Working Paper
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Making Rosetta Dance: The Combinatorics of Standardizing Interorganizational Service Processes

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Abstract

Attempts to develop open process standards, such as Rosetta Net, have had limited success in finding wide-spread adoption. Standardization of interorganizational business processes, previously viewed as aiding interorganizational collaboration, is shown to impede that collaboration in service contexts. We show that the modeling methods used to standardize inter-organizational processes fails to account for the impact such standardization has on managerial flexibility. Service production involves co-production between consumer and producer, giving rise to greater uncertainty in the sequence of production. Because of this uncertainty managerial flexibility is highly valuable in services. This will show that this uncertainty gives rise to an explosion in the amount of production sequences making coordination between organizations very difficult using process modeling paradigms imbedded in recent attempts at standardization. It will be shown a different approach to modeling processes is needed in a service context.

Introduction

Computing standards organizations, like Rosetta Net, have tried for years to develop interorganizational process standards with little success outside the IT manufacturing industry that initially established the organization. Workflow modeling technology is used by frameworks, such as Rosetta Net, as the language to express the processes. Current workflow modeling frameworks used in practice are unnecessarily restrictive, making coordination difficult in service contexts. Using a different approach to modeling processes could resolve this problem.

Services differ dramatically from manufacturing because production in services involves co-production between consumer and producer. A high degree of uncertainty results from this co-production (Argote, 1982; Jones, 1987). For example, in a manufacturing environment process variation is seen as indicative of poor quality (Oakland, 1996). In services by contrast, this variety can be a sign of the flexibility that is necessary for high quality (Feldman, 2000).

Co-production of output in services necessitates a dance between consumer and producer. In service industries the choreography of this dance-of-production is highly contingent upon the specific interactions of consumers and producers, which implies far greater uncertainty a priori in the sequence of events necessary for production of services. Choreographing this dance-of-production in services requires a fundamentally different modeling framework, which incorporates the flexibility that service production necessitates. Process modeling frameworks in use today evolved out of the modeling of manufacturing processes, which have the explicit goal of having as little variety as possible. Initially these modeling frameworks were adapted to model services in a project-oriented context. Projects, such as construction services or software design, are by definition unique. Constraints imposed by traditional manufacturing modeling frameworks are not excessively restrictive in a project environment because the sequence of production was customized for each instance (Meredith and Mantel, 2002). When these modeling frameworks are moved out of a project context into an ongoing service context, where the model is explicitly designed to handle multiple instances, the limitations that the framework places on flexibility becomes especially relevant. By failing to address inherent differences the production process between services and manufacturing, the use these modeling frameworks to form standards results in poor adoption because of the loss of necessary flexibility.

Conceptualization about the role of variety in services is supported by empirical work on task sequencing which has observed a high degree of variety in service settings (Pentland, 2003). Previous studies have shown processes to be a potential source of flexibility in organizations (Feldman and Pentland, 2003). It is necessary to examine what is meant by variety in a service context. Good service processes are like good manufacturing processes in that they are repeatable (Parasuraman, et. al., 1985). Services and manufacturing are different in that in a service context the customer supplies key inputs to the production process (Brown, et. al. 2002;). Because of the co-productive nature of service production repeatability take on a different meaning that in manufacturing. Repeatability in a service context refers to responding to customer requests in a consistent manner. For example, responding to a given customer request in a consistent manner from customer to customer would seem to be a mark of good service. In this respect services and manufacturing are very similar, but in services the service provider has little control over when and in what order the customer chooses to provide a given input to the production process. Often the expressed goal of good service is to be accommodating to a wide variety of circumstances, which viewed another way is the ability to handle a wide variety of inputs in as many sequences as possible.

In many service contexts the sequence of production is unknown to the producer prior to starting production because services involve co-production between consumer and producer (Argote, L., 1982). This uncertainty gives rise to a combinatorial explosion of feasible sequences. In this context a production sequence is feasible if it is consistent with employee or management understanding of how a process could be done, that is to say the sequence does not violate any expressed or implied business rules (Kumar and Zhao, 1999). It will be shown that, because of the number of potential process paths, coordinating electronically is difficult using current technology. Workflow technology in use today has been shown to be inadequate for addressing all the situations that may need to be modeled (van der Aalst, et. al., 2003). Current technology works by relaxing constraints on a single sequence model to explicitly specify the paths that are valid. Kumar and Zhao (1999) proposed a modeling framework, Process Constraint Language (PCL), which works by constraining a fully open model. By specifying what is invalid PCL minimizes the loss of flexibility and thus seems a far more appropriate approach to modeling service processes. We will show how an approach similar to PCL address assumptions in current workflow technology that impact the ability to coordinate service processes and are a far more appropriate means from which to develop process standards in services.

Concept Development

As economies develop service work plays a greater and greater role. Among modern industrialized nations it has been shown that service work exceeds manufacturing work in both dollar and employment level terms (BLS, 2005). Service work is only expected to grow in the future. Empirical economic research has shown IT to have different impacts in manufacturing than in services (Wimble, 2006). While empirical economic research provides and excellent starting point to identify possible areas that differences between services and manufacturing differ, a more detailed understanding of the exact mechanisms behind differences is needed. It has been shown that having flexible processes is preferred in service work and that information technology plays a major role in many service industries (Leidner, 1993). Previous work on services has shown that they differ from manufacturing in that the customer provides necessary inputs to the production process (Rothschild and White, 1995). The ability of a service provider to deal with a wide variety of situations is a mark of high customer service (Zeithaml, et. al., 1990; Cronin and Taylor, 1994) and a key factor in retaining customers in service environments (Keaveney, S., 1995). Service workers must be capable of developing novel solutions to the often unique situations they often face. A great deal of uncertainty results from this uniqueness often requiring a great deal of information processing (Bowen and Ford, 2002).

Increasingly information processing involves the use of workflow management systems, which are being used to define work processes in service industries. Workflow technology has been shown to break processes down into sequential steps for the precise aim of limiting task variety (Fletcher, et. al., 2003). Current process modeling technology has known limitations. Using Petri-nets it has been shown that all of the commercial process-modeling frameworks are unable to model some known workflow patterns (van der Aalst, et. al., 2003). In order to examine the impact of workflow modeling on flexibility and variety it would be helpful to look at the task sequences a given modeling technology produces. Measuring variety in processes has been accomplished by the coding of task sequences in several applications (Saberherwal and Robey, 1993; Pentland, 1995).

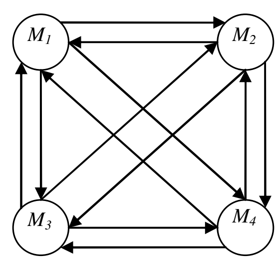
RosettaNet offers standards for implementation frameworks, business message schemas, process specifications using workflows, and data dictionaries. The process standards used by RosettaNet follow the standard workflow framework established by the Workflow Management Coalition (Piccinelli, et. al., 2002). The Workflow Management Coalition

(WfMC) which models processes in sequential steps (Holligsworth, D., 1994). While RosettaNet has been primarily adopted by electronics manufactures, Cluster 6 in RosettaNet is explicitly designed for customer service activities (RosettaNet Consortium).

Theoretic Development

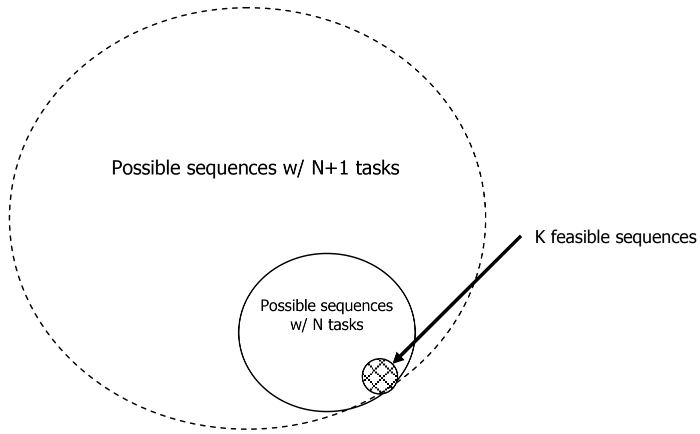
In order to understand why PCL-type approach to modeling is more appropriate for modeling services it is necessary to examine how inter-organizational process standards can lead to either a) the combinatorial nature of service process makes it is nearly impossible for organizations to find the sequencing and assignment of tasks on which they agree or b) even if they can find agreement the adoption of process standards destroys value. Process standards inherently forces managers to commit apriori to both who performs a given task and in what order it is to be done. By adopting inter-organizational process standards organizations greatly reduces one of the largest sources of organizational value, managerial flexibility. The magnitude of the reduction of this flexibility is not obvious until one realizes that both task-sequencing and task-assignment[1] gives rise to an explosion in the amount of production options available to managers. Interorganizational process can be viewed as containing two problems 1) a task-sequencing component and 2) a task assignment component. The two components can be viewed together as in figure 1.

Figure 1. A 4-task Interorganizational process



In order to develop an interorganizational process one must: a) determine the order the tasks are to be completed in and b) who or what is to complete the task. In this context if each task is to be done once and only once in each production sequence the number of possible sequences is a factorial function of the number of task to be completed, if a given task can appear in a sequence more than once this only greatly compounds the number of possible sequences. In this paper we will concentrate on the first problem, finding an agreement as to the task sequence. It is informative to first look at the nature of the explosion in the number of task sequences in a single organization context in order to understand the added complexities of interorganizational processes. Current workflow modeling frameworks in use today work by specifying a limited number of possible sequences and gradually releasing the constraints to allow for possible exceptions (Kumar and Zhao, 1999). Organizations often need to constrain the production sequence for a variety of reasons ranging from physical preclusion to purely aesthetic reasons. For example an organization delivering a service may require physical goods prior to service delivery because the service involves modification of the physical goods. If one attempts to specify a fixed number of feasible sequences the proportion of possible sequences that are feasible shrinks rapidly. Again feasible means the sequence does not violate any expressed or implied business rules. This is shown in figure 2.

Figure 2. Combinatorics of Task Sequencing



Given that service contexts have been shown to exhibit a great deal of variety, one would expect that K is relatively large in most effective service organizations. Assuming that k is relatively large in most service organization, coordinating processes interorganizationally adds a layer of complexity in that there must be agreement upon a feasible task sequences among organizations. Now consider the number of ways to order n number of tasks. The permutations of n number of tasks is

$$N!$$

Now consider that we implement the inter-organizational process using workflow systems which constrains the workflow to one task sequence. In this case by constraining the workflow to one sequence the loss of sequences is

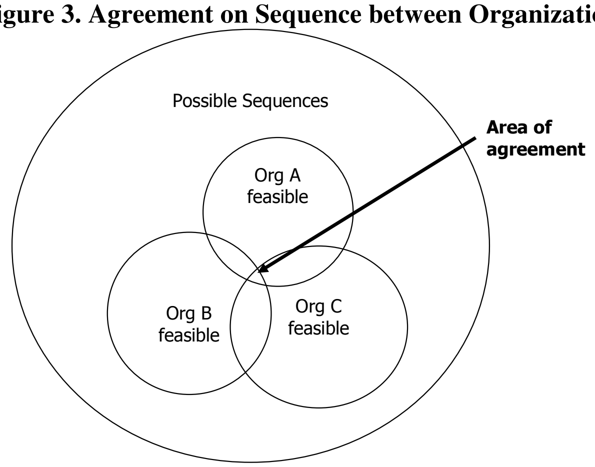
$$N!-1$$

Next, consider that management imposes a minimal number of restrictions. For example task A must be done first. This case results in a loss of

$$N!-(N-1)!$$

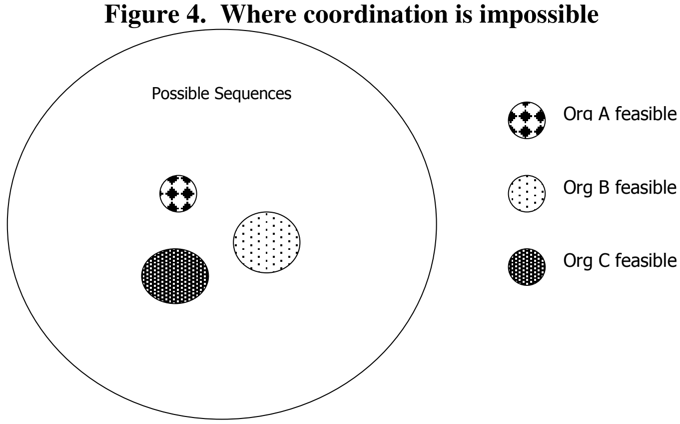
task sequences available to management. Complete agreement as to task sequence is needed when the process in electronically mediated, since the underlying computer application require specific pieces of information in a specific order to function since the workflow is imbedded within the application. In this electronically mediated context coordination is only possible when there is common agreement between as to task sequence all organizations. This agreement is shown in figure 3.

Figure 3. Agreement on Sequence between Organizations



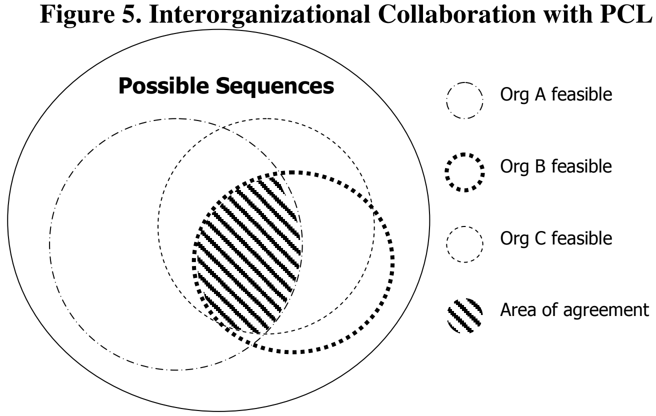
When organizations try to find an area of agreement to develop process standards this becomes exceedingly difficult due to the size of the search space because the area of agreement is so small relative to the size of possible sequences. Given that the space of agreement is likely to require a great reduction in the feasible task sequences, this raises the question if the organizations are even able to find the agreement at all given how large the space of feasible sequences is. If the number of sequences is highly constrained by each organization it is quite possible that the process cannot be completed interorganizationally because no agreement exists. This is shown in figure 4.

Figure 4. Where coordination is impossible



By utilizing a process framework, like PCL, that explicitly allows for greater flexibility it would appear that the probability of an interorganizational process overlap and the ease of finding that overlap. It is important to note that the more flexible framework both maintains the flexibility needed in service contexts and greatly increases the ease of interorganizational collaboration because it greatly expands the size of the feasible task sequences at the organizational level. This is shown in figure 5.

Figure 5. Interorganizational Collaboration with PCL



An Example

To illustrate this point, consider a travel agent as an example. The hypothetical travel agent performs four tasks: lodging, car rental, airfare, and also finds tickets to attractions such as local museums or sporting events or other such attractions where tickets are scarce and often purchased in advance. The travel industry makes a good example in that it has been shown to that customer service is especially relevant in this industry (Murphy and Tan, 2003). Next consider a given travel agent adopts a standardized process which constrains the process to the following order: 1) select airfare, 2) select lodging, 3) select rental car, and 4) select attractions. The travel agent is adopting the process standard because the various partners, used to the book the various items, within the industry are moving to the standard. While on the surface this constraint may not seem unreasonable, consider the impact on the flexibility that is needed in the industry. Consider a couple planning a vacation to Scottsdale, Arizona. First and foremost, the couple wants to visit a particular spa and a particular golf course. The couple wants to rent a convertible. They would like to upgrade to a mountain view room, but not exceed their strict budget. The couple has no preference on airline. The entire trip is contingent upon getting reservations at a particular spa and a tee time at a particular golf course. The budget for the hotel room is contingent upon what is spent on the spa, golf, and rental car. The problem with the constraint placed upon this system by the process standard is that it does not allow the couple to first book the attractions which determine what occurs in the rest of the process.

Discussion

This study has several important implications for both managers and researchers. For managers it is shown that the business impacts of adopting interorganizational process standards in a service may be very different the business impact in a manufacturing context. Managers should carefully consider how such standards will impact the flexibility that is much needed in a service context The study also reinforces the general idea that the production process in services is often very different from that in manufacturing. These differences are especially relevant in services given the often important role of information technology in service provisioning. For researchers this study provides some important insights as to both the potential impacts of interorganizational process standardization and a general framework for looking at processes in a service context. It is shown that process standardization, normally thought to be a positive thing, actually leads to a loss of much needed flexibility in service contexts. This study is not without limitations. The paper did not include empirical examination of the ideas proposed and the idea could generally benefit from some empirical examination of what is occurring in the field. This research opens up many avenues for future research. First, empirical research could be conducted to test the impacts of adopting process standards in service contexts. Empirical research in this area could take several forms from archival-based econometric study to a highly imbedded case study. Second, there is potential to use the ideas presented in this paper to develop a new modeling methodology specifically designed for interorganizational processes in service organizations. Finally researcher could develop valuation tools using real-options to help managers access the financial impact of the flexibility losses outlined in this paper.

Conclusion

Standardization of interorganizational business processes, previously viewed as aiding interorganizational collaboration, is shown to negatively impact that collaboration in service contexts. Modeling methods used to standardize inter-organizational processes does not account for the impact of standardization on much needed managerial flexibility. The co-production between consumer and producer in services gives rise to greater uncertainty in the sequence of production, making flexibility more valuable. The uncertainty inherent in services gives rise to an explosion in the of possible production sequences. Coordination between organizations becomes very difficult using process modeling paradigms imbedded in recent attempts at standardization. By using a different modeling framework, such as PCL, to modeling processes in a service context coordination become much easier.

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