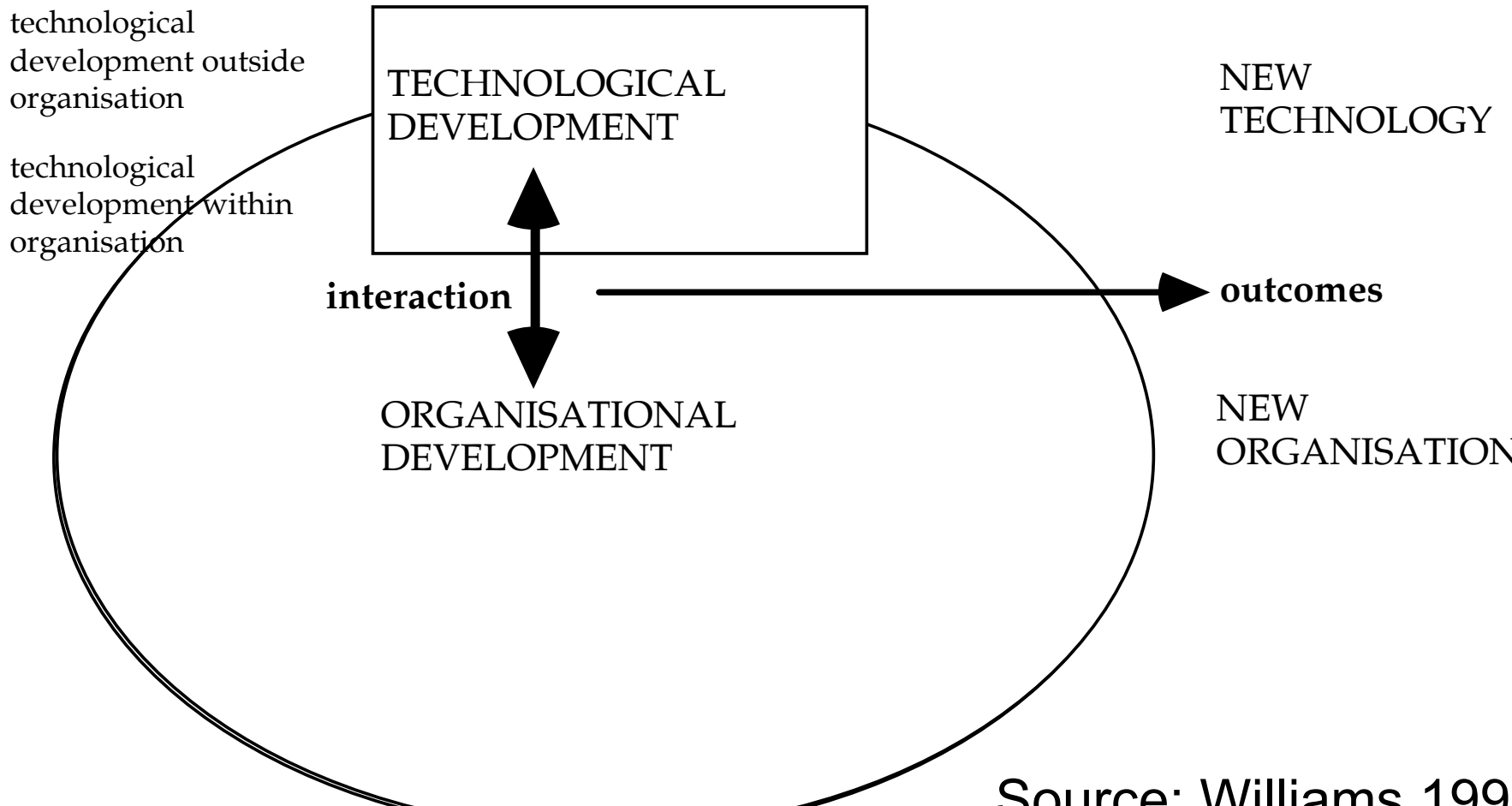
(Fleck, Webster and Williams 1990, Fleck 1994)

New applications develop on cumulative base of existing technologies

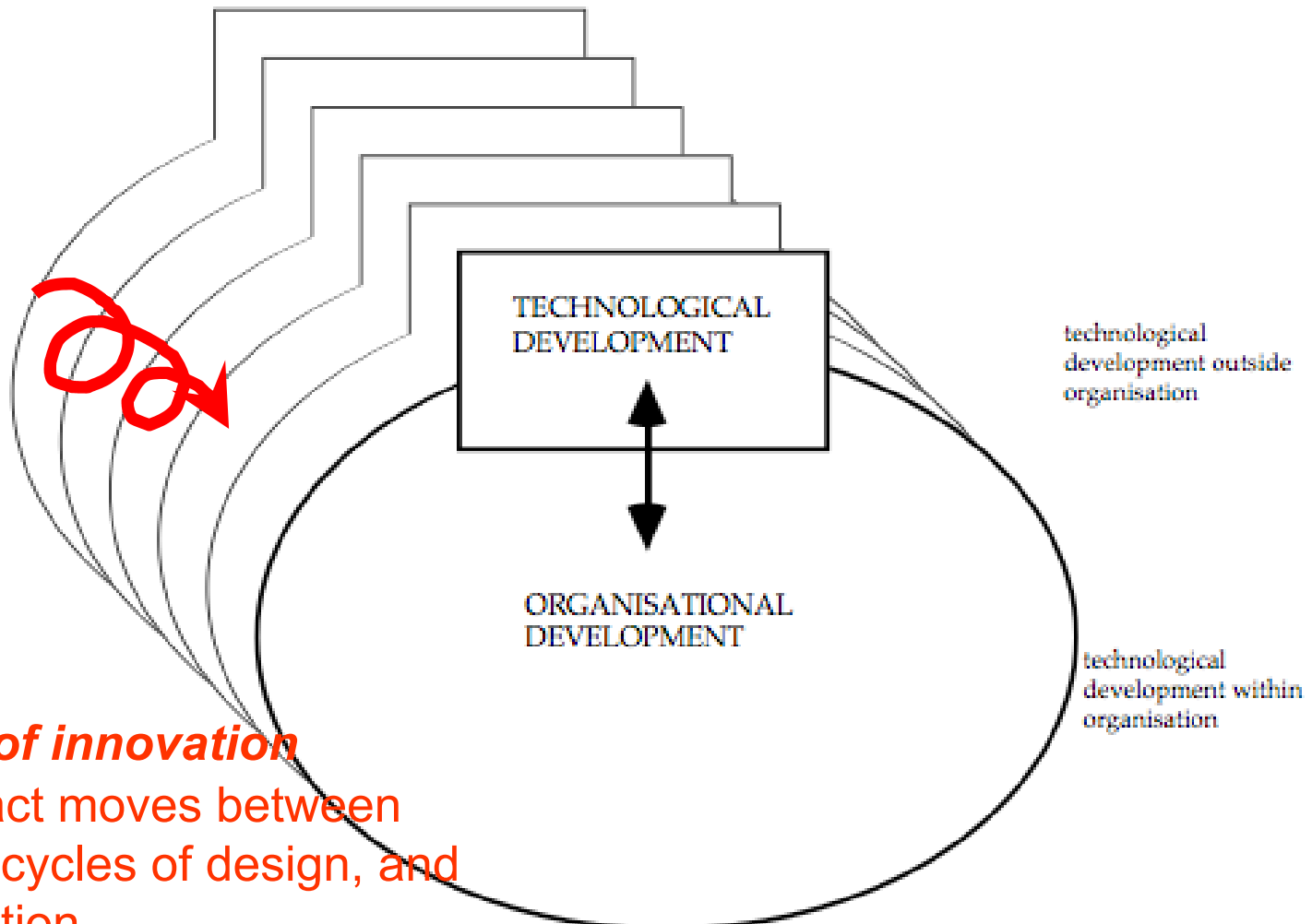
New technologies embody organisational templates:

- presumptions about organisational practices in earlier sites of design/implementation/use
- Visions of what kinds of change can be realised
- (Changing) concepts of best practice

Schematic Model: episode in development of Technology & Work Organisation

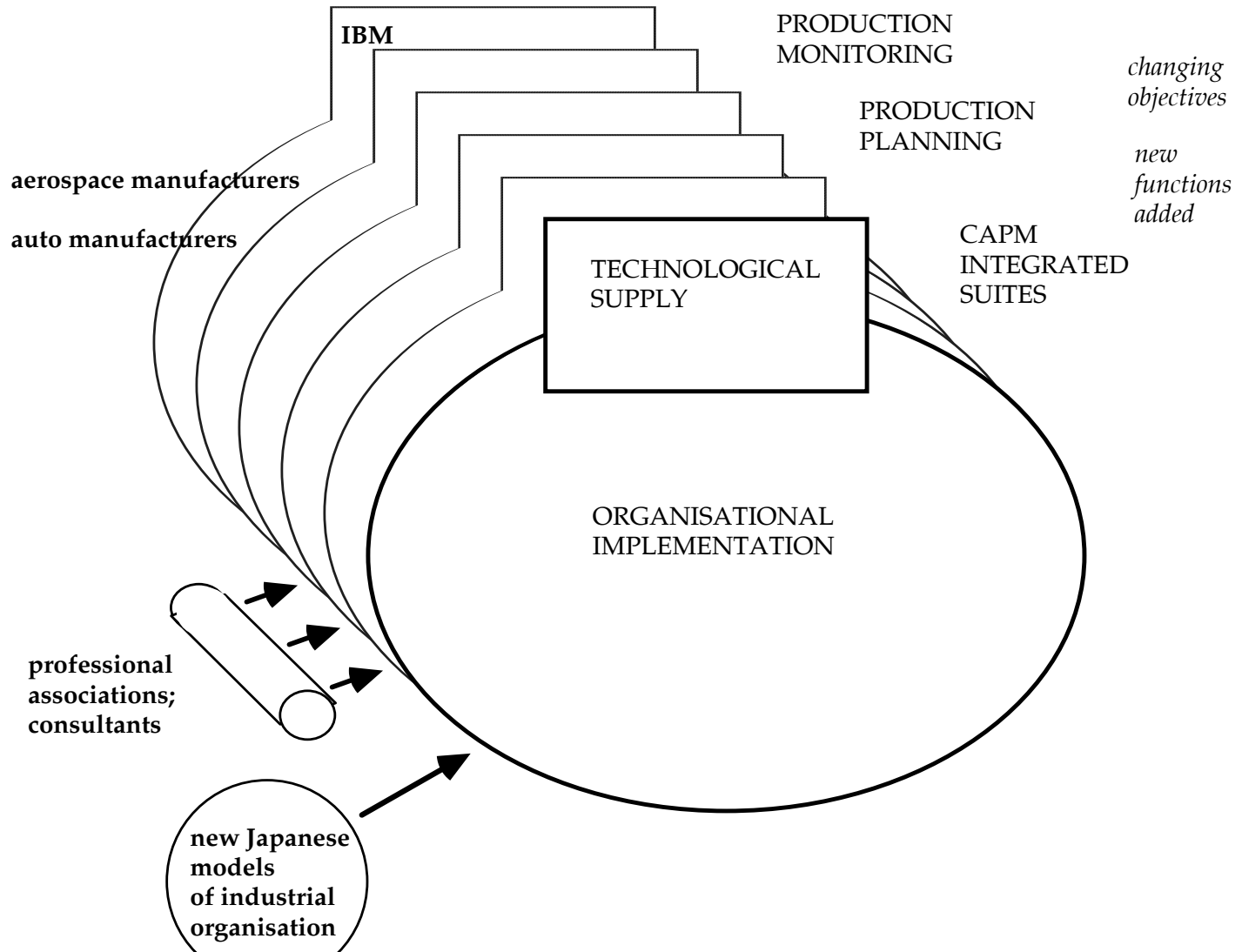


The Biography of an Artefact: spiral of innovation between technology supply and organisational implementations



The *spiral of innovation* is an artefact moves between successive cycles of design, and implementation

Schematic Diagram: Evolution of CAPM/ERP



Evolution of ERP: Enterprise Resource Planning systems

- 1960s Roots in inventory control (IC) packages, developed in large automobile and aerospace manufacturers - complex assemblages
- 1970s extension to Material Requirements Planning (MRP) and Manufacturing Resource Planning (MRPII),
- 1980s Computer Aided Production Management seen as stepping stone to Computer Integrated Manufacture:
 - ◆ added functions: sales & order management, marketing, finance & accounting, human resource management.
- 1990s ERP label following SAP, Oracle market leaders.
- 2000 Gartner predicts evolution to extended-ERP (ERP II): interorganizational processes such as supply chain and customer relationship management:

by 2005 *what is achieved is ERP 1.5*

New architectures - eg Software As A Service

ERP Timeline

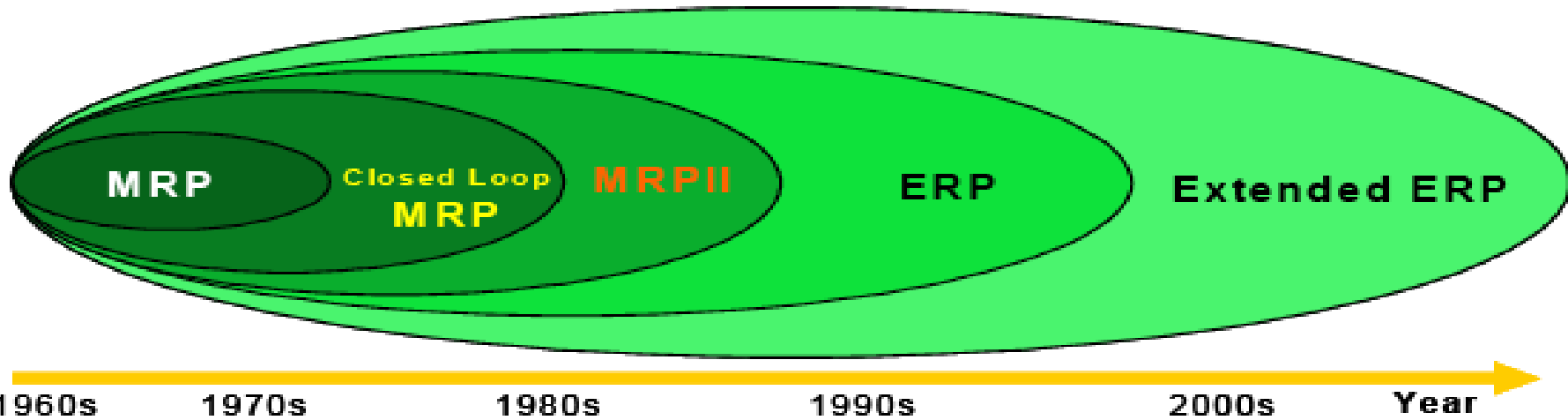
- ERP concept coined by Gartner (Lopes 1992)
- seen instance of Computer-Integrated Manufacturing
- alongside success of SAP R/3 system

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Observations on ERP Evolution

- Continuity
 - obscured behind rhetorics of the new - new names
 - deletion of historical experiences behind new promises
 - Dynamism - changing business prescriptions
 - ◆ MRP about production to planned orders
 - ◆ 1980s re-engineered towards flexibility Japanese/Just-In-Time;
 - ◆ 1990s influence by Business Process Redesign;
 - ◆ 2000 refocus on inter-organisational view eg supply chain management and customer relns
 - Broader shaping of concepts/agendas
 - ◆ eg professional associations - British Production and Inventory Control Society (owned by American APICS; dominated by suppliers) and latterly industry analysts such as Gartner
- Need better theorisation of these influences

ERP Evolution



airat and Jungthirapanich 2005 p.289 figure 2 Evolution of ERP)

What underpins periodic name changes?

- Changes in functionality
- Changes in best-practice concepts/business prescriptions
- Changes in underlying architecture (probably key =>)
- Vendors wanting to sell to their existing customers the need to upgrade to new architecture

Changes in constitution of field over time

- 1970s 3 MRP gurus: "**Crusade**"
- Initially MRP part of movement for education/professionalisation of *industrial practitioners*; MRP vendors established
- 1980s emergence of consultants; APICS/BPICS professional associations promote wide uptake of MRP I & II
- 1990s MRP/ERP field institutionalised; emergence of Industry analysts: Commodification of community knowledge
- 2000s extension of ERP brings it into collision with other fields eg CRM eg supply chain

Changes in constitution of field over time

- The field grows in size
- The account becomes more generic: the narrative shifts from individuals to organisations to classes of organisation
- The field becomes more intricately structured and institutionalised (new players and layers)
- Technology comes to play a more central role
- Theory of industrial organisation becomes marginal
- Extension of functionality brings MRP/ERP into collision with other technical fields - destabilises and de-matures technology

The well-rehearsed narratives of ERP

- Note widely circulated accounts of the self-evident historical evolution of MRP/ERP: *self-serving Whiggish history of improvement*
- Czarniawska (2004) discusses 'transformation of events into a story (history)'.
- She contrasts the confusion of **contemporary observation**, in which the future significance of particular events is obscure, with the carefully ordered **retrospective accounts**.
- In this shift from *Chronological* to *Kairotic* time, accounts are re-organised; noise and uncertainties of everyday life are removed

Back to the Future? the 1990 view of Future of MRP

- 'Beyond MRP: MRP and the Future of Standard Software for Production Planning and Control'
International workshop, November 1990 The Hague
- SERC report notes MRP implementation difficulties/rigidity, which limited its uptake. The workshop considered three options:
 - i) gradual evolution of generalised MRP
 - ii) increase in user-driven special versions of MRP for particular industries, through partnerships between users and smaller suppliers
 - iii) MRP [to be replaced by] Factory management systems supplied by system integrators

Back to the Future? the 1990 view of Future of MRP

- The majority of participants considered:
 - ◆ 'MRPII in the form of standard software as an unworkable concept'.
 - ◆ The future lay not with generic software packages; instead, 'urgent need' for more 'context specific software packages'
- Explosive growth of SAP/ERP systems just around the corner not anticipated
 - ◆ Contemporary view surprised us.
Difficulties in doing retrospective study
 - ◆ Limitations to sociology of promise - 'expectations as self-fulfilling prophecy?'

Packaged enterprise software - an apparent contradiction

- Portrayed as universal solution
- Top 100 UK companies all use SAP
- Diversity - indeed uniqueness - of individual user companies
- Suchman: cannot have a “view from nowhere”
- How is a generic solution constructed?
How can it bridge to such a wide range of user organisations

Managing complexity and diversity of user requirements

- Frequent failures of ERP attributed to 'poor fit' between system and user organisation requirements/practices - impose unwanted organisational change
- Customising package:
 - ◆ may prejudice dependability of system
 - ◆ may impede ability to utilise new versions of package (package paradox)
 - ◆ Creates maintenance and technical problem

ERP/packaged software studies

- Huge numbers of ERP implementation studies
 - ◆ Initial failure in 30% of cases
 - ◆ Partial implementation
 - ◆ Bolt-ons and customisation
(contradiction: standard implementation cited as 'success factor' due to time & money costs of modification and subsequent maintenance costs)
 - ◆ Align organisation to package requirements
 - ◆ This is only part of the story
- Few studies address design/or design, procurement, implementation cycle



Generification

- Localization studies don't adequately address longer-term co-evolution of artefacts and their social settings of use
- Not to say we should view generic solutions as embodying features that can be applied in all contexts
- Argument: not that organizations in which software circulates are the same; rather, through various generification strategies, local sites *can be treated as the same*.

Vendors manage package architecture & development process

- SAP conquered the world
 - one sector at a time
- Gradual extension into other sectors (eg SAP moves from manufacturing into chemical and other industries, and then to financial services and public sector: Universities; Local Government)

Birth Stage

- Accumulate functionality with each new application/target user
- Meeting 'pilot sites' individually
- Simply adding functionality will make already enormous systems even larger as well as particularized to Pilot Sites...

Suppliers' active strategies for managing & controlling diversity

- Management by community, by content, and by social authority
 - ◆ user groups - careful management
 - ◆ getting user community to align with supplier generification goals

Management by Community (revealing diversity)



Management by 'Community'

SoftCo:

Does **everyone** want the ability to store 2 records?

America South Uni:

We would maintain only one record...

American North Uni:

...no record is needed.

Belgium Uni:

In our case, **things are completely different...**

Management by Content (smoothing diversity)

- Search for equivalencies between different sites, and in this process making requirements generic

SoftCo: I just want to get some common things...Is there any rule how [modules] contribute.

South Africa: The student can still do exam and be graded...

Canada: We wouldn't use these rules: we take all courses into progression.

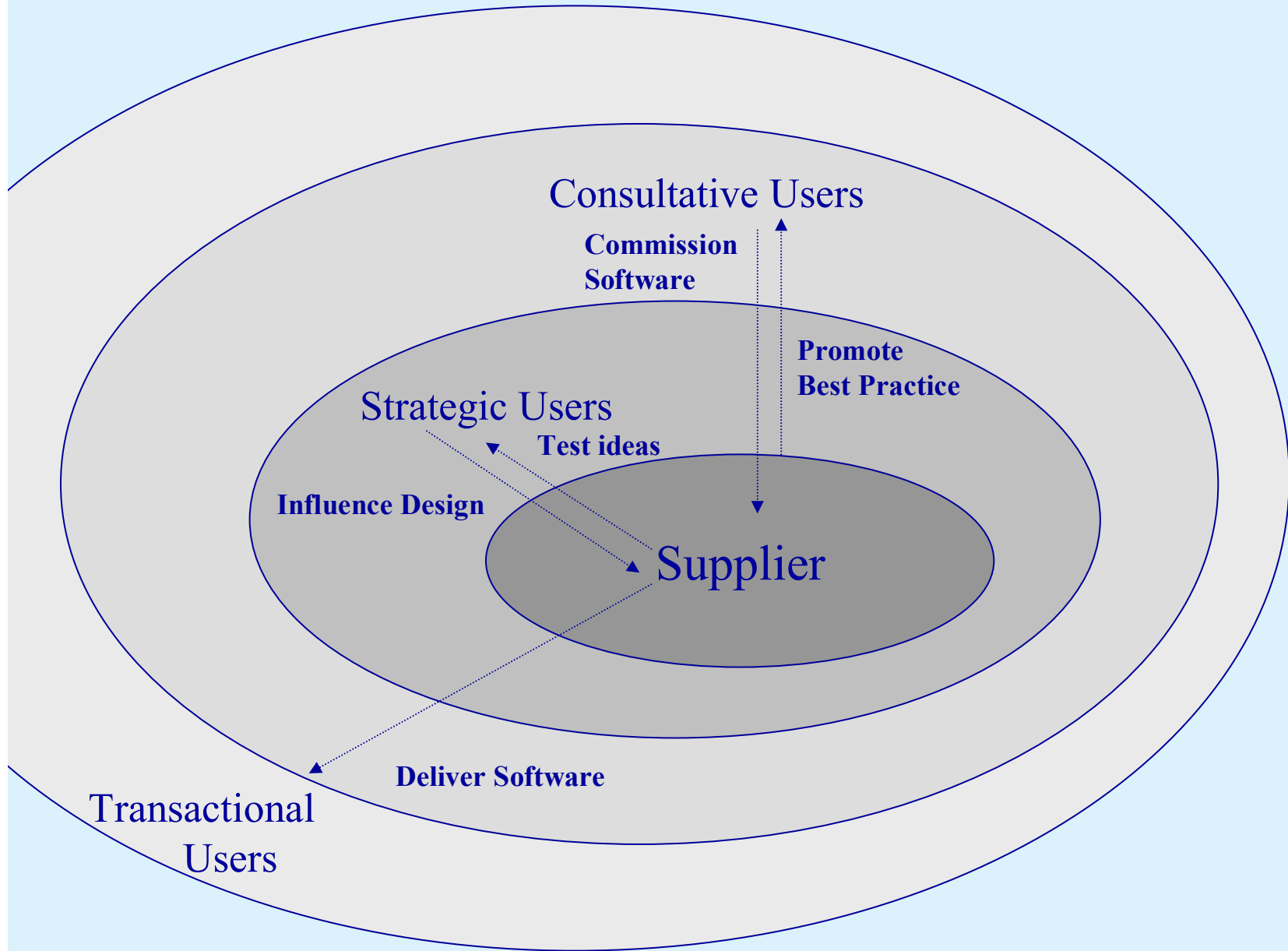
SoftCo: It is the same at [Ivey League Uni]. It is the US model. It is the difference between the European and the US model.

Management by Content (smoothing diversity)

- Supplier labels requirements as organizationally particular
 - ◆ Belgium Uni: "Can you assign student number according to campus"
 - ◆ SoftCo: "I would call that **"customer specific"**"
- Materiality: 'Acetate' as an alignment tool (limited space)
- User strategies:
 - ◆ to become key sites (and thus win investment & have their requirements catered for)
 - ◆ to demonstrate generic character of their requirements
 - ◆ "We have the feeling that it's becoming a strategy to try to label issues as **'university specific until proven differently'**. Should it not be the other way around? Should [SoftCo] not search for generic concepts behind the specific situations at the different pilot universities? (email from Belgium University to Pilots)".

Proximity of Users to Artefact

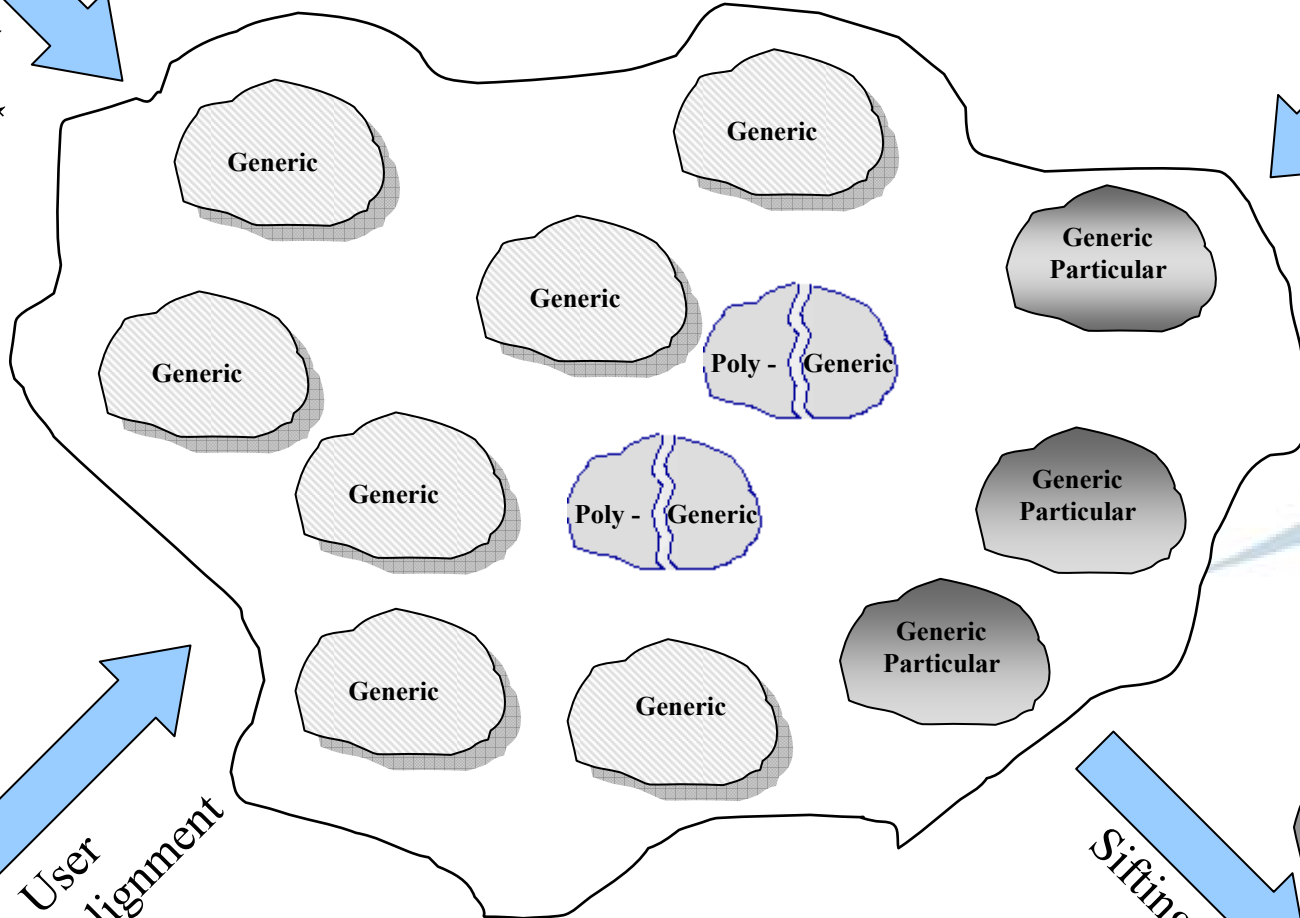
Segmenting users



Not Black Box but 'Black Blob'

Process Alignment

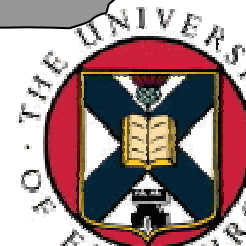
Promising Future



User Alignment

Sifting

Software Package



Another View on SoftCo

- SoftCo actively detaches itself from its users...
- ...however what happens during technical breakdown
- Technical support/repair seen as irredeemably 'situated' and 'territorial' activity (Julian Orr 1986)
- SoftCo receives 800,000 calls for help each year
- Appears to challenge the vendor strategy of 'generification' as well as overwhelm them

Globalised Face-to-Portal Form of Support

- We found that when users experience downtime, SoftCo no longer engages in Orr-type forms of support.
- Problems are 'lifted out' from their local settings and brought back to be worked on within one of the vendor's numerous labs (only 500 require site visit).
- SoftCo programmers rarely meet with users and have relatively little specific knowledge of their local sites (deals with 'user in the portal')

GLOBAL SAP LABS NETWORK



SAP Labs India (Bangalore)



SAP Labs United States (Palo Alto)



SAP Labs Canada (Montreal)



SAP Labs Germany (Walldorf, St. Leon-Rot)



SAP Labs France (Sophia Antipolis)



SAP Labs Hungary (Budapest)



SAP Labs Bulgaria (Sofia)



SAP Labs Israel (Ra'anana)



SAP Labs China (Shanghai)



SAP Labs Japan (Tokyo)

	SAP Labs India (Bangalore)	SAP Labs United States (Palo Alto)	SAP Labs Canada (Montreal)	SAP Labs Germany (Walldorf, St. Leon-Rot)	SAP Labs France (Sophia Antipolis)	SAP Labs Hungary (Budapest)	SAP Labs Bulgaria (Sofia)	SAP Labs Israel (Ra'anana)	SAP Labs China (Shanghai)	SAP Labs Japan (Tokyo)
Managing Director(s)	Georg Krieser; Niran Princ	Amit Patel	Laura Le Bars	Olaf Henrich	Werner Sommer	Laura Le Bars	Pavlen Tilyu	Uri Ziv; Mickey Seiner	Shang Ling Jun	Kenji Sakuma
Full-Time Equivalents (FTEs)	1,746	1,100	140	6,100	180	70	200	600	300	100
Average Age of Employees	37 years	33 years	33 years	35 years	34 years	35 years	35 years	32 years	29 years	34 years
Average Tenure with SAP	2 years	6 years	3 years	8 years	5 years	2 months	3 years	3 years	2 years	6 years
Research & Breakthrough Innovation	AI/5, Application Platform	Research; User Interface Design	Research	AI/5, Application Platform, Research	Research (European Union Projects and Disruptive)			Application Platform	AI/5, Research	
Product & Technology Group	PIUs Applications; Industry Solutions; Emerging Solutions; SAP NetWeaver	PIUs Applications; Industry Solutions; Emerging Solutions; SAP NetWeaver; Suite Optimization; XaaS; Program Office; Platform Ecosystem Strategy; Product Innovation; Solution Marketing	PIUs Applications (CRM); Industry Solutions (Retail, Logistics and Deployment); Utilities; Emerging Solutions; Public Business Solutions	PIUs Applications; Industry Solutions; Emerging Solutions; SAP NetWeaver	PIUs Applications; SAP Travel Management; Analytics	PIUs Applications (CRM); Industry Solutions (Automotive, Aerospace & Defense, Industry Composite Applications)	PIUs; SAP NetWeaver; Emerging Solutions	PIUs; SAP NetWeaver (Enterprise Services; Infrastructure; Composition; SAP Master Data Management); Emerging Solutions (Manufacturing); Small Business Solutions; XaaS Strategy; Product Innovation; Platform Ecosystem (SAP Developer Network)	PIUs Small Business Solutions; Adaptive and Cloud Computing; Human Capital Management; Financial; Business Consolidation; Services-Cloud; Public Sector; Linux Lab	PIUs Applications (Application Solution Management); Industry Solutions (Industry Solution Management); Emerging Solutions; SAP NetWeaver (PIU)
Production	Test Center; Subsystem; Assembly			Quality Governance and Production						
Global Service & Support	SAP Active Global Support; installed base maintenance & Support; SAP Custom Development; Global Center; SAP Hosting	Installed Base Maintenance & Support	Installed Base Maintenance & Support	SAP Active Global Support; installed base maintenance & Support; SAP Custom Development; Globalization; SAP Hosting	SAP Active Global Support; installed base maintenance & Support	Global Center			AI/5 (Solution Management); SAP SuccessFactors; mySAP Ariba; SAP Custom Development; Globalization; iHCM Legal Changes; Translation	SAP Custom Development; Globalization
Customer Solutions & Operations	DBS; Competitive Market Intelligence			DBS; Competitive Market Intelligence					Business Process Renovation	

DISTRIBUTED FORMS OF SUPPORT ('Passing Regime')

- Problems have to search for expertise
- Problems are 'sticky'
- Difficult to ascertain 'where' the problem is and who 'owns' it
- Various 'triage devices' (two systems)
- Users are 'endowed'
 - ◆ can raise priority levels – and demand immediate help
 - ◆ given benefit of doubt
- Programmers not responding quickly enough to a problem can be sanctioned
- Some users known to try and exploit vendor

Ping-pong

So concerned with not being entangled with users it sometimes leads to perverse consequences

- “The customer message was initially forwarded to the wrong component and subsequently went back and forth between the customer and [SoftCo] support with no ownership taken for the message.
- Having received no information for a month, the customer requested to close the message as ‘it was taking so long that I might as well just live with the bug as [SoftCo] is obviously not concerned in fixing their own bugs’.
- I picked up the message while monitoring messages for the specific market and contacted the customer directly. I listened to the customer’s frustrations, understood the situation and promised to take action. While the customer appreciated the efforts he advised – ‘you are flogging a dead horse’. I took immediate action and forwarded the message to the responsible team, informing them about the customer’s negative experience. The message was subsequently resolved in less than a day”. (Priority Response Coordinator at SoftCo)

Vendor Forced to Continually Regulate Hybrid Organisational Form of Labs and Portal

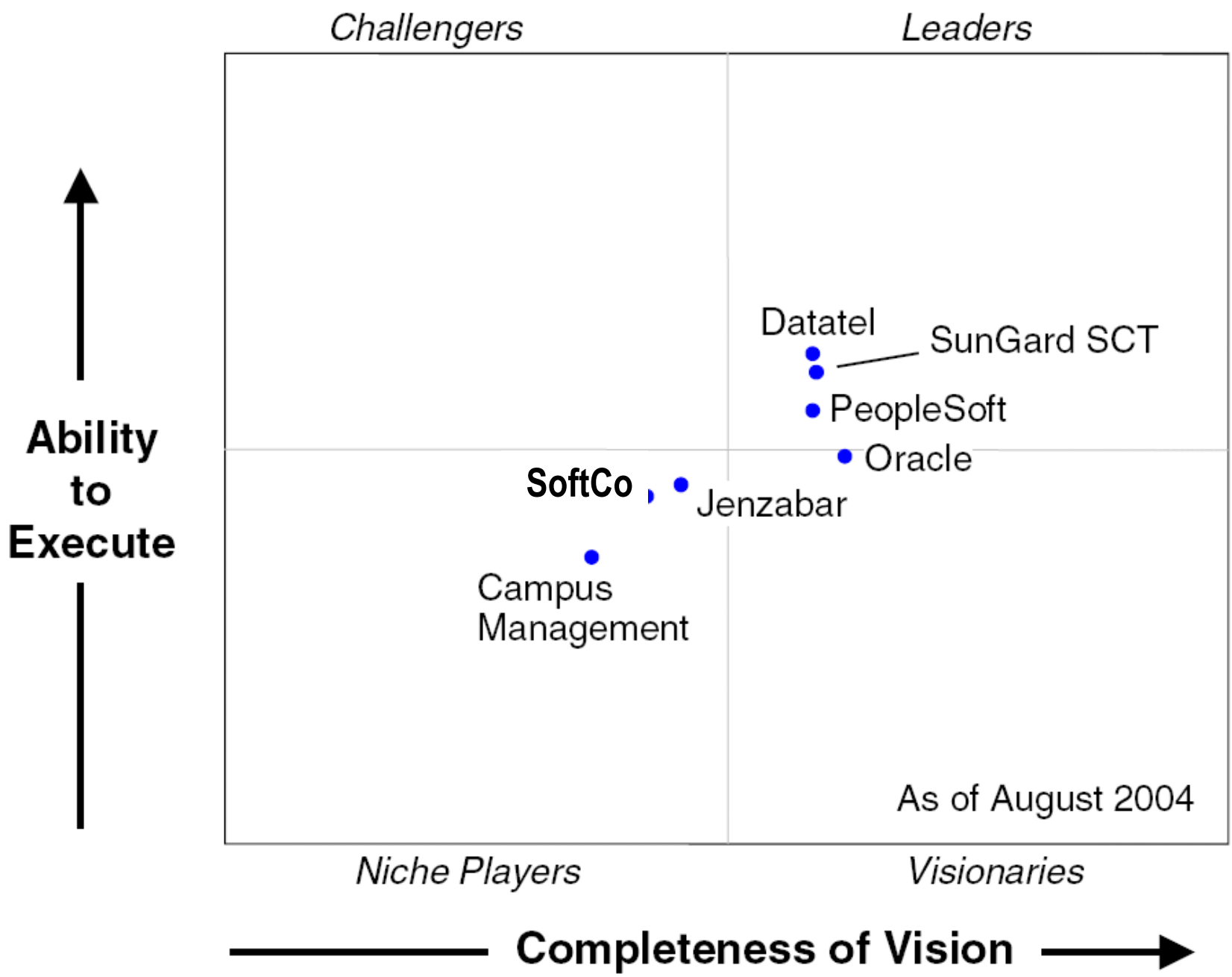
- Ping-pong outlawed
 - ◆ SoftCo raised protocol stipulating just how and when a user might be 'passed'
 - emphasised the need for a 'justified reason' to be given and 'passing chain' to be created
 - ◆ Unsurprisingly 'wild-forms' of ping-pong were still commonplace though they did take on a more complicated bureaucratic form ('regulated ping-pong')

A View on the Wider Technical Field

Executive from SoftCo emails customer to convey some exciting news:

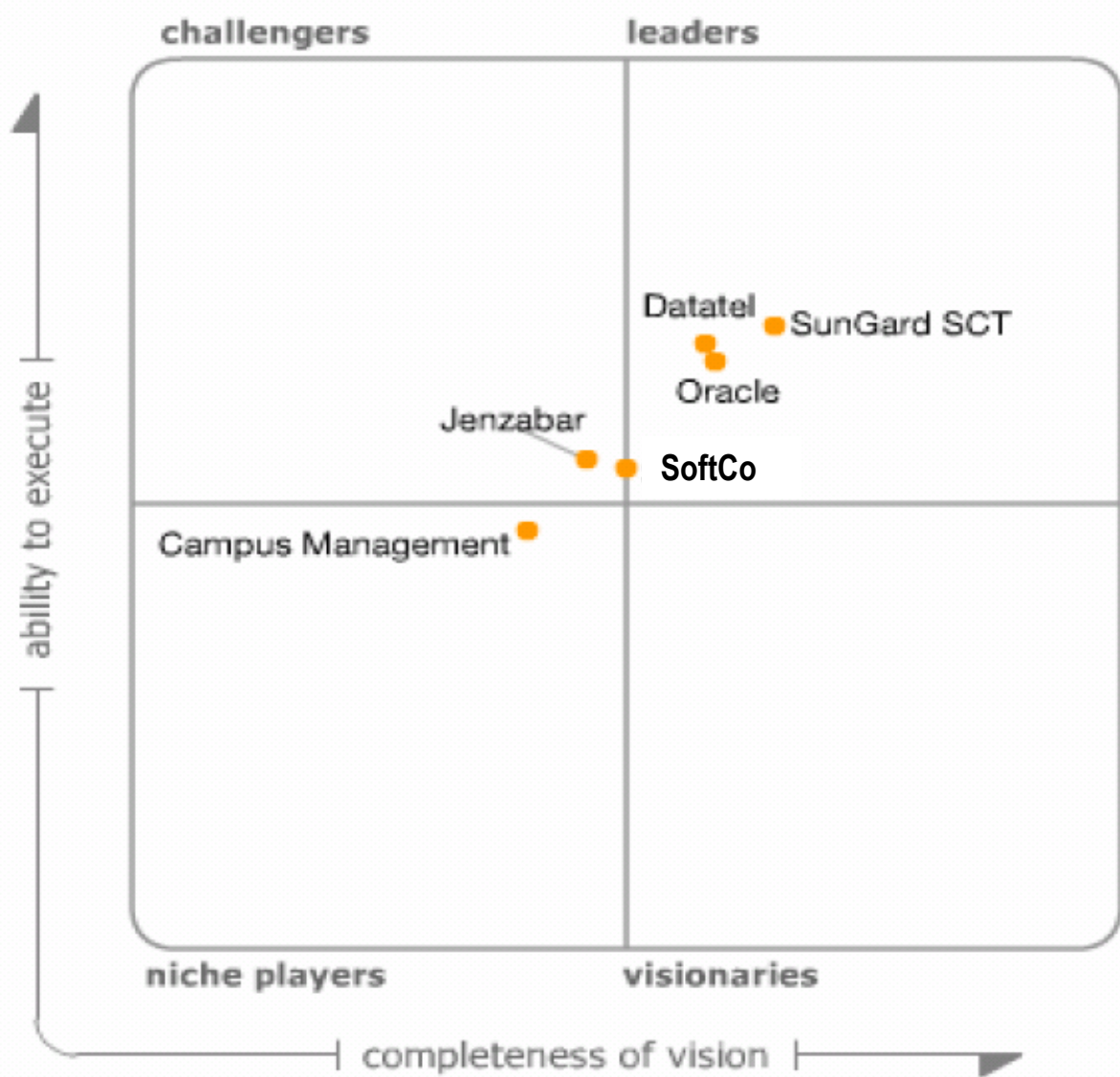
"I am attaching the most recent Gartner Group Magic Quadrant...As you can see our rating has improved quite dramatically. Over recent years, our position on the "execution" axis has slowly improved, but 2005-2006 has been a Great Leap Forward. As you can see, this is because we have continued to "execute" but also have done a much better job of communicating our company's "vision"".

Higher-Education Administrative Suites, 2004



MAGIC QUADRANT

Figure 1. Magic Quadrant for Higher Education Administrative Suites, 2005



Commodification of Community Knowledge

- Gartner analysts build up network of vendor customers
 - ◆ through interactions with 'calculative network' (Callon & Muniesa, 2004) analysts gathers evidence on capacities, competence, commitment of vendors
 - this calculative network...
 - geographically dispersed
 - selective
 - informal

Gartner Basis of Interactions

- IT Manager's email to SoftCo
 - ◆ "I would suggest that [SoftCo] need to be aware of quite how much influence Gartner are developing amongst the higher education community in the UK. This could actually be good news, given Gartner's comments about [SoftCo] and [BigVendor]... But I suggest that your higher education team should become well aware of Gartner's comments because they will certainly be known to the university IT Directors (though whether we would agree with them is something else!)"
- SoftCo executive replies
 - ◆ "I appreciate your ongoing dialogue with [Bob] of Gartner. As you know, we also have a parallel dialogue with Bob. I agree that he is looking for [SoftCo] to 'execute' on the 'vision' (in Magic Quadrant terms) in terms of key projects such as yours..."

User seeks to utilize favourable Gartner assessments to win greater commitment to their field from supplier

IT manager to colleague

“Things are getting ever more interesting for me and the [SoftCo] relationship. They are really moving in to a ‘partnership’ role - throwing in highly competent resources to ensure that we go live on 10th October. Though I guess it helps that they realise that [a senior Gartner analyst] has told them that Gartner are watching [SoftCo’s] ability to implement at each of 3 universities in the world...and that their results will materially affect whether [SoftCo] move from the lower left quadrant to the top-right!”

The Technical Field has become more Organised

- Industry analysts centre-stage in IT procurement market
- Fulfil crucial role in shaping expectations about the development of technological fields and constituting markets for constantly changing supplier offerings
- It is they who hold the ropes and set the rules of the game
- Define the boundaries of the technology and criteria by which particular vendors and offerings may be judged
- Drawing up signposts about state of industry and future development
 - ◆ Gartner coined the phrase ERP and then went on to map out visions of how this and related segments of the software market should develop

Implications for analysis

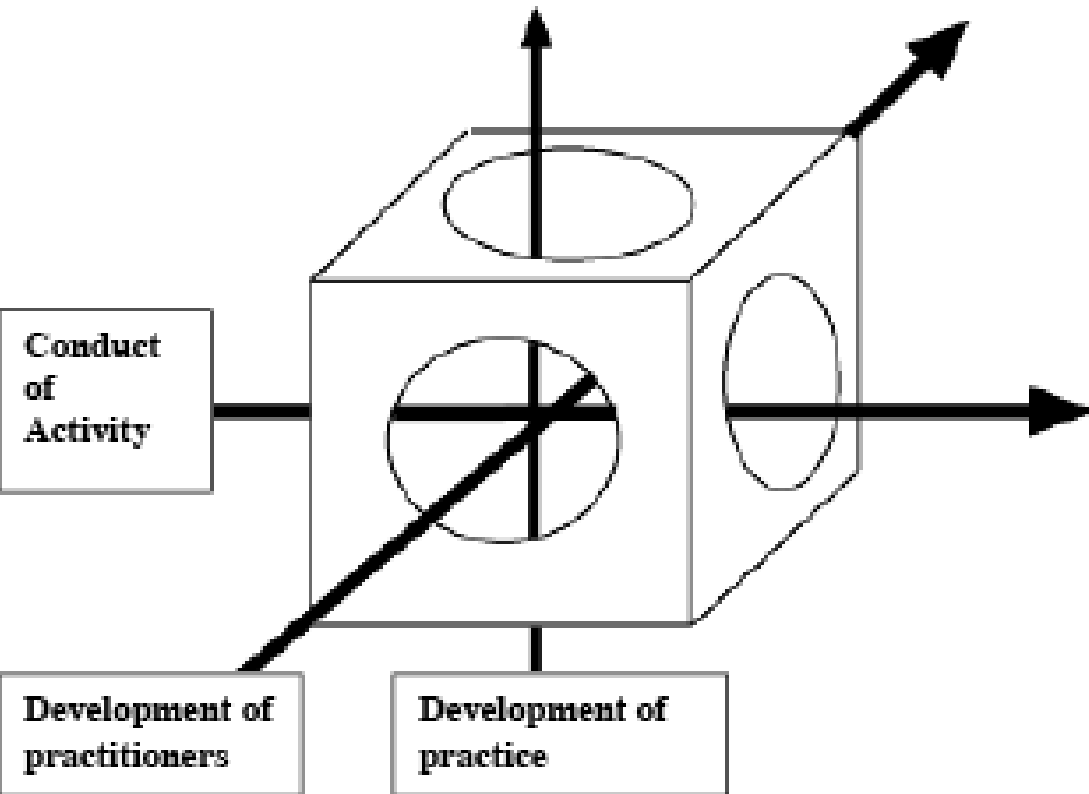
- Shaping of ICT applications
 - ◆ interaction of supplier & user strategies
 - ◆ broader knowledge terrain for these artefacts - shaped eg by specialist networks; suppliers; industry analysts
- Need for evolutionary & historical perspective; addressing:
 - ◆ ICT design & implementation *in tandem*
 - ◆ Local and broader context
- Need more effective analytical templates, addressing different timeframes and levels

Multi-temporality:

'Hutchins cube'

Hutchins 1975:312,

Hyysalo 2004:12



any moment in human conduct is simultaneously part of

- the unfolding of a task,
- the development of the individual doing it,
- the development of the work community,
- the development of the professional practice.

Concept of biography at different levels of analysis

1. development of particular innovation & organizations/people connected with it
 - ◆ *Software/systems development life cycle*
 - ◆ (Moments in) design/implementation/use
2. the evolution of a technology product;
 - ◆ Multiple product life-cycles in evolution of supplier offering: *product life-cycle management strategy*
3. the emergence of a technological field and coupling with societal practice;
 - ◆ *Technology life cycle*
 - ◆ evolution of technical fields across multiple suppliers, adopters, intermediaries

Multi-level analysis

- Need to attend to:
 - ◆ immediate context of action;
 - ◆ other settings in the translational terrain;
 - ◆ broader institutional/technological setting
- Context provides discursive resources/framings for local level actors
 - ◆ **Technical field** as tool for managing uncertainty:
 - simplify choice of methods for improvement;
 - enables some comparison between various suppliers/their offerings within the field

Orientation to theory

- Concept of biography offered as a tool for analysis
 - ◆ better temporal and spatial templates
 - ◆ Concepts - arena and agora
- Complex spaces Cf single site study or simple methodological nostrums such as “follow the actor” of Actor Network Theory
- Cf ANTs rejection of social science theory, use these as provisional and partial accounts that inform selection of sites of study

Multi-level analysis: Arena and Agora

- *Company social constitution* (Clausen & Koch 1999) relatively stable arrays of actor strategies, tools and competences within organisation; structured eg by labour market institutions
- *Development Arena* (Jørgensen & Sørensen 2002) where multiple actor worlds meet
- (cf Fleck 1988 implementation arena)
- Koch (2005) ERP as community
 - avoid local \Leftrightarrow context dualism
- See as specific framings of broader Agora

Agora of Technical & Organisational Change (Kaniadakis 2006)

- A heterogeneous space populated by beliefs, techniques, artefacts, suppliers, users, intermediaries
- Different perspectives on/viewpoints/slices through the agora (e.g. supplier c.f. user c.f. analyst viewpoint)
- Micro-meso-macro - not fixed analytical categories but depend on scope of research - eg design may be 'local' to developers but appear as part of landscape for organisational users; which black boxes may be opened?
- Variable research geometry: Zoom lens metaphor: different depth and range of focus depending on concerns & methodology