End-to-end process management: implications for theory and practice

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The term 'end-to-end' process management is now commonplace in the language and practice of operations. Managers are encouraged to migrate from functional process management to end-to-end process management to realise a range of performance improvements. However, these improvements are often elusive; the specific challenges associated with such a migration are under-researched. This paper uses a cross-sector study to identify the challenges of end-to-end process management and to generate practical managerial guidance. Three areas are identified that demand particular managerial attention: the need to move beyond process mapping, the role of IT in process management and maintaining the process infrastructure as a strategic asset. More significantly, the findings highlight the need for greater conceptual clarity regarding the end-to-end concept itself. The existing literature suggests that scope is the primary differentiator of the end-to-end process – the requirement to manage an extended boundary from customer order through to customer fulfilment. However, this research suggests that the end-to-end concept is more complex, comprising of three core constructs with seven dimensions: scope (boundary conditions, sequence/flow and controls); scale (resources and input/output transformation) and complexity (interrelationships and orientation). End-to-end process management involves much more than an extended boundary. It requires a systemic perspective and clarity regarding controls and transforming resources.

Keywords: end-to-end processes; BPM; systems; case study

1. Introduction

The operations management literature contains many models and frameworks identifying the 'process' as a fundamental unit of analysis. The importance of the process concept is arguably unprecedented and can be seen to transcend research epochs: from the quest for increased productivity found in Taylorism in the early 1900s (Taylor 1911), through the importation of Japanese philosophies and efficiency techniques (e.g. JIT, TPS), to the concentration on the reduction in defective output exemplified in Six Sigma programs. In each case (productivity, efficiency and effectiveness) it is possible to identify the role of the process concept, at least in implicit form, as an organising factor.

The concept of process or business process is widespread in the operations management literature. Process thinking implicitly (or explicitly) often underpins literature in diverse areas such as finance, quality, innovation, customer relationship management, etc. Smart, Maddern, and Maull (2009), among others, provide a synthesis of much of this work. They articulate a model of business process management (BPM) comprising 'application' components for infrastructure development and 'conceptual' components that constitute a necessary foundation on which deployment is based.

One of the key foundational conceptual components in this model suggests that sustained, conscious process management operates on an end-to-end basis, from initial customer request to customer fulfilment. Considerable emphasis is often placed on the development of an end-to-end process architecture as a means for understanding the organisation from a business process perspective (Pritchard and Armistead 1999). Many authors have emphasised the need to adopt a customer viewpoint and to manage processes from a 'horizontal' rather than a 'vertical' perspective (Armistead 1996; Zairi 1997; Hammer 2002; Skrinjar, Bosilj-Vuksic, and Indihar-Stemberger 2008). Goldkuhl and Lind (2008), for example, describe a business process as 'moving from customer requirement to customer satisfaction'. Similarly, Kohlbacher (2010) suggests that organisations engaged with BPM focus on 'customer to customer' business processes.

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A focus on the end-to-end process is also widely reported in the practitioner community. Volvo, a leading automotive manufacturer, describes its journey from 'fragmentation to end-to-end processing' (Volvo Group Services report 2012). Similarly, Nike, a leading international sportswear company, outlines its approach to manufacturing on its website as follows, 'We're looking end-to-end' (Nike 2013). A focus on the end-to-end process is also reported by public organisations. For example, Lambeth Council's website reports a new approach to adult social care, 'we have started to review our end-to-end processes' (Lambeth 2012). On a larger scale, the US Department of Defense Strategic Management plan for 2012–2013 builds upon a decision made in 1999 to 'reorient the management of our business operations around end-to-end processes that reflect how we execute our business today (across functions and across organizations)'. The end-to-end perspective would help to 'reduce transaction times, drive down costs and improve service' (DoD 2011).

Practitioner research groups also emphasise the growing importance of end-to-end process management. Forbes predict that understanding 'not just some but all of a company's end-to-end processes' will be a Top 10 strategic issue for chief information officers in 2013 (Forbes 2012). PWC dedicate their 2010 Technology Forecast Journal to 'managing the end-to-end process' highlighting the challenges, and benefits, associated with this approach (DeGarmo 2010). User communities such as Business Process Trends (www.bptrends.com) offer practical insights into end-to-end process management. These are also explored via blogs. Forrester suggest the 'increased use of end-to-end customer feedback processes' as one of their Top 15 trends for customer service (Forrester.com 2012). Gartner discuss 'the importance of end-to-end process design' (Gartner 2011).

However, the end-to-end process concept remains vague. As noted above, the existing literature relies heavily upon the process start and finish points to differentiate the end-to-end concept. A contrast is made between a traditional perspective where processes are managed within departments (and are closely correlated to established patterns of managerial control), and end-to-end processes that are managed across these departmental boundaries. Whilst a distinction predicated exclusively upon the boundary conditions of the process offers commendable simplicity, there is considerable evidence that end-to-end process management creates managerial challenges beyond those associated with the traditional perspective (Smart et al. 2009). For example, an audit report on the USA DoD's move to end-to-end process management discussed above notes that 'despite spending about $1.8 billion', the programme had not succeeded in integrating the functions within its procure-to-pay end-to-end process (DODIG Report 2012). This suggests that a richer understanding of the end-to-end concept is required to pursue the theory that can inform managerial practice.

The research presented in this paper reports on a cross-sector exploration of the end-to-end concept. An approach using case methods, which offer a powerful and effective platform for exploratory theory building (Voss, Tsikriktsis, and Frohlich 2002), was adopted. In total, 10 case studies were selected to provide sufficient contextual breadth for the exploration of the end-to-end process phenomenon. These provided variation in core activity, scale and complexity, sector and perceived process maturity. All the case companies were engaged in initiatives related to processes.

A key objective of the research was to develop theory regarding the end-to-end concept and its role in process management. In particular the research sought to:

(1) identify managerial challenges associated with end-to-end process management,
(2) develop a comprehensive characterisation of the end-to-end concept to inform managerial practice.

The paper is organised as follows. Following this introduction, a review of the relevant literature describes the idea of BPM. A discussion of the end-to-end concept leads to the introduction of systems theory to provide the reader with underpinning literature. The methodology is presented in Section 3, together with a brief overview of the cases. Section 4 presents the findings of the case research and outlining the management challenges. Analysis and discussion of the findings are presented in Section 5. A theoretical framework is presented which offers a richer specification of the end-to-end process concept through three constructs and seven dimensions. Conclusions are presented in Section 6, together with limitations and opportunities for further research.

2. Literature review

2.1. *Business process management*

Managing processes are a pervasive and significant business activity that transcends both sector and geography (Biazzo and Bernardi 2003). Woodall (2001) notes, for example, the relationship between processes, service quality and customer satisfaction in the service sector. This thinking builds upon earlier work by Roth and Jackson (1995) that identified a significant relationship between business process capabilities and service quality. This relationship is further supported by a more recent empirical study (Maddern et al. 2007) which evidences BPM as a driver of technical service quality. While the origins of process management are firmly established in manufacturing each of these studies suggests the relevance of process management in service contexts. In

addition to this sectorial relevance, there is also clear evidence of process management transcending geographical contexts: by Forsberg, Nilsson, and Antoni (1999) in relation to Swedish companies, Ongaro (2004) looking at public services in Italy, Rosemann and de Bruin (2004) examining heath services in Australia and Khong and Richardson (2003) in their study of Malaysian banks. While the antecedents of process management may be found in production management practices and their corresponding theoretical frameworks, contemporary studies suggest applicability within a far broader sectorial and geographical context.

The strategic imperative for engaging in BPM also appears broad: to create competitive advantage (Armistead 1996); to enhance supply chain management (McAdam and McCormack 2001); to support Enterprise Resource Planning (ERP) implementation (Beretta 2002); to co-ordinate business processes (Acur and Bititci 2003); to improve productivity (Alfaro, Ortiz, and Poler 2007); to improve financial performance (Skrinjar et al. 2008) and to achieve greater corporate agility (Neubauer 2009). It would therefore appear that in addition to transcending sectorial and geographical conditions, BPM is often associated with management actions to enhance competitiveness.

However, research suggests that many organisations struggle to achieve targeted benefits (Cardwell 2008; Smart et al. 2009; Palmberg 2010). Following an extensive survey of BPM adoption, Neubauer (2009) concludes that 'the majority of companies following BPM initiatives still have weaknesses'. In seeking to understand the challenges, researchers have identified a range of critical success factors including, technology and method (Frolick and Ariyachandra 2008); people involvement (Hung 2006) and effective governance (Ravesteyn and Batenburg 2010). The research also highlights the importance of generic change management success factors such as top management support, good communication, project management and training (Trkman 2010). Managing the end-to-end process is found to be particularly significant and challenging (Baker and Maddux 2005; Batista, Smart, and Maull 2008; Kohlbacher 2010).

Existing research has also examined the core characteristics of BPM. Given the breadth of application it is unsurprising that there has been considerable debate regarding various thematic change initiatives, technologies and methodologies, each competing to appropriate the BPM label. However, a consensus is emerging which differentiates BPM as an on-going commitment to the management of end-to-end processes (Smart et al. 2009). In contrast to earlier business process re-engineering (BPR) initiatives, organisations engaged with BPM emphasise a need for a sustained focus on their processes (Kohlbacher 2010). Radical intervention, the central theme of BPR, is replaced by a requirement to continually address process management and to achieve process maturity (Niehaves 2010). Attention is given to the process infrastructure. Typically this involves establishing a process architecture that identifies core processes and the relationships between processes (Armistead and Machin 1997). Process owners are appointed with accountability for end-to-end processes (Samson and Challis 2002). Improvement is focussed upon customer perceptions and supported by end-to-end process measurement (Maddern et al. 2007). Often a process strategy is specified to inform and direct the deployment of the various elements of the process infrastructure (Pritchard and Armistead 1999). Critically, the process infrastructure is informed by a 'process mindset' consisting of three components: the conscious management of processes; the centrality of process management and the need to manage processes from an end-to-end perspective (Smart et al. 2009). The 'end-to-end' process concept informs the mindset and is central to the implementation of process infrastructure.

2.2. *End-to-end processes*

Considerable emphasis is placed on the end-to-end process within BPM. The transition from the process management within departments, to process management, aligned to customer requirements is widely reported (Smart et al. 2009; Palmberg 2009; Kohlbaker 2010). Smart, Childe, and Maull (1999) emphasise similarity in many of the early definitions of a business process (Davenport 1993; Harrington 1992; Rummler and Brache 1990) and present definitional properties citing Davenport: 'a process is simply a structured, measured set of activities designed to produce a specified output for a particular customer or market'. In their work, a clear distinction is made between within-function processes and the distinct cross-functional and customer-facing characteristics of business processes. These characteristics are, in part, identified by Goldkuhl and Lind (2008) who describe a business process as 'moving from customer requirement to customer satisfaction'. Similarly, Kohlbacher (2010) suggests that organisations engaged with BPM focus on 'customer to customer' business processes.

Attempts to articulate the 'end-to-end' concept rarely move beyond statements of indicative boundary conditions derived from the relative position of the customer. One of the few attempts to explicitly address this phenomenon is provided by Frye and Gulledge (2007). Their proposed definition, 'the flow of event driven functions across one or more organization and system boundaries' is broad. Their work relates closely to event-driven models, popularised by Rummler and Brache (1990), and to technology-centric (ERP-type) solutions. According to writers such as Galliers et al. (1999) the business

process phenomenon is business-centric, not IT-centric. Taking this business-centric orientation, Smart et al. (1999) highlight the link between business processes and the realisation of intended organisational objectives. Acknowledging the diverse entities that are integrated to realise organisational objectives, and the multiplicity of perspectives which reside within the population of organisational actors, Smart et al. (1999) suggest the adoption of a 'systems approach'. They suggest that the basic model of a business process is analogous to the basic model of a system. This would suggest that a more powerful platform for understanding the end-to-end concept may reside in the literature based on systems thinking.

2.3. *Systems perspective*

General systems theory (von Bertalanffy 1956) may be conceptualised as an attempt to discover and articulate the principles of organisation that underlie systems. Whilst support for the general systems theory itself has receded, many of its concepts and principles have had impact across a range of disciplines: cybernetics (Ashby 1956); operational research (Churchman 1968); engineering (Daenzer 1976) and information systems (De Marco 1978). In the social sciences, 'closed' and 'open' systems were distinguished: closed systems are isolated from their environments, while open systems, including organisations, are characterised by an exchange with their environments. There have been numerous open systems articulations of organisations, exemplified by Katz and Kahn (1966), and numerous uses of systems thinking in management research (Simon 1952; Buckley 1980; Flood 1990; Ahmed and Simintiras 1996; Gingele, Childe, and Miles 2002). Atkinson and Checkland (1988), whilst acknowledging the diversity of specific definitions, isolate a cluster of ideas that underpin systems theory. They argue that an entity or system exhibits emergent properties (properties of the whole as one entity), a nested or hierarchical structure and processes of communication and control which enable it to survive in its environment. Essentially they see two paired constructs: emergence and hierarchy and communication and control.

There are two significant management challenges arising from emergence. Firstly, causality is difficult to identify because a system of interrelated processes is complex. An activity may affect numerous other activities within the system. Furthermore, such influence may be cyclical and determined through the action of an intermediate activity/event (see Buckley 1980). Secondly, non-linear relationships and multiple feedback loops make outcome predictions extremely difficult (Forrester 1961).

A number of authors have recognised synergy between systems theory and the nature and properties of processes and process management (Rummler and Brache 1990; Maull et al. 1995; Smart et al. 1999; Batista et al. 2008). Gingele et al. (2002) argue that a business process embodies systemic ideas. Processes are defined as *input-output transformations*. They are *hierarchical* in nature and are *interdependent* as outputs from one transformation become inputs to another. Each complete business process may be divided structurally, into smaller elements such as sub processes, activities and tasks, but not functionally (Ackoff 1971). A system of processes is *purposeful*; it is the means by which the business delivers its objectives. *Boundaries* exist, differentiating processes from each other and collectively from their environment. Boundaries are often defined by the controls that measure process/system performance. Additional *controls* include those originating in the system's environment, which enforce regulation. The ability of a process to meet its objective is impacted by the interactions (*communications*) with other processes and with entities across boundaries. Critically, processes can only be understood and managed at the systems level where the *emergent properties* of the interactions are manifested.

In summary, the existing literature reports the growing adoption of BPM. It also highlights the failure

Table 1. The end-to-end process concept – existing literature.

Source	References	Dimensions of the end-to-end concept
Business process literature	Harrington (1992), Davenport (1993), Armistead (1996), Pritchard and Armistead (1999), Zairi (1997), Hammer (2002), Frye and Gulledge (2007), Skrinjar, Bosilj-Vuksic, and Indihar-Stemberger (2008), Goldkuhl and Lind (2008), Palmberg (2009) and Kohlbacher (2010)	(1) An extended boundary (2) Focussed on the external customer
Systems-informed literature	Rummler and Brache (1990), Maull, Childe, and Weaver (1995), Ahmed and Simintiras (1996), Smart, Childe, and Maull (1999), Gingele, Childe, and Miles (2002), Batista, Smart, and Maull (2008) and Smart, Maddern, and Maull (2009)	(3) Hierarchical, interdependent processes (4) Complex controls and communication

of many organisations to fully realise targeted benefits. The end-to-end process concept is recognised as central to BPM and a source of management challenge. However, examination of the end-to-end concept is limited. The process literature suggests the differentiating characteristic of the end-to-end concept is that the boundary extends to include the external customer. The systems-informed literature offers powerful concepts, but further empirical evidence is required to crystallise the concept and its challenges. An overview of the dimensions of the end-to-end process is provided in Table 1 below.

3. Methodology

The aim of our research was to develop theory regarding the end-to-end concept and the implications for management. Given the limited theoretical platform, an exploratory investigation adopting a case study methodology was considered appropriate (Eisenhardt 1989; Yin 1994). Whilst the existing literature evidences the widespread adoption of end-to-end process management beyond thematic initiatives, case selection identified companies that were actively pursuing BPM, ensuring that informants had extensive experience of the relevant concepts and management challenges.

The research design was configured to obtain rich data through engagement with key informants, and in a wide range of contexts. Case selection included service organisations reflecting the importance of the service economy (Machucha et al. 2007) and its enthusiasm for BPM (Woodall 2001). As the research aimed to explore the challenges associated with scales and levels of process maturity, cases were also pursued from organisations of differing process maturity levels. Shortly before the launch of the research, a process maturity exercise had been carried out at an industry-academia forum using the process capability maturity model developed by the Software Engineering Institute at Carnegie Mellon University (McCormack and Johnson 2001). The results enabled cases to be selected representing each of the levels in the model. Discussions with interviewees during data collection were used to clarify and confirm process maturity in each case. The framework recognises five levels of process maturity:

- Level 1 organisations are immature. Their processes are ad hoc and undefined (Initial).
- Level 2 organisations have started to focus on processes and have defined some of their major processes. They can repeat some of their processes with predictable results, while other processes are not yet well controlled (Repeatable).
- Level 3 organisations have defined all their basic processes and have some degree of control over them. They have begun to emphasise the collection of data and use measures to help manage their processes (Defined).
- Level 4 organisations have put a lot of emphasis on the management of processes. They have good process measures and gather data consistently (Managed).
- Level 5 organisations have taught employees about processes and enlisted them in a continuous effort to refine and improve processes (Optimising).

There is a general consensus that between 4 and 10 cases offers the appropriate balance between the time and cost required to generate depth and richness and the volume and variety required to underpin generalisation (Perry 1998; Yin 1994; Voss et al. 2002). This research is based on 10 case studies conducted in both manufacturing and service organisations of varying process maturity.

Table 2 outlines the main attributes of the 10 cases.

Cases A–C are manufacturing companies. Case A is one of the leading exponents of BPM in terms of both scope and process maturity. Case B aims to address the end-to-end processes across the whole organisation, but has only recently begun this journey. Case C has sophisticated management of production processes, but little or no management of its support processes.

Cases D–J reflect the diversity of the service sector. Case D is relatively mature, but process management is

Table 2. Case attributes.

Case	Core activity	Process maturity	Size	Sector
A	Power systems	Optimising	Global	Manufacturing
B	Racing engines	Repeatable	Small	Manufacturing
C	Thermoplastics	Initial	Small	Manufacturing
D	Telecommunications	Managed	Global	Services
E	Utilities	Defined	Large	Services
F	Advertising	Managed	Large	Services
G	Banking	Optimising	Large	Services
H	Insurance	Repeatable	Global	Services
I	IT Solutions	Repeatable	Large	Services
J	Health	Repeatable	Small	Services

fragmented and uncoordinated. Case E is beginning to implement BPM and is focussing, initially, within one major business unit. Case F has considerable process expertise, but this is largely from a TQM perspective – end-to-end process management is less effective. Case G has a mature and effective process infrastructure. The infrastructure directly supports the largest business unit and the concepts and tools are used across most other business units. Case H has recently begun a strategic BPM programme which will impact much of the organisation. Case I is developing a BPM programme, based on emerging technology, which will embrace much of the organisation but the programme is relatively immature. Case J is also beginning a BPM implementation focussed on the delivery of end-to-end process improvement, but within discrete organisational units.

The main research instrument was a semi-structured interview addressing issues including:

- The nature and core attributes of BPM
- Key events and drivers of process management within the organisation
- Current process maturity
- Current BPM deployment, including application and conceptual components
- Current process performance
- Critical success factors for BPM

The interviewees were all executives or senior managers with an extensive knowledge of BPM and a detailed understanding of historic and future plans for deployment in their organisation. In most cases, they were directly responsible for BPM programmes aiming to improve service and/or cost. Interviewees were notified in advance to allow them to carry out any necessary preparation. Interviews were held on site and lasted between two and three hours. Following the interviews, all interviewees were provided with summary transcripts and key findings and invited to comment. This triggered an iterative process of discussion via meetings, phone calls and other media which helped to address potential bias (Voss et al. 2002). To ensure construct validity, several further sources of evidence were used including public domain documentation and privileged company documentation (Stuart et al. 2002).

The first phase of analysis involved the creation of individual case records to capture organisational attributes, historical BPM activities and details of the current BPM deployment. This was organised by reference to the BPM application components (process strategy, architecture, measurement, ownership and improvement) and conceptual components (conscious process management, macro process management and process centrality) as outlined by Smart et al. (2009). The records also reported the outcome of discussions surrounding process

maturity, perceptions of critical success factors and details of change activity. Content analysis, across the cases, was used to summarise the results in tabular form. Subsequent analysis involved the application of techniques suggested by King (2004) to identify emergent themes. Building on the coding methods outlined by Miles and Huberman (1994), template analysis (King 2004; Waring and Wainwright 2008) provides a systematic approach to the capture, ordering and subsequent interpretation of qualitative data. The specific approaches to each research objective are presented below.

The first research objective was to explore the management challenges of BPM. Content analysis of the case records provided evidence of the impact of generic change management factors on BPM deployment. This technique also identified a number of BPM specific challenges related to individual elements of the process infrastructure such as the process architecture and measurement described by Smart et al. (2009) as 'application' dimensions. Three important challenges emerged from the template analysis which impacted the process infrastructure as a whole, rather than individual dimensions. In addition, analysis revealed the priority afforded by interviewees to the challenges arising from the new 'mind set' required for BPM, in particular the nature and the impact of the end-to-end concept. This was manifested in various ways including: the relative time spent on these issues compared with generic change factors and application issues; the degree of enthusiasm expressed; the complexity of the issues and direct reporting of them as the critical challenges.

The second research objective sought to develop a comprehensive characterisation of the end-to-end concept and to consider the implications for end-to-end process management. Again template analysis provided a structured approach to addressing this objective. An initial template was created based upon attributes of the end-to-end concept identified in the literature review. Whilst analysis confirmed the impact of these constructs, gaps were found in the data-set. Further, iterative coding integrated the missing data items into a more comprehensive theoretical framework.

Due to the limitation of space for reporting the extensive data, the findings presented focus on the emergent themes identified with illustrations extracted from the case analysis. Further details of the interview process and template analysis are provided in Appendix 1.

4. Case findings

As described in the methodology section, data analysis revealed three types of management challenges: generic change management challenges, challenges arising from both the application and conceptual components of BPM.

4.1. *Generic change management challenges*

BPM programmes are differentiated from BPR programmes in that they seek to provide a long-term focus on processes and the external customer, rather than being focussed on the transformation to process structure. However, the actions and structures through which such ambitions are realised involve significant organisational change, and BPM deployment is subject to generic change management factors. These were explored and the results reinforce existing literature in this area (e.g. Banuelas and Antony 2002; Al Mashari and Zairi 1999). Executive sponsorship and effective communication were found to be critical in all cases. Other factors included the need for a compelling case for action, effective leadership and strategic alignment.

Managing the relationship between BPM and other change initiatives emerged as a particularly important challenge to successful BPM implementation, particularly with regard to the boundaries and scope of parallel Lean and Six Sigma initiatives. In some cases, BPM programmes directly competed for resource with other change initiatives (e.g. Cases D, G). In many cases, there was a competition for executive attention and support. Duplication and overlap were particularly evident in larger organisations. Inter-programme issues were exacerbated by both organisational restructuring and changing programme management structures.

Whilst the interviewees recognised the relevance of generic change factors, greater emphasis was given to more specific BPM issues.

4.2. *Implementing a process infrastructure*

As noted previously, all the cases recognised the importance of building a process infrastructure similar to the five elements identified by the Smart et al. (2009) framework. Recurring challenges were identified in respect of each element. For example, the need to formalise and document the process strategy; to fully engage with business units to ensure subsequent ownership and use of process maps; to find appropriate metrics which reflected external customer needs, rather than a more familiar internal service level agreements; to overcome resistance to the introduction of end-to-end process ownership, particularly from 'middle managers' and to avoid becoming exclusively IT led when developing improvements. However, three issues emerged which transcended these individual elements.

4.2.1. *Moving beyond process mapping*

Interviewees consistently articulated a need to implement every element of the infrastructure to deliver targeted benefits. However, the requirement to address all five elements of the infrastructure was not evidenced in actual implementation. Rather, implementation was dominated by one element – process mapping. This was consistently the launch activity for BPM and, as previously noted, often required extensive resources. For several organisations, process mapping and BPM implementation had become virtually synonymous (e.g. Cases B, I).

Organisational improvement generally reflected the extent to which implementation embraced all elements of the infrastructure. Case G had leveraged end-to-end process ownership and measurement to transform service performance resulting in record levels of customer satisfaction. In contrast, Case B had spent two years mapping business processes, but had delivered no tangible customer service or financial benefits. Indeed, the findings suggest an inverse relationship between the resource and time allocated to the implementation of individual elements of the infrastructure, and the scale of sustainable benefits to be derived from their deployment. Often, the process mapping exercise was carried out by the specialist teams, remote from end users and the production of a repository of maps was a key milestone. The assumption was that documenting of processes, in itself, would create business value. However, significant benefits were only generated where maps were adopted by the relevant process owners, and used, together with relevant measurement, to direct systematic improvement activity. Sustaining these benefits required a strategy to ensure the integration and ongoing maintenance of the infrastructure.

4.2.2. *Clarifying the role of technology*

All the organisations informing this research recognised that BPM was more than an IT project. Nevertheless, many of the organisations had made significant investment in process modelling software. Case B, for example, had dedicated the first 18 months of their BPM programme to software selection. Other organisations moved between software platforms in response to perceived failures and future opportunities. For the larger organisations, IT investment in excess of £1 m was common for each application. Interestingly, some of the most successful organisations did not use dedicated modelling software, preferring instead to capture, communicate and control their processes through simpler tools (e.g. flowcharts) using the intranet as both a repository of process models and an access mechanism to the models. Whilst the tangible presence of new process technology can generate a valuable sense of 'progress' for BPM implementation, the data suggests it can also lead to an expensive, time consuming, diversion from other potentially more powerful implementation tasks.

4.2.3. *Maintaining the asset*

The data suggests that the challenges above have relevance for organisations regardless of size, sector and process maturity. However, analysis of more process-mature organisations identified a further significant challenge. Previous research has identified a growing perception of processes as 'strategic assets' (Grover, Kettinger, and Teng 2000). Our findings reinforce that perception but point to the challenges associated with the ongoing maintenance of a process infrastructure. Often, specific contextual issues such as mergers, rising levels of complaints, or individual process concerns can trigger BPM implementation. Once these issues are addressed, the resource required to maintain the process infrastructure can be under threat. The programme director at Case A captures this issue '*they forget how bad it was*'. Case G had achieved remarkable success in customer service, clearly attributed to the introduction of process owner teams, accountable for end-to-end performance. However, the energy, resource and focus required to sustain performance had diminished. Process owners had been re-directed to other programmes and investment budgets were limited. Measurement frequency and scope was reduced with providers complaining about the time and effort required to supply the necessary data. Most significantly, perhaps, communication of the programme was curtailed. Following a widely communicated launch, the (successful) outcomes of process ownership had been posted on the front page of the company intranet. Two years after launch, process issues and performance were no longer 'front page' news.

4.3. *End-to-end process management*

The final and most significant set of challenges related to the conceptual components of BPM, in particular managing process end-to-end. All interviewees identified managing the end-to-end process as a critical element of BPM. 'Gaining visibility' of the end-to-end process was a common objective for new adopters. This would seem a relatively modest ambition. The end-to-end process was often described as 'the chain of activities which link an initial customer request for a good or service to the eventual fulfilment of that request'. However, realising this objective often proved difficult. All the organisations reported that mapping end-to-end processes was a substantial and challenging undertaking with average timeframes between one and two years. Often process mapping initiatives extended beyond original planned dates, particularly where the programme lacked an initial high-level process architecture. Mapping was described as an 'iterative' process and 'part of a process journey'.

Organisations also undertook complete restructuring of their process architecture and documentation after achieving their original planned end state. Case F, for example, had reported considerable success in process mapping as part of an award-winning submission to EFQM. Two years later, they revisited their process architecture concerned that '*mapping was silo based, not end-to-end*' and concluding that previous attempts had been imposed by senior management and were not being adhered to. A new architecture was being rolled out to address these issues. Similarly, Case G created an extensive process modelling database which was considered a benchmark for process mapping and management. Three years later, following concerns about the limited adoption of the process repository, an alternative process methodology and repository were introduced.

The challenge of maintaining an end-to-end perspective extended beyond simply creating the process architecture. Two cases (A & D) had relatively well-established process architectures, which informed end-to-end ownership and measurement. Both companies reported concerns regarding the profile and integrity of their BPM programmes. Case A suggested that the programme had become '*stagnant*' and needed '*constant renewal*'. The original triggers for BPM had been addressed and there was little ongoing investment. For Case D, a recent organisational restructuring had centralised process management within a specialist division, removed from day-to-day business activity. Whilst the company continued to maintain its process repository and operate end-to-end process management, the migration to a centralised process function was seen as problematic.

The end-to-end concept was also reported to impact other elements of BPM activity. Case G initially introduced end-to-end process ownership at the level of core processes, including 'New Business' and 'Account Maintenance'. However, communicating the boundaries of these processes, and providing sufficient clarity to measure and direct process specific improvement proved difficult. A revised ownership structure was introduced which retained the concept of end-to-end but expressed through more recognisable and manageable process definitions such as 'cheque account opening', 'statements' and 'collections & recoveries'. Establishing metrics for end-to-end processes was particularly challenging. Organisations reported a disconnect between internal service level measures and external customer measures. '*All our SLAs are green but the customer is telling us this process isn't working*' (Case G). Coordination across different areas of the business was also a key challenge for an improvement activity. Case D, for example, had over 120 projects related to a new technology. However, there was no overall coordination of these projects, and

no analysis of the impact on the customers or the end-to-end processes.

The challenges associated with end-to-end processes were found across all sectors and maturity levels. For example, Case C operated very sophisticated process management techniques within its production processing. These processes were fully documented with designated process managers using advanced statistical management methods. Whilst the company had recognised a need to extend process management beyond the production function and introduce an end-to-end perspective, this was proving to be difficult. '*We are really struggling to grip up non manufacturing*'. Similarly, Case F had a proven record in total quality management, but this competence did not help the introduction of end-to-end process management. '*We still have a silo mentality. There is a lack of awareness of end-to-end*'.

5. Analysis and discussion

The findings from this research suggest that the end-to-end concept is central to BPM and the source of its most significant challenges. Accounts of lengthy durations and iterations highlighted the unforeseen complexity of the task which required managers to acquire a new process mind set and language. Interviewees themselves often referred to concepts such as boundary, emergence and holism when seeking to explain the challenges they faced. Also, the data raised concerns about the adequacy of traditional process conceptualisation as a basis for understanding the challenges of end-to-end process management. This suggested that theoretical development needed to focus upon the process concept itself.

As discussed in the methodology section, analysis of the process concept was informed by a template based on the literature summary presented in Table 1. This suggests that the end-to-end process concept is differentiated by an extended boundary focussed on an external customer and a hierarchical structure in which the processes are inter-dependent and require more complex control

mechanisms. Initial analysis sought to empirically validate these concepts and consider the extent to which they provided a comprehensive theoretical framework for the end-to-end process concept.

All the interviewees recognised the significance of the extended boundary. For some (Cases B, C, E), the identification of the extended boundary was specified as a major aim of the programme. The focus upon an external customer was also widely reported. Case D, for example described their customer focus as a key strength, '*Thanks to our end-to-end process management, we are very much focussed on the external customer*'. For Case H, a focus on the customer was an important feature of their strategy, '*we are focussing on joining the business value chain together using process management to focus on the customer*'. Others reported a need to focus on an external customer but recognised this would take time. '*Currently, we are still more focussed on the organisation's needs*' (Case J).

The findings also highlighted the emergent and hierarchical nature of end-to-end processes. For example, the end-to-end process 'Manage Customer Relationships' (Case G) incorporated activity from a range of diverse functions. This range of activity was not previously overtly connected. Clearly the constituent activities existed prior to the specification of the end-to-end process and continued to operate once the process was defined. However, explicit management of the end-to-end process was needed to optimise performance.

Managing end-to-end processes also highlighted issues concerning control and communication. The end-to-end process exposed multiple feedback loops; this obscured the causality of performance outcomes. None of the cases, including those which reported significant benefits from their programme, was able to explicitly identify causal relationships directly accountable for reported performance improvements.

Whilst the existing literature identified properties of end-to-end processes, it did not provide a comprehensive insight into the related management challenges.

Table 3. The end-to-end process concept compared with the traditional process thinking.

Process constructs	Dimensions	Traditional process perspective	End-to-end process perspective
Scope	Boundary	Clear boundary, often a function or department	Fluid boundaries related to perceived customer order fulfilment
	Sequence/flow	Uni-directional, linear sequence of activities. Event driven.	Complex flows involving multiple feedback loops.
	Control	Simple control mechanisms	Adaptive controls responding to changing requirements
Scale	Resources	Transforming resources not inherently part of process	Transforming resources central to process design and management
	I–O transformation	Activity focussed (procedures)	System focussed
Complexity	Inter-relationships	Discrete processes	Inter-dependent processes
	Orientation	Internal orientation	Focussed on the external customer

A number of significant challenges were found in the data which could not be explained through the existing properties. Furthermore, the existing properties in themselves did not explain the scale and sources of the management challenges. Why was an extended boundary so problematic? What specific challenges did the extended boundary generate? The analysis did not provide a coherent, integrated theoretical framework differentiating the types of properties informing the end-to-end concept.

Iterative analytical coding was carried out to address these issues. Table 3 summarises the results of this analysis into a comprehensive framework.

The table differentiates three important constructs within the overall process concept: scope, scale and complexity. These constructs are outlined below and used to contrast traditional, functional management with end-to-end process management.

5.1. *Scope*

The first construct, Scope, is primarily informed by the *boundary* of the process. It is the dimension most commonly adopted to characterise end-to-end process management and is determined by managerial responsibility (from a functional perspective) and customer-centric requirements from an end-to-end perspective. Overall, the data confirmed *boundary* as an important issue for end-to-end process management. However, the analysis contrasts the fluid boundaries associated with end-to-end processes with the clarity found in departmental process management. Reference was made to a need to 'discover' end-to-end processes. The end-to-end process architecture was typically populated with processes whose titles based on an external customer perspective did not reflect any of the internal departmental processes. Case J, for example, contrasted its core end-to-end process transformation '*sick-to-well*' with its operational definition '*admission-to-discharge*'. The latter was familiar, specific and extensively measured. The former, embracing social care, public health, primary care and secondary care was far more complex. These findings suggest that management challenges do not reside exclusively with the 'extended' boundary reported in the existing literature. Rather they are the product of the optional, uncertain and unfamiliar boundaries inherent in end-to-end process management.

Analysis also revealed two further dimensions of scope: the *sequence/flow* orientation of process conceptualisation and the extent (range and origin) of the process *controls* captured.

The case data strongly suggested that the process management develops from narrow (functional) activity-centric articulations capturing the '*sequence*' of activities to articulations based on the *flow* of transformed resources through the operational system. Case J, for

example, reported a need to '*develop an understanding of flow*' in order to migrate from managing within individual departments to managing the end-to-end process. Their use of electronic white boards to track patient flows had exposed multiple feedback loops associated with the end-to-end process. Patients did not progress in a simple linear sequence through the various departments; rather treatment was iterative involving multiple visits to different departments. Managers reported a need to adopt a dynamic flow orientation, recognising the complexity of the end-to-end process. This was contrasted with their more familiar perspective of process management in which units of work passed sequentially through specified pathways. Apparently, it is only through understanding the flow of these transformed resources through the operational system that informed improvement of efficiency and effectiveness can be made. Understanding the sequence of process activity, devoid of contingency often captured by flow, is unlikely to provide the necessary insights.

Multiple feedback loops aligned to customer fulfilment also impacted the *controls* required for end-to-end process management. Often, control developed from localised internal metrics of performance and productivity to external metrics of satisfaction. Case G, for example, reported a shift in emphasis from departmental measures of performance and productivity to external metrics of customer satisfaction. An extensive Six Sigma measurement programme resulted in satisfaction levels for over 90% of 'customer touches' being routinely captured. Results were reported at board level reflecting a significant refocussing of management attention. The move to a customer focus places a requirement on the organisation to constantly monitor the environment and to link the results through to process redesign. Maintaining control in a system where both inputs and outputs are constantly undergoing change necessitates an adaptive capability and a move to 'sense and respond' (Haeckel 1995) rather than the traditional command and control model. Combined with these external metrics was an increased recognition of regulatory controls imposed by external agencies that impact process execution. Case G, for example, reported that the end-to-end process both clearly exposed the impact of Financial Service Authority regulations and enabled them to manage these regulations in a more co-ordinated manner. Capturing these regulatory controls is essential for process design and improvement.

In summary, the critical management challenges associated with scope involve the clarity of the boundary and managing the complexity of the system contingencies surfaced by a 'flow' orientation. Traditionally, processes have been managed within discrete departments or functions where the boundaries are clearly prescribed by the department structure. Processing is organised and

managed around departmental objectives. In contrast, the move to end-to-end process management creates uncertainty regarding the start and end points of the process. Boundaries are difficult to identify and subject to change. As noted earlier, the challenge of extended boundaries is widely reported. However, the increased complexity of flows within end-to-end processes is less well explored. Within departments, processes are often sequential. Work is initiated by a specific event and moves through an orderly, prescribed sequence of activities from start to finish and can be controlled by simple controls. In contrast, end-to-end process management focuses on the flow, rather than simply on the sequence of activities. Processes may involve multiple feedback loops, conditional workflow and re-processing. The increased complexity generates a need for a greater, overt integration of processing and more sophisticated controls. Internal controls based on events and internal policy must be extended to include external performance feedback and regulation.

5.2. *Scale*

The second construct, Scale, deals with the extent to which transforming resources are considered an integral part of the end-to-end process. The transformation of inputs into outputs is a foundational concept in operations management (see, e.g. Slack, Chambers, and Johnston 2004). Inputs include materials and information (transformed resources). These are transformed into outputs by resources such as people, facilities and systems (transforming resources). The move to end-to-end process management highlights a need to co-ordinate management of all aspects of the transformation process.

This issue was characterised by one interviewee as '*managing process with a big P*' (Case G). Here the introduction of end-to-end process management had significantly impacted the management of change in the organisation. Previously, change programmes were managed through a collection of independent work streams with accountability in discrete areas such as IT, HR, locations, etc. 'Process' was one such work stream focussed exclusively on procedural issues. Operations managers were co-opted onto change programmes to write the revised procedures. Their role was largely reactive, dealing exclusively with the operational consequences of planned changes. Following the introduction of end-to-end process management, a more integrated approach was introduced. Process became an organising concept for change. The inter-connectivity between process, technology and people was recognised and managed as a coherent whole. Process management was elevated from a narrow specialist activity to one which provided a frame for understanding the full implications of proposed changes.

The expansion of the process concept to include transforming resources was reported as an important indicator of process maturity. For example, the CEO of Case E had expressed concern that the company was '*bleeding millions through inadequate processes*'. The introduction of end-to-end process management would focus the organisation on process and address this strategic concern. The team charged with executing this programme, whilst still at an early stage of implementation, described the need to '*get the bigger thinking around process we see in more mature companies*'. In particular, reference was made to the need to replace a purely operational view of process with one which included the resources required to deliver and change the process. '*At the moment we focus on activities; we need to focus on the whole process*'. Similar aspirations were expressed in other cases which were starting end-to-end programmes, for example, Cases B and J.

Overall, the findings suggested that the scale was an important process construct and problematic for organisations seeking to manage end-to-end process management. End-to-end process management necessitates consideration of all elements of the *input/output transformation*, including transforming resources. Re-designing the process becomes a more challenging and significant task. Procedural changes cannot be isolated from changes to resource (staff, systems, etc.) and control systems (performance, regulatory). Perception of the input/output transformation moves from an operational focus on the activities within the process to a more systemic perspective which embraces the resources required to effect the transformation.

5.3. *Complexity*

The final construct, Complexity deals with the extent to which the *inter-relationship* of processes within the operational system is considered and the extent to which processes are aggregated around providing customer value (customer-functional *orientation)*.

Integration of the end-to-end process requires more than a simple alignment of existing departmental processes. Often organisations launched BPM by focussing on a single end-to-end process, for example delivering a mortgage (Case G). Initial boundary issues focussed on start and end points for the process. Critical questions included: '*Did the process start with a customer requesting a mortgage in the branch, or when the customer receives advertising or direct marketing material? Did the process end with an offer, draw down of the mortgage or first repayment?*' Such issues were greatly exacerbated when considering the totality of the organisation's end-to-end processes. This is echoed in the repeated failure and frustration reported by those organisations that attempted to create end-to-end process

architectures by aggregating lower level activities. In contrast, the successful and sustainable process architecture found in Case A was built 'top down' with respondents specifically differentiating the nature of their highest level, core processes, from the lowest level components. These core processes had unfamiliar titles, were not previously overtly managed as processes and encompassed multiple lower level functional processing. Their scope was related to the organisation as a whole rather than the operational concerns of individual departments.

From a functional perspective processes are organised around the departmental structure; processes are *discrete* and considered independently. End-to-End process management emphasises the *interdependency* of processes within the whole operational system. Performance is therefore considered a systemic property necessitating holistic management.

A further dimension of complexity, *orientation*, reflects the extent to which the organisation is focussed upon the external customer. The data highlights the challenges this creates. Those engaged with the BPM programme were required to 'think like the customer', they had to take an 'outside in' view rather than the traditional 'inside out' perspective. Often the BPM programme created a new 'language' of process. End-to-end process definitions such as 'create customer solutions' (Case G) and 'develop customer insight' (Case A) lacked the clarity of traditional operational process definitions. Those engaged in the programme reported the acquisition of a new process vocabulary as an important milestone on their process journey and highlighted end-to-end thinking and language as difficult to obtain yet critical to successful BPM deployment. '*End-to-end process is not a concept understood by the business at the moment*' (Case E). Becoming fluent in process was recognised as a learnt skill which required the creative ability rather than mechanistic rigour. A member of the BPM implementation team at Case G described the challenge: '*End-to-end thinking is important and hard to get*'. Controlling the language was reported as an important implementation tool. However, successful communication of end-to-end thinking remained a considerable challenge: '*The functions still don't understand end-to-end*' (Case D).

Organisations engaging in end-to-end process management focus on configurations for enhancing the value delivered to customers; customers are considered the central entity to be served whereas functional perspectives pursue process configurations to maximise internal (often departmental) targets. These are often based on service level agreements (SLAs) which do little to provide value to the customer. The dimensions of customer/functional focus and discrete/interdependent help to understand the orientation dimension.

The issues raised through the framework have significant implications for theory and practice. In exploring the challenges of end-to-end process management, this research has highlighted a need for a richer understanding of the process concept. Looking back at Table 1, the process literature reports an extended boundary focussed on the external customer as the differentiating dimensions of the end-to-end process. Some researchers argue that end-to-end processes also demonstrate systemic properties in particular end-to-end processes are hierarchical and interdependent with complex controls and communications.

Our data confirms these dimensions but identifies three additional dimensions not reported in the existing literature: (1) management attention shifts from the simple linear sequence of activities associated with functional process management to the more complex flows and multiple feedback loops associated with end-to-end processes; (2) transforming resources become central to process design and management; (3) there is a shift in management focus from activities and procedures to other elements of the input/output transformation including regulations and resources.

More importantly, the framework synthesises the extended set of dimensions into three core constructs: scope, scale and complexity as shown in Table 3. Scope and scale are concerned primarily with the dimensions of individual end-to-end processes. The scale construct and its associated dimensions have enjoyed little previous research attention. Complexity addresses the additional challenges arising where multiple end-to-end processes are managed and where conditional loops disrupt the linearity assumed in BPM. The boundary and control dimensions of the scope construct are familiar from the existing process literature. Similarly, the systems-informed literature discusses the dimensions of the complexity construct. Collectively, they provide a comprehensive and coherent theoretical platform for differentiating functional process management from end-to-end process management.

The framework also provides an insight into the sources of end-to-end process management challenges. For example the term 'extended boundary' is central to current definitions of the end-to-end process. In isolation, this term suggests that the management of the end-to-end process is simply a continuation of existing functional process management across a longer process. The findings suggest that management challenges are not primarily the product of a longer process; rather they are linked to boundary clarity, the movement from clear departmental structures to less well-defined end-to-end process boundaries. In addition, the framework identifies boundary conditions as one of the three dimensions relating to the scope of the end-to-end process.

The findings suggest the proposition that organisations *applying end-to-end process management to gain competitive advantage should consider the dimensions identified in the framework: boundary; sequence/flow; control; resources; input-output transformation; inter-relationships and orientation.*

The findings also highlight an important barrier to the adoption of end-to-end process management. The move towards end-to-end process management requires managers to re-conceptualise their understanding of process. The popular techniques required to map, measure and improve processes are largely based upon linear repetitive functional operations. Many of the organisations attempted to map functions with a view to aggregating the results, yet their measurement and improvement techniques operated at a functional level. Respondents reported a need to adopt a new 'mind set' which transcended the functional perspective and 'unlearn' familiar process techniques. This new thinking was more 'holistic' recognising both the interdependence of much processing and the need to operate at the level of the whole organisation. By exposing the complexity of the end-to-end concept, identifying its distinctive constructs and dimensions and explicating the impact of these on the migration to end-to-end process management, the framework offers practitioners a more informed point of departure to address the challenges of end-to-end process management. In doing so, the framework supports both the growing number of service organisations seeking to introduce end-to-end process management, and manufacturing organisations who wish to extend their management expertise beyond production towards full end-to-end process management.

6. Conclusions

This research addresses a significant gap in the current literature. Whilst the term end-to-end process management has become firmly embedded in many organisations, previous literature is vague and effective managerial guidance is limited. Many organisations seek to adopt end-to-end process management as a means of improving performance; few fully realise this ambition.

The findings from this research highlight the challenges which organisations face realising targeted performance improvements. Without ignoring the generic change management prerequisites such as executive support and effective communication, the findings point to challenges directly related to the implementation of an end-to-end process infrastructure. The hidden complexity of the end-to-end process concept itself appears as the most significant source of challenge. Managers inherit a conceptualisation of end-to-end process rooted in functional practices with an extended boundary. This view is inadequate.

In addition to issues associated with an extended boundary, challenges arise in respect of more complex flows and the need for more sophisticated, adaptive controls. Focus shifts from the operational procedure itself to a broader context which considers how transforming resources such as people and systems are utilised to effect the transformation. This extended definition of process demands an integrated approach to improving the end-to-end process. This is exacerbated by the need to manage multiple end-to-end processes, aligned to customer requirements. The clear boundaries provided by departmental structures are replaced by more fluid structures reflecting changing customer needs and opportunities to organise around perceived and individual customer priorities.

The research contributes to management practice in a number of ways. Managers are alerted to a range of challenges arising from end-to-end process management and guidance is offered to address these. The prevailing focus upon process mapping is questioned and the managers are advised to implement all aspects of an end-to-end process infrastructure to optimise performance improvement. Managers are also advised to consider the role of technology in end-to-end process management. The findings suggest that this can be a prolonged and expensive exercise often ending in abandonment of the technology and attention is drawn to organisations which have successfully implemented end-to-end process management without incurring such costs. Perhaps the most significant guidance concerns an early recognition of the end-to-end process infrastructure as a mainly intangible strategic asset requiring ongoing maintenance. Tangible assets such as buildings and equipment require obvious maintenance; the same is true of the intangible end-to-end operating processes.

The research also informs management practice by alerting managers to the complexity of the end-to-end process and offering important insights into the widely reported requirement to adopt 'new ways of thinking' when implementing end-to-end process management. End-to-end process management requires a systemic perspective on the operational system comprising interdependent processes informed by adaptive (internal and external) controls. Processes are determined by fluid boundaries and variable flow explicitly related to the customer and includes the transforming resources required to provide value. By highlighting these less well reported aspects of end-to-end process management, the research offers managers an opportunity to learn, to understand process with a big 'P' and avoid commonly experienced challenges to implement effective solutions more rapidly.

The research contributes to the theory by providing an empirically grounded, comprehensive explication of the end-to-end process concept. This is particularly

important to the operations management community in which the process is a core concept. In particular, the research helps to close the gap between the narrow functional process perspective that dominates current academic thinking, and the wider process perspective required to develop theory to inform current managerial challenges. Greater conceptual clarity is also beneficial to the general management community, where the extensive adoption of the end-to-end process label is matched by the diversity of meanings. As mentioned by Voss et al. (2002), the identification of key concepts is an important step in theory building. It enables subsequent research to establish causal relationships and develop explanatory theory. This research offers an initial proposition specifying seven dimensions of process which organisations must address when migrating from functional to end-to-end process management.

6.1. *Limitations and further research*

Whilst care has been taken to follow appropriate protocols (Voss et al. 2002; Stuart et al. 2002), for example, in terms of case selection and the use of data collection and analysis techniques to support valid and reliable conclusions, the findings are based on a limited number of cases, and further research is needed to fully validate the results. The research exposes the complexity of the end-to-end process, and specifies the dimensions that must be addressed when moving to end-to-end process management. The contingencies which may impact this migration, such as varying organisational structures, strategies, market contexts, levels of resources, etc. are worthy of further investigation. This research has focussed upon business to consumer contexts. Future research might explore the applicability of the end-to-end concept in business-to-business contexts and the implications for supply chain management. The research has also focussed on core operational processes often described as customer facing processes. There is an opportunity to explore end-to-end process management in management and support processes. The conceptual framework used to identify and analyse the key dimensions of BPM draws upon one particular model of BPM (Smart et al. 2009). BPM is a recent phenomenon and other conceptual frameworks might offer alternative perspectives (e.g. Van der Aalst 2004, Palmberg 2009). The exploration of the end-to-end concept draws upon systems concepts, particularly emergence and hierarchy and communication and control. Further analysis of the systems literature in fields such as system dynamics and synergy (Batista et al. 2008) may generate additional or alternate insights. Similarly, there are concepts from the change management literature such as hard and soft factors (Sirkin, Keenan, and Jackson 2005) and phases of change management (Pinto and Slevin 1988) which

might offer further insights into BPM deployment. Finally, the cost of the manufacturing legacy on process thinking and management requires further attention, particularly in an economy increasingly dominated by service organisations.

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Appendix 1. Case study method details

1. *Interviews*

Interviews were designed to capture data using the BPM framework outlined by Smart et al. (2009) referencing the application and conceptual components of BPM. Interviewees were pre-advised of the interview questions (below) and asked to provide supporting evidence. Interviewees also raised issues of clarification and offered additional information, outside the prescribed interview question set.

Section 1 Organisation details	*Section 2 Process maturity*
What is your role in the organisation?	What is the level of your process maturity (see below)
What are your key products & services? What are your main markets? How are you organised? How large is the organisation? When was the organisation established? How has the organisation developed over time? What are the values and culture of the organisation? How does technology support the organisation?	
Section 3 Process approach	*Section 4 Key events and drivers of process management*
To what extent is your process management focussed on the external customer? To what extent is your process management focussed on the end-to-end process? To what extent is your process management focussed on the total set of processes, their boundaries and interactions? To what extent is your process management active and sustained as a programme?	Open questions
Section 6 Process approach	*Section 7 Key implementation issues*
Customer satisfaction (Surveys/focus groups/mystery shopper, complaints) Operational performance (Speed, reliability, variation, quality, flexibility, productivity, cost, risk) Internal feedback (staff, magazines, POTs) External measures (ISO, EFQM, benchmarking)	Aims & objectives Challenges Barriers Critical success factors
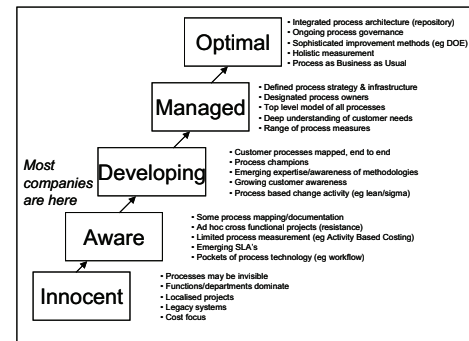
Section 5 current bpm deployment

Process architecture	
How are processes identified?	Is there a structured approach to process identification? Is there a high level view of processes? What types of processes have been identified? What is the scope & orientation of maps? What level of detail is captured? What data is captured on the maps?

Appendix (*Continued*)

Process architecture	
How are process maps and models stored & managed?	Is there a structured approach to process storage & management?
	What level of detail is captured and managed?
	How is change managed?
What tools and process IT are used?	What tools are used for process mapping?
	What tools are used for process modelling/simulation?
	What tools are used to support execution?
How is the process documentation used to support the business?	How does the documentation support business-as-usual activity?
	How does the documentation support change activity
	How does the documentation support strategic activity?
What are the strengths & weaknesses of the process architecture?	(These questions are repeated for each element of the process infrastructure)
What are the future plans for the process architecture?	

Process ownership & governance	
Who owns the processes?	Is there a structured approach to process ownership?
	What is the scope & orientation of process ownership
	How is the approach to process ownership managed?
	Which processes are owned?
	How is process ownership integrated with other business management?
What is the role and accountabilities of a process owner?	Are process owners responsible for the process strategy?
	Are process owners responsible for Business as Usual?
	Are process owners responsible for process improvement?
	Are process owners responsible for process change?
	Are process owners responsible for outsourced processes?
	How are process owners recruited, trained and motivated?
What resources, knowledge & tools are used by process owners	What teams/structures support process owners?
	How do process owners acquire necessary resources?
	What information is used by process owners to manage their processes?

Process measurement	
How are processes measured?	Is there a structured approach to process measurement?
	How is the measurement system managed?
	To what extent is measurement holistic?
	How is process measurement integrated with other business measurement?
	Who owns process measurement?
What are the key process measures?	How is customer satisfaction measured?
	How is service quality measured?
	How is process cost measured?
	How is operational performance measured?
	How significant is process measurement?
	How widely available is the output from process measurement?
How is process measurement used to support the business?	How does process measurement support business-as-usual activity?
	How does process measurement support change activity?
	How does process measurement support strategic activity?

Process improvement	
What is the approach to process design?	Is there a structured approach to process design?
	What is the scope & orientation of process design?
	What methodologies are used to support process design?
	What % of current processes have been formally designed?
What is the approach to process improvement?	Are processes designed to deliver agreed capabilities?
	Is there a structured approach to process improvement?
	What is the scope & orientation of process improvement?
	What is the balance of continuous and radical process improvement?
	What is the significance of process based change to overall change activity?
	What methodologies are used to support process improvements?

(*Continued*)

Appendix (*Continued*)

Process improvement	
How are process improvements delivered?	How are improvement opportunities identified & prioritised? How are customer and business requirements identified? What analytical techniques are used to support improvement? What techniques are used to support implementation? How are benefits quantified and their realisation monitored? How quickly are improvements delivered? Who is involved in process improvement?

Process strategy	
How is BPM development positioned within the organisation?	Is there a formal process strategy and associated programme? What is the scope of the strategy? Who owns the strategy?
How is the BPM strategy aligned to the business?	How is the strategy resourced & managed? Is process a key driver for the business? Are process & IT strategies fully aligned? Does the process strategy inform change strategy?
How is process knowledge & expertise developed & managed?	Is there a core methodology? Where does existing knowledge reside? How are you trying to develop process knowledge?
How is BPM communicated and promoted?	What media are used to communicate BPM? Who is promoting BPM? How widespread is the use of process language?

2. *Template analysis – example*

Over 200 items of code related to the end-to-end concept were identified within the data. An initial template was created from the existing literature to analyse the codes. The results confirmed the relevance of the template items. Cases citing each of the codes are shown below.

Items	Cases referencing items									
	A	B	C	D	E	F	G	H	I	J
Extended boundary	×	×	×	×	×	×	×	×	×	×
External customer Focus	×	×	×	×	×	×	×	×	×	×
Emergence & hierarchy	×	×		×	×	×	×	×		×
Control & communication	×		×	×		×	×	×		×

However, over 80 items of code could not be referenced through the template. An iterative process of coding generated a revised template through which all items of code were captured. Cases citing each of the revised codes are shown below.

Items	Cases referencing items									
	A	B	C	D	E	F	G	H	I	J
Boundary	×	×	×	×	×	×	×	×	×	×
Sequence/flow	×	×		×	×		×	×	×	×
Control	×		×	×		×	×	×		×
Resources	×	×		×	×	×	×			×
I/O transformation	×	×		×	×	×	×			×
Inter-relationships	×	×		×	×	×	×	×		×
Customer orientation	×	×	×	×	×	×	×	×	×	×