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Services, Processes and Routines: Literature review and implications

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Abstract
Service management involves building new services by combining and recombining processes and routines. In this paper, we examine the ontological and epistemological perspectives that inform our understanding of the chunks of functionality that are being recombined. Based on a review of 367 influential articles, we identify two very different sets of assumptions about the nature of processes and routines. We discuss the implications of these divergent assumptions for service management.

Keywords
Services, Routines, Processes, Process Management, and Service Management

Introduction
IT service management seeks to align IT services with customer needs through well-defined processes (Johnson et al., 2007), often by recombining these processes to create new services (Chen, 2008). Recombinability is key to service management and related technologies, such as service oriented architecture (SOA) (Papazoglou & Georgakopoulos, 2003). The question we address here is, what is the *nature* of the processes being recombined? Further, if we have different assumptions about the processes being combined, what implication does that have for service management?

To address these questions, we review 367 influential articles on processes and organizational routines. This review reveals divergent ontological and epistemological assumptions about the nature of these building blocks. Ontologically, processes can be treated as fixed objects or as systems with internal dynamics. Epistemologically, processes can be represented with typical (abstract) data, or with a sample of specific (concrete) instances. These differences are not purely

academic, because our assumptions about the building blocks used to create services will shape our understanding of how the resulting services should be managed. The paper begins with definitions of the key concepts, followed by a literature review and a discussion of the implications for IT service management.

Definitions

Business process. Business processes can be defined and modeled in many ways. Typical definitions mention a collection of activities, a progression of steps, and a goal or valuable outcome (Melao & Pidd, 2000). Furthermore, for any process, one may choose to emphasize different perspectives, such as function, behavior or information flow (Curtis, Kellner, & Over, 1992). Melao and Pidd (2000) sorted typical definitions in four broad categories: deterministic machines, complex dynamic system, interacting feedback loops, and social constructs. Lindsay, Downs and Lunn (2003) note that the process modeling techniques actually used are predominantly in the deterministic category.

Organizational routine. Organizational routines have been defined as repetitive, recognizable patterns of interdependent actions carried out by multiple organizational actors (Feldman & Pentland, 2003). These characteristics also define most organizational work processes and workflows.

To the extent that there is a meaningful distinction between "routine" and "process," it is one of scope: the term "business process" often refers to long chains of activity, like "order to cash" or "purchase to pay." Such processes are likely to contain many recognizable patterns of activity (e.g., order entry), each of which could be treated as a separate routine. The current research literature on organizational routines does not make this distinction. Organizational routines can be found in production, customer service, hiring, budgeting, strategy formation and every other part of an organization. They are the key means by which organizations convert inputs into outputs.

Service. Services have also been defined in many ways. Table 1 shows some widely cited definitions of services as identified by Rai and Sambamurthy (2006).

Reference	Definition
Vargo and Lusch (2004)	Capabilities or competencies that one person, organization, enterprise, or system provides for another.
Hill (1977)	A change in the condition of a person, or a good belonging to some economic entity, brought about as a result of some other economic entity, with the approval of the first person or economic entity.
IBM Research (2004)	A provider-client interaction that creates and captures value.
Fitzsimmons and Fitzsimmons (2006)	A time-perishable, intangible experience performed for a customer acting in the role of a coproducer.

Table 1: Definitions of Services

These definitions emphasize the roles of the participants (e.g., client-provider, producer-coproducer). These roles are important for analyzing the economics of a service (who pays whom, for what). The involvement of multiple actors mirrors the definition of organizational routines. Furthermore, for any service to be rendered, some pattern of action must have taken place. Thus, at the level of action, services share a common ontological foundation with

processes and routines. Like processes or routines, services are composed of recognizable, repetitive patterns of interdependent actions.

Two levels: type and instance. In the process modeling literature, processes are conceived as having two levels: an abstract type and particular instances. The type is the process model, and the instances are the specific cases where the process is executed. For example, in mortgage banking, there might be a different process type (or model) for each way to price a loan. The instance level consists of a particular customer getting a price on a particular loan. In principle, the instances conform to the type.

In the literature on organization routines, the same conceptual distinction exists, but different labels are used. For example, Feldman and Pentland (2003) refer to process instances as the "performative aspect," and the abstract pattern (the type) as the "ostensive aspect." In current theory, instances of a routine do not necessarily conform to the abstract pattern of the ostensive; rather, they help to create the abstract pattern, as participants construct their understanding of the routine.

Path dependence. Sydow et al. (2009) define path dependence as the tendency for past actions to influence future actions. Schulz (2008) argues that organizational routines are inherently path dependent, in the sense that actions in the present change the probability of which actions are most likely in the future. Like ruts in the road, patterns of action form as a result of experience and history. As a result, whenever there is a possibility of variation, merely executing the actions in a routine can lead to endogenous change (Feldman & Pentland, 2003). No external trigger is needed to initiate the change.

The potential for process instances to influence the underlying process model is not a part of conventional process models (flow charts, IDEF0, etc.). These models describe processes that are effectively *stationary*; they do not change over time (Lindsay et al., 2003). Fahland and Woith's (2009) model of disaster response processes offers a rare exception to this rule; as they themselves note, "Many works consider the adaptation of workflows by run-time application of transformation rules on a static process model." But in nearly all such models, "the process adaptation must be triggered externally."

Endogenous changes are not allowed in a typical process model, but they are easily observed in real life. Consider, for example, the way that a web browser stores URLs and cookies from recently visited sites, as well as recent searches, recent forms, and so on. In effect, it retains a trace of your recent actions. As you surf, the retained information makes it more likely that you will repeat those actions, as the browser autocompletes your typing and assists you in your work. On a larger scale, search and recommendation systems often embody a similar, path dependent quality (Orlikowski, 2007).

As a result of path dependence, routines have dynamic properties that are not envisioned in typical process models, such as inertia and endogenous change (Pentland et al., 2010). In the IT literature, processes are treated as stable unless managers introduce new constraints, affordances or incentives. But routines can display the opposite dynamics: they can stay the same when external conditions change (inertia), and they can change when external conditions stay the same (endogenous change).

Literature review

Having defined our main concepts and established some relationships among these concepts, we examine how they have been treated in the literature in terms of two fundamental categories: ontology and epistemology.

Ontology of action patterns: Static versus dynamic

When business processes are conceptualized as fixed, mechanistic things (Lindsay et al., 2003; Soffer & Wand, 2005), instances of a process conform to the model. Change can only be imposed from outside. We characterize this as a *static* ontology.

In contrast, in the literature on organizational routines, action patterns emerge from within the routine, through human agency and subjectivity (Feldman, 2000; Feldman & Pentland, 2003). This is a core idea in theories of practice (Bourdieu, 1990) and structuration (Giddens, 1984). As Giddens (1984) makes clear, this is an ontological issue; it concerns our fundamental understanding of what exists. In this view, participants can choose alternative courses of action based on their understanding of the situation. And because the individuals enacting the routine have agency, they may be looking into the past (re-enacting a precedent), improvising for the present (reacting to circumstances) or planning for the future (anticipating consequences) (Emirbayer & Mische, 1998).

Further, each participant has his or her own point of view, and they do not necessarily share the same understandings and goals. As Nelson and Winter (1982) argue, routines often reflect an informal "truce" between competing interests. Because participants have agency, organizational routines can change over time, even without any external intervention (Feldman, 2000; Feldman, 2003; Feldman & Pentland, 2003). This change is driven by the "participants' reflection and reactions to previous outcomes of the routine" (Feldman, 2000, p. 611). Such changes may be interpreted as organizational learning, where inferences from experience are encoded into new routines (Levitt & March, 1988). Alternately, as Ciborra (2000) argued, systems can simply drift and decay over time. Static models tend to mask these phenomena.

Epistemology of routines: Actual versus typical

It is difficult to gain knowledge about the exact state of an organizational routine (Feldman & Pentland, 2008). Organizational routines are often widely distributed in time and space and thus difficult to observe. The variable, dynamic nature of routines presents a further epistemic challenge: even if you could accurately observe one performance, it is unlikely to be representative of other performances.

Faced with this complexity, and the multiple points of view implicated in each performance, there is a tendency to rely on typifications (Reissman, 1993) rather than detailed descriptions of what is actually happening. Interview methods tend to produce typified process descriptions (Huckvale & Ould, 1995). Designers sometimes refer to typifications as the "happy path" (the best case scenario for a process that ignores exceptions and potential difficulties).

Comparison of the literature

We can use these insights to inform our understanding of business processes and to classify the way action patterns are conceptualized in the information systems literature. First, what ontology do we find: are action patterns treated as static or dynamic? Second, what is the

epistemological stance toward these patterns? Do we use actual data generated by a running process, or do we rely on typifications and normative process descriptions? To answer these questions, we conducted a quantitative analysis of the literature on processes and routines.

Methodology. First, we chose a set of topics based on a qualitative review of the literature related to service management and process management, as shown in Table 2. Rather than focusing on service management *per se*, we focused on the building blocks of services, which are processes and routines.

Topic (number of articles reviewed)	Example articles[1]
Business process modeling (N=40)	Becker, Rosemann and Uthmann (2000) Giaglis (2001) Melao and Pidd (2000, 2008) Recker, Rosemann, Indulska and Green (2009)
Business rules (N= 19)	Adam et al. (1998) Herbst (1996) Kardasis and Loucopoulos (2004)
Process reengineering and change (N=124)	Grover, Fiedler and Teng (1994) Kettinger, Teng and Guha (1997) Motwani et al. (1998) O'Neill and Sohal (1999)
Workflow and process automation (N=153)	Georgakopoulos, Hornick and Sheth (1995) Mentzas, Halaris, Kavadias (2001) Stohr and Zhao (2001) van der Aalst (2004) Reijers and Mansar (2005)
Business process analysis (N=10)	van der Aalst, Weijters and Maruster (2004) Rozinat and van der Aalst (2008) Tiwari et al. (2008)
Organizational Routines (N=48)	Feldman and Pentland (2003) Becker (2004) Pentland and Feldman (2005)

[1] To meet word count limits, we did not include a full list of articles.

Table 2: Topics Covered in Formal Review

Our goal was to locate the highly-cited papers within each stream of literature we had selected. Thus, we used Thomson's Web of Science (SSCI) to locate the articles, as it provides citation counts, and covers journals and major conference proceedings in business, IT, computer science, and related fields. We searched for papers that had 10 or more citations, looking for keywords in both the topics and titles of the papers. To prevent a North American bias, both the British English and American English spellings of the keywords were searched for (e.g. "organizational routines" and "organisational routines"). After removing papers on topics outside our scope (e.g. workflows in molecular biology), a total of 367 unique papers were retrieved. Some papers appeared in more than one topic, such as "process modeling" and "workflow management." Once retrieved, the citations for the papers and their abstracts were exported into the EndNote reference management software.

After we classified the articles into the different streams, the next step was to code the papers in terms of ontological and epistemological assumptions. Table 3 shows the criteria used to classify whether processes were understood to be "static" or "dynamic."

Criteria	Static	Dynamic
1. Is improvisation allowed during the execution of the process?	No: the process is completely defined in advance of process execution	Yes: the process is enacted while being carried out
2. Is the process described explicitly?	Yes: the process is written down, modeled, coded, etc.	No: the process exists in minds of the participants
3. Is the process description stored somewhere?	Yes	No
4. Do the participants have agency?	No: they have no choice about what to do	Yes: they have choice about what to do
5. Can the participants understand the process subjectively?	No	Yes

Table 3: Ontological Classification Criteria

Table 4 shows the criteria used to classify whether the process descriptions were based on "typical" or "actual" instantiations.

Criteria	Typical	Actual
1. Is the data about the process obtained from a live, running process?	No: the data is obtained from interviews, surveys, case studies, or other forms of retrospective recall	Yes: the process is taking place when the data about it is being collected
2. Is data collected from multiple iterations of the process?	No	Yes
3. Is the process description specific or generic?	Generic	Specific: it might include times, outcomes, sequences, etc.

Table 4: Epistemological Classification Criteria

Three authors coded the articles using these criteria. They first coded the articles in the "organizational routines" and "workflow management" categories and then checked the consistency of their understanding of the coding scheme. An inter-rater reliability check of the coding among the three coders resulted in a value of 67%. After discussing the results and clarifying their understanding of the coding criteria, two of the coders proceeded to code the articles in the remaining categories. The inter-rater reliability improved to 84%, and disagreements were reconciled to arrive at the final results.

Figure 1 shows the results of the coding process using a bubble plot, where the size of the bubble is the number of articles with 10 or more citations. For each stream of literature, the horizontal axis shows the relative number of articles where the ontology is basically static (vs. dynamic). The vertical axis shows the relative number of articles where the epistemology relies on typifications (vs. actual instances). On these two dimensions, four of the six streams of literature are clustered in the "static, typical" corner of the figure. Process modeling is the most extreme; it naturally leans towards a "static" ontology because it assumes that process descriptions can be formalized, explicitly stored and retrieved. The exception is the small (but rapidly growing) literature on process analysis, which is based on analysis of actual process event logs, which often contain exceptions, variations, improvisations and errors.

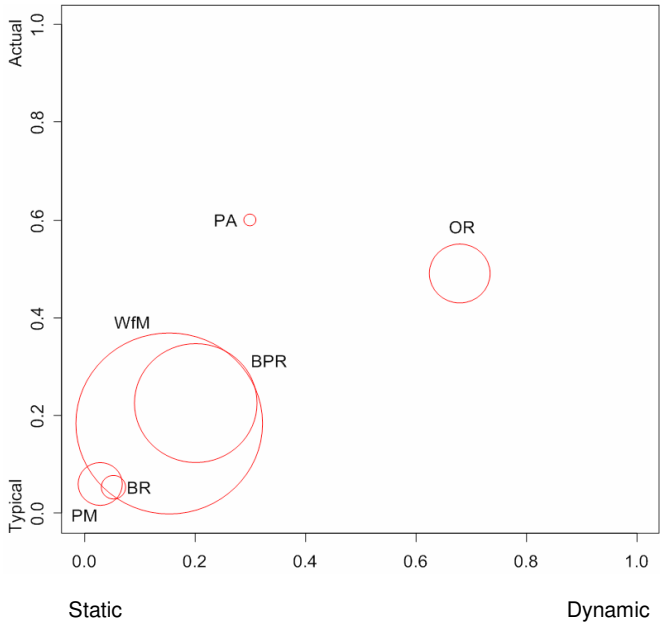

Figure 1: Classification of Literature

(PA = process analysis; OR = organizational routines; PM= process modeling; WM = workflow management; BR = business rules; BPR = business process re-engineering)

Discussion

The results in Figure 1 are consistent with earlier reviews in areas such as process modeling and reengineering. Our review suggests that a great deal of the literature involves representations of how a process *typically* works, or prescriptions of how it *should* work, rather than how it *actually does* work. Also, the vast majority of these approaches rely on static models. This is in line with Tumay's (1995) finding that over 80% of business process reengineering (BPR) projects used static flowcharting tools for business process modeling (cited in Irani et al., 2001). The literature on process analysis provides a significant departure, because it uses workflow event logs to capture actual process instances. But in the other streams of IS research, there is a strong tendency to model the typical performance of the process (rather than the actual), and to treat patterns of action as static objects.

In contrast, Figure 1 shows that the literature on organizational routines has a much greater tendency to treat patterns of action as dynamic and to rely on data from actual process instances. There are still a considerable number of articles that treat routines as "black boxes" (Pentland & Feldman, 2005). These papers generally adopt a theoretical framework from economics or strategic management, and use routines as an explanatory mechanism (rather than making routines the focus of inquiry) (e.g., Knott & McKelvey, 1999). The papers that focus on routines as a phenomenon generally treat them as dynamic and use actual data (e.g., Howard-Grenville, 2005).

Research on technologies to support business processes, such as workflow management, is also clustered towards the static/typical quadrant. Much of the research in these streams adopts a design science perspective (Hevner et al., 2004) and offers solutions to the problem of process variability and process control, among other design objectives. Thus, these streams of literature

deal with how technology can be used to streamline, rationalize and control IT-enabled processes; they are trying to codify search and minimize or eliminate exceptions.

Implications for service management

Because services are composed of processes and routines, differences in our assumptions about these building blocks are likely to have implications for service management. For example, Cohen (2007) argues that organizational routines are widely misunderstood as rigid, mundane, mindless, and explicitly stored somewhere. This is a good description of a fully automated workflow implemented in BPEL, for example. Implicitly or explicitly, this is how business processes are most often conceptualized: as fixed, mechanistic things (Lindsay et al., 2003; Soffer, 2004; Soffer & Wand, 2005). The model of a loan origination process presented by Sun et al. (2006) is a good example of such a model.

Formal service management techniques often attempt to create patterns of action that are explicitly represented and stored so that they can be reproduced exactly. In Cohen's (2007) terms, these techniques are trying to convert *live* patterns into *dead* ones. Cohen argues that dead routines are rigid and mindless. Dead routines generate patterns that are predictable, given the initial conditions. In contrast, any organizational routine that involves people who are capable of making decisions and learning from experience, is at least partially a "live" routine (Pentland et al., 2010).

Formalizing and storing a repeatable process model is undoubtedly a reasonable prescription for manufacturing processes or other processes that can be characterized as production lines (Levitt, 1972). But in most services, where the pattern of action is co-produced by a service provider and a client (Sheth & Sharma, 1997), it is unrealistic to assume that patterns of action are fully predictable. Variations are the norm, and may not be easily anticipated. Further, to understand those variations, reliance on typified data creates some risk. When the actual process starts to diverge from the happy path (for example, when an understanding breaks down), it is essential to have data on specific process instances.

Managing path dependence

Whenever we introduce variation into a process that includes human agents (or any mechanism capable of memory), we can expect path dependent effects to emerge (Pentland et al., 2010). In particular, it is possible for exceptional instances of the process to influence future instances, thereby giving rise to what Feldman and Pentland (2003) refer to as endogenous change. If the change seems positive, we may call it learning, but in either case, the process is changing.

This points to a potential dilemma in service management. On one hand, it may be important to promote learning and adaptation within a service. Incremental changes, brought about through interaction with customers, are an important mechanism for continuous improvement in service. On the other hand, to encourage re-combinability, process components must be stable and well defined. Changes must generally be suppressed and very carefully controlled and documented. However, by attempting to minimize the negative effects of path dependence, service managers may miss the positive effects of path *creation* (Garud, Kumaraswamy & Karnoe, 2010), such as learning, innovation and agility. Clearly, if service management adopts a "static/typical" view, it would be less well positioned to understand and manage this dilemma.

Conclusion

By examining the assumptions about the building blocks of services, we have identified a potential dilemma for service management. To foster agility and recombinability, service components must be fairly static (conforming to the assumptions of the IT literature in general). To foster adaptation and learning, service components should be more dynamic (conforming to the assumptions of the literature on organizational routines). Of course, real services embody a mixture of elements that will vary rather widely in their tendency to be static or dynamic. As organizations shift from outsourcing "utility" functions (such as communications and infrastructure) and IS development towards business processes (Smith & McKeen, 2004), the level of performance ambiguity changes (Bendapudi & Berry, 1997). For this reason, understanding the dynamics of the underlying processes will be an important area for research and practice.

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