Implementation Strategy alternatives for Coproductive services - a comparative study

S Sivakumar, B Mahadevan

Extended Abstract

Coproduction systems involve active participation of the customer in the creation of the core offering through shared inventiveness, co-design, or shared production of related goods and services. In these systems, an enabling environment is offered, where customers can invest their physical/mental effort to coproduce a customized offering according to their preferences (Etgar, 2008). Unlike pure self-service system, coproduction systems do not require all activities to be undertaken by customers. They typically involve a mix of activities split between the firm and the customer. The research objective of this study is to normatively evaluate two complementary implementation strategies for the firm to undertake its' share of activities; in the presence of coproduction by the customer.

Flexibility is a key capability required for coproducing customized offerings. Since product and service systems involve different types of flexibilities, we restrict our attention to service systems. We focus on two types of flexibilities viz. *Resource flexibility* (Daniels, Mazzola & Shi, 2004) and *Service modularity* (A Bask et al., 2011). Resource flexibility is the ability to dynamically reallocate one or more units of renewable resources from one process to another. It is also referred as multi-functionality or workforce agility. Service modularity allows the overall service to be componentized as modules and orchestrated in different sequences with different set of parameters to co-create the overall service experience. Resource flexibility (RF) strategy relies on the fungibility of a flexible resource to carry out different types of tasks, while service modularity (SM) strategy relies on orchestration of specialist service modules in different sequences/parameters to customize the service. The advantage of RF strategy is its ability to achieve higher economies of scope, while that of SM strategy is to harness specialization efficiency. The disadvantage of RF strategy is the higher cost of managing the resources, while SM strategy requires over-staffing of the system to deliver comparable service levels.

The research question is to normatively evaluate the performance of RF implementation Strategy vis-à-vis SM Strategy; given an exogenously specified coproduction level. There are no related studies on service systems under this setting. Prior studies in a manufacturing setting have compared strategies involving different types of flexibilities using techniques such as queuing and simulation models (Chan, 2001; Tsubone & Horikawa, 1999). There also exists relevant queuing based literature on performance of manufacturing/service systems (Bitran & Morabito, 1996; Mandelbaum & Reiman, 1998). We build on this stream of literature. However this study is different from the extant body of work as (a) it involves mixed implementation systems with varying coproduction levels (b) the strategic alternatives cost differentially and hence we consider the resource costs (c) the list of exogenous system factors on which comparison is made is wider than prior studies.

We employ a suite of analytical and simulation modelling techniques for this purpose. We use expected sojourn time and nodal resource utilization as system performance measures. We use queuing network based models to compare the performance of pure implementation of these strategies (when Coproduction level = 0) under steady state. We model a system implementing RF strategy as a M/PH/1 queue (Neuts, 1981) and SM strategy as a open Jackson network (Jackson, 1957). These models have distribution assumptions of Poisson arrivals and exponential service times. We then use Simulation models to study the performance of mixed implementation of these strategies (when Coproduction level >= 0) under steady state. We remove the restrictive distribution assumptions and use Erlang-*k* arrivals and Lognormal service times. Standard statistical techniques such as T-tests and ANOVA were used to verify the results. Adequate precautions for warm-up, replication and post-hoc statistical significance and robustness of results were taken care.

The results show that as Coproduction level increases preference of SM strategy increases. We also find this effect to be accentuated when the position of coproduction tasks within the

overall service process flow follows a particular pattern. We also characterize the preference of these two strategic alternatives via a single threshold policy. This involves a comparison of the cost leverage ratio of the specialist resource over flexible resource (γ) with a new defined system threshold called resource leverage indifference threshold (η). The preference for SM strategy is further accentuated under conditions of high arrival rates, high service failures (frequency/severity) and systems closer to tandem flow-shop than a jumbled job-shop. We also present interesting results on the shape of η curve w.r.t. the exogenous system factors. The results hold significant promise for furthering research in this space and insights for practitioner managers implementing coproduction systems.

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