Go Back

Dynamics of Application Service Provision Business Models

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Abstract

Demand for e-commerce capabilities and chronic shortages in the skilled labor pool have engendered a new genre of IT firm termed as the application services provider (ASP). These firms rent applications from independent software vendors and provide them to end users as a service. We present a variety of business models observed in the ASP market. Viability of these business models is predicated on an ASP's ability to become profitable while adding value to users' service needs. Typically, these business models aim at getting big fast (GBF) in order to exploit both the network externality and the economies of scale. We describe causal structures associated with one of these business models and argue that system dynamics simulations provide an ideal set up to conduct analysis associated with the evolution of GBF policies. We illustrate our argument using evidence gathered from an ASP engaged in development of IT based mortgage services.

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Introduction

"Application Service Providers (ASPs) deliver on a rental or lease basis and manage applications and computer services from remote data centers to multiple users via the Internet or a private network."

http://www.aspindustry.org/faqs.cfm

We begin this paper by describing software application usage in a large insurance company. Attendance for employees in this company are tracked, entered and retrieved using a payroll software application. This software application was purchased from an independent software vendor (ISV). The software is built using a time-sharing technology such that multiple departments within the insurance company are able to log in and access the information system and store data in a variety of standalone databases. The advent of application service providers (ASPs) represents a new type of business arrangement such that this insurance company merely rents use of the payroll software on a per transaction basis. The ASP, an intermediary firm, has acquired the software from the ISV that developed the payroll application. Time sharing capability enables the ASP to rent this software to either multiple departments in this insurance company and/or to multiple insurance companies. A senior manager from the insurance company explained to us that this scenario is classic candidate for outsourcing to the ASP because he is "chronically short" on skilled information technology (IT) labor pool, besides payroll updates is not a "core competence" for the insurance company.

This insurance company example is not an isolated instance of ASP value proposition. Recent growth in web usage in general and E-Business applications in particular has made ASPs into a potentially viable business model. This business model speeds up implementation, minimizes expenses and risks incurred across the application life cycle, and overcomes the chronic shortage of qualified technical personnel available in-house.

Growth of the ASP business models raises a host of strategic and operational issues. Most ASPs are facing stiff price competition and are struggling to turn in profit. The ASP market structure is seeing major flux in terms of firm entry and exit on the supplier side. ASPs routinely re-assess their own business model in terms of the network externalities and economies of scale that they must gain to attain or retain profitability. Hence, many ASPs tend to follow the “get big fast (GBF)” policy (Eisenmann and Pothen, 2001). Running in parallel to these economic questions are operational decisions such as appropriate level of application customization, conformance to industry standards, and timing for software upgrades.

In this paper we will argue that these decision problems call for a dynamic assessment of GBF policies. We begin the argument by describing the ASP market structure and the ASP value creation chain. We outline a variety of business models observed within this context. We present the system dynamic representation for one of the business models in the form of causal loop diagrams in section V. We use these loops to provide a policy analysis example for an ASP engaged in development of IT based mortgage services. This example demonstrates that while following the GBF policy is good strategy for gaining market share, operational choices in terms of software architecture and allied level of custom services must be considered within the GBF context to ensure ASP profitability.

II. Market Structure

Revenues for the application services industry have been projected to grow from $2.7 billion in 1999 to $22.7 billion in 2003. Trade press has attributed this growth to the desire to lower capital cost, need for accelerated time to market, and chronic shortage of in-house IS resources. Growth has been balanced by resistance to service outsourcing with in-house IS organizations, concerns for data privacy and security, and limited application availability due to poor reliability/ uptime. Coincident with the growth in the revenue, the total number of firms offering ASP capabilities has risen dramatically, for instance the membership of asp.org, a not for profit consortium has risen from 29 to over 700 in the past two years. This number includes not only pure play ASPs[1], such as Corio Inc., but also independent software vendors (ISV) such as Oracle and J.D. Edwards that view the ASP model as an alternate channel for their existing delivery model. Interestingly, very few of the start up ASPs have reported a profit over the past two years. Reports on segmentation and consolidation within this market are available in the ASP trade literature (www.aspnews.com).

III. Value Creation

The core value proposition for ASPs is to lower total cost of ownership (TCO for the end customer), make monthly fees predictable, accelerate time-to-market, provide access to market-leading applications, and allow business to focus on their core competencies (Jaruzelski et al 2000). Within the current market structure, pure play ASPs are facing harsh competition. They must differentiate themselves by adding value to the basic application developed by an ISV. ASPs typically rent a basic application, and then

[1] Pure play ASP are companies whose sole business is to lease applications and add value by providing software, networking and support services.

add value by helping the customer meet the requirements that are not provisioned in the basic application.

A value chain for application provision is shown in figure 1. An ASP's value chain has four key sets of activities: solution provisioning, distribution, service integration and customer interface. Provisioning covers activities related to the development of applications to be provided by ASPs to their customers and the development of the middleware that enables the remote delivery of these applications. Distribution describes the activities surrounding the delivery of applications to ASP customers. These activities include data center hosting, co-location services, and the enabling infrastructure for both the data center and network environment. Service integration activities are focused on integrating the ASP's services into the customer's operations. These activities include business process analysis, application customization and aggregation services, and customer-based integration. Customer interface activities focus on acquiring customers and managing the customer relationship.

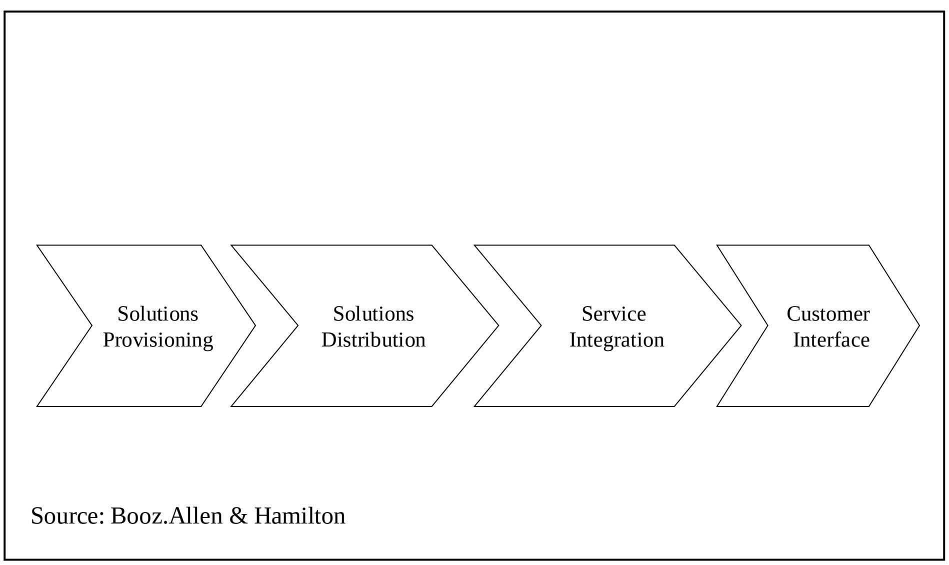


Figure 1. ASP Value Chain

In the next section we will develop a mapping for a variety of business arrangements, termed as Business Models, that we have observed within the ASP industry.

IV. Business Models

A business model is a method by which a firm builds and uses its resources to offer its customers better value than its competitors and to make money while doing so. It details the set of Internet and non-Internet related-activities that allow a firm to make money, now and in the long term. This model enables a firm to have a sustainable competitive advantage. In general, setting up a business model requires that the senior management executive has to make four choices (Rayport and Jaworski 2001):

1) the value proposition for the targeted customers
2) a market space offering, which could be a product, service, information, or all three
3) a unique defendable resource system
4) a financial model.

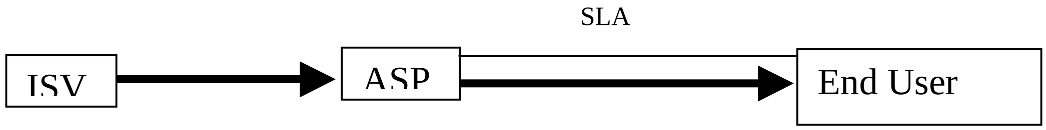
We have created maps for a variety of ASP business models by dividing the application supply chain into three or more segments as shown in figure 2. The term VAR refers to value added resellers or channel partners that are in the industry either with or without an ASP business model (Foster, 2000). ASPs typically rent a basic application, and then add value by helping the customer meet the requirements that are not provisioned in the basic application. ASPs guarantee certain performance in a service level agreement (SLA) in exchange for a fee for the service provided. The thick arrow shows the flow of value creation, while the thin line represents the existence of a contract (SLA) across organizational boundaries. The motivation for developing this mapping has been to establish a basis for analysis of ASP business models using the system dynamics methodology.[2] An illustrative analysis is described in sections V and VI.

The first business model (BM-1) in figure 2 represents the basic arrangement, in that the ASP, e.g. Corio Inc, develops wrapper type of application integration capabilities for selling basic applications such as Great Plains's pay roll solution to an end user such as the insurance company described in section I. BM-2 represents a solution where the ASPs, such as Breakway Inc., service their end customers by augmenting consulting services so that VARs can access the customers too. BM-3 represents the business model for firms, e.g. Loudcloud Inc., that have developed a close relationship with various ISVs such that they understand the integration issue between applications and enable VARs to secure SLAs with end customers. The last two models represent two different varieties of aggregations (Madnick and Siegel, 1999). BM-4 is the application aggregation or the portal model. Two well know examples of services following this model are Yahoo and Jamcracker Inc. These ASPs provide the end users with a menu of choices based on pre-screened and integrated applications selected for their quality of service. BM-5 refers to the data aggregation model. One key difference between BM-4 and BM-5 is the need for heterogeneous set of end-customers such that the primary market receives a cost subsidy based on aggregated data sold in a secondary market. Some examples of companies following these types of model are Maxmiles and REaxon.

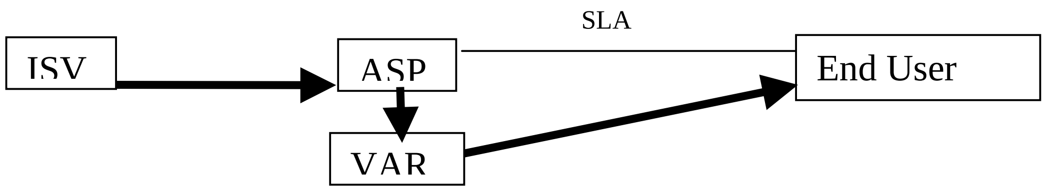
Formal arguments for bundling and for the economics of cost subsidy within complementary markets are available in the literature (Bakos and Brynjolfsson, 2000; Parker and Van Alstyne, 2000). We emphasize that these mappings are not an exhaustive

[2] We have mapped five stand alone BMs. An ASP can engage in multiple BMs. A direct engagement between ISV and VAR or end customers is not shown for ease of exposition.

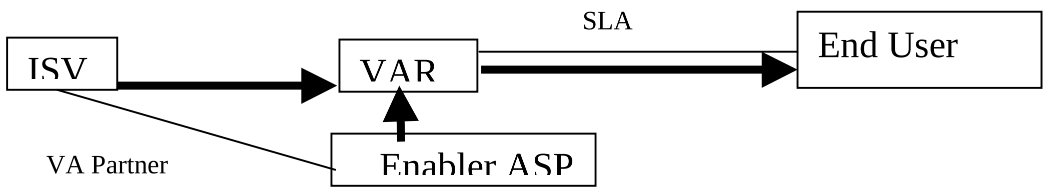
list of possible business models within the ASP sector but a representation of models that we have observed in the marketplace. The reader can augment the list based on maps of other innovative application provision arrangements.



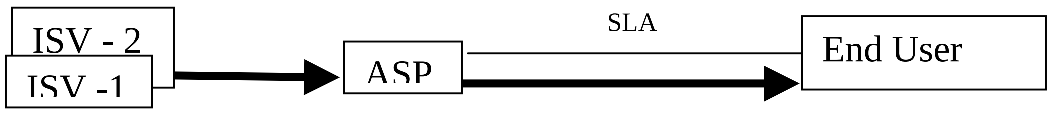
BM-1: Basic Application Provision



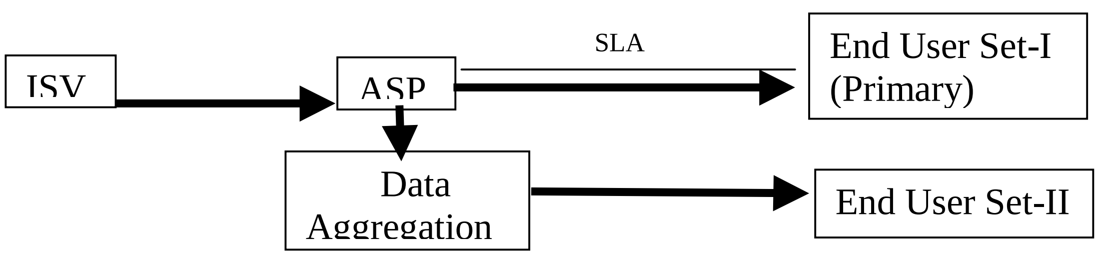
BM-2: Channel access/referral through a VAR



BM-3: ASP provides the Infrastructure to enable VARs



BM-4: Application Aggregation



BM-5: Data Aggregation Service for Alternative Markets

Figure 2: ASP Business Models

Creation of value for the end customers within a business model is a necessary but not a sufficient condition for returning an ASP to profitability. Many business writers have recognized that the underlying economics tend to rely on a "get big fast (GBF) strategy (Eisenmann and Pothen, 2001). They have argued that the GBF strategies work particularly well in the presence of network externality and scale effects. Such strategies implicitly presume that managers within an ASP will account for dynamic effects such as the variable size of the installed base while making operational decisions such as service capacity design and the amount of customization that ought to be offered by way of adding value. However, formal policy analyses that shed light on the tradeoff associated with these dynamics are difficult to find in the literature.

Since each of these five business models involve a variety of time delays and non linear cost structures, system dynamics (SD) is an appropriate methodology for analyses of GBF policies. In the next two sections we illustrate a SD based policy analyses by using the case evidence generated from an ASP engaged in the data aggregation business model. Similar SD models can be built for the other four business models described in this section.

V. Causal Structure underlying the Data Aggregation Business Model

The structure described in this section is based on interviews conducted at an ASP engaged in the mortgage industry. The Chief Strategy Officer for this ASP indicated that they set up their business by recognizing an "opportunity to leverage economies of scale around the usage of third party software" in their target segment. We model their business by following the path dependence and positive feedback structures developed by

Sterman (2000). Structures underlying the network effect and economies of scale are described using a causal loop diagram in figure 3.

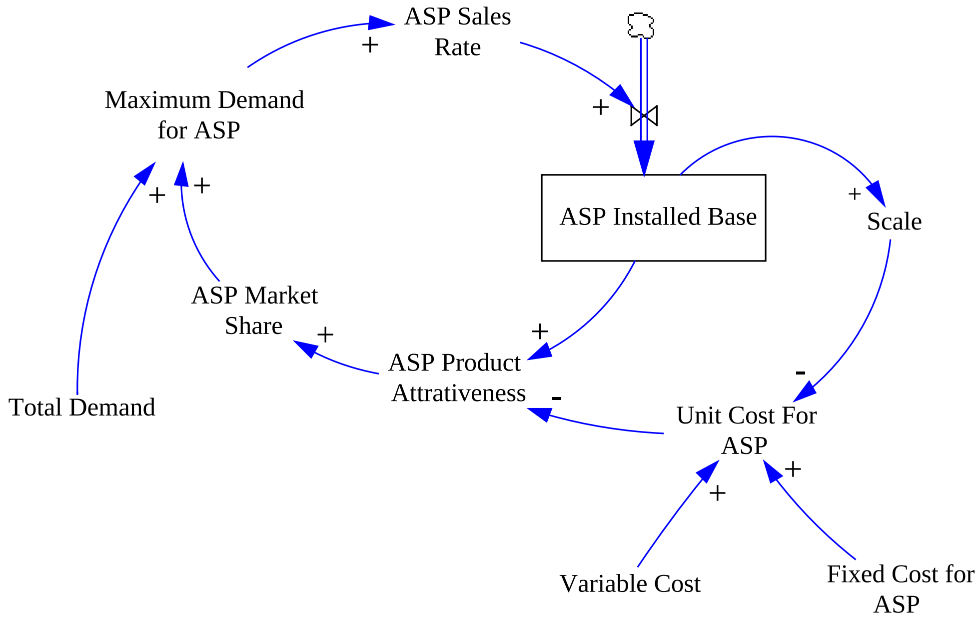


Figure 3: Market Share Acquisition Loops

The reader can ascertain, by inspection, that these feedback loops result in the growth of the market share for the ASP as the installed base rises and the unit cost drops. Based on the description of the demand pattern evolution, and for ease of exposition, we have made the following assumptions while formally implementing the causal structure:

(i) The total demand for value added service is constant within the target segment

(ii) Sales for the ASP follow a classic Bass diffusion pattern (Mahajan et al 1990). The market share for the ASP is computed using a “US/(US+THEM)” formulation, where US represents the ASP and THEM represents the competition, including the ISVs (Lilien et al, 1992).

(iii) The price of the service is same as variable cost for the application set by the ISV. The fixed cost for the ASP is greater than zero. The fixed cost includes the cost of renting the application from the ISV, and the cost of integrating valued added features into the application. For detailed discussion of adding value via application integration the reader may refer to Balasubramanian et al (2001).

Managers in our subject ASP were keen on following the GBF strategy within their primary customer segment. However, they have to grow their installed base and simultaneously raise the size of the aggregated database. Implementation of this dual strategy hinges on their technical teams' ability to manage fixed costs in terms of amount of value added features that could be "hardwired" into their own software. Hardwiring implies increasing the fraction of the value added features embedded in their software. Hardwiring results in the following causal logic:

(a) Once implemented, it increases the product attractiveness, and increases the installed base. This increases the size of the aggregate database.

(b) It reduces the opportunity to provide customized service solutions. Reduction in customized solutions lowers the variability and average number of database entries per user. This reduces the size of the aggregate database.

The tradeoff between causal logic (a) and (b) is captured in figure 4. This modified causal structure works in conjunction with the market share acquisition loops shown in figure 3. A reader can trace the causal links and ascertain that the fraction of VA embedded in software can either increase or decrease the ASP cost subsidy. The cost subsidy resulting from data aggregation is nonlinear in nature. Aggregation requires the database to rise above a “critical size” threshold before it can generate significant revenues and provide cost savings within the primary market. Given the nonlinear nature of this structure, the impact of raising the fraction of value added (VA) embedded in the software couldn’t be judged by mere inspection of the loops in figure 4. The results depend on the parameterization of the underlying model and running simulations. In the next section we present the simulation results and discuss their managerial implications.

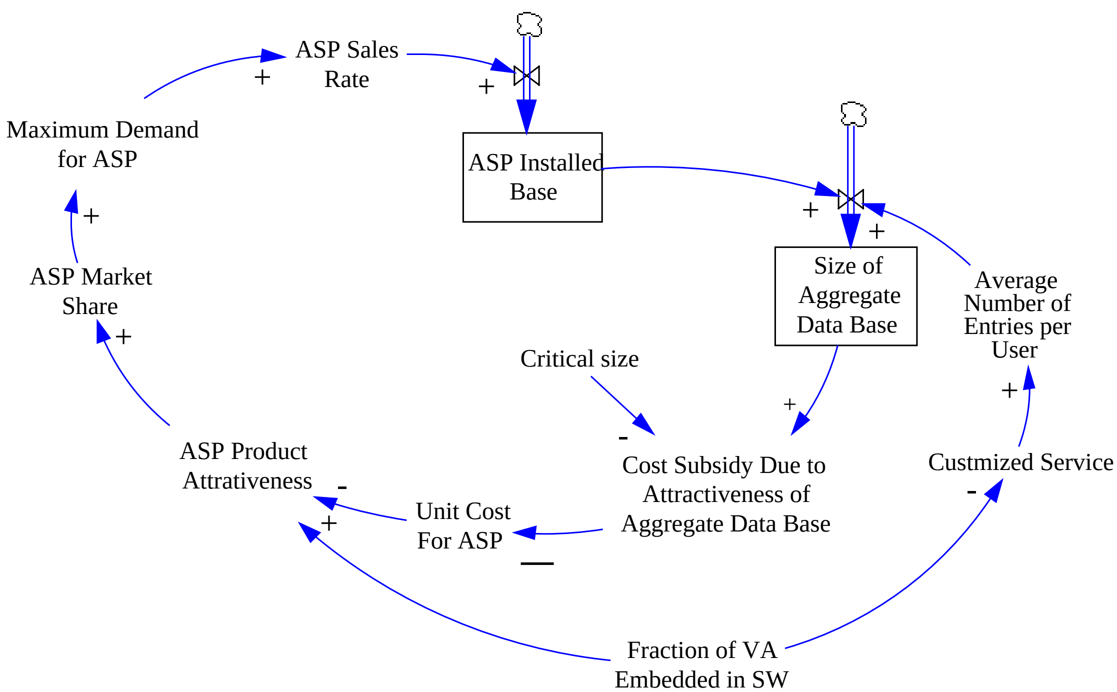


Figure 4: Data Aggregation Tradeoff

VI. Preliminary Results

We assume that the ASP must price its service at the same level as its unit cost for renting the software. This is a reasonable assumption within the competitive context for the case that we have studied. This assumption allows us to exclude competitors, market clearing mechanisms, and the price variable from the model. Also, this implies that the managers for the ASP can focus their attention on two distinct performance measures: **size of the installed base** and the **unit cost for the service**.

We present the simulation results for a basic ASP case (BM-1) by setting the average number of entries in the database per user to zero.

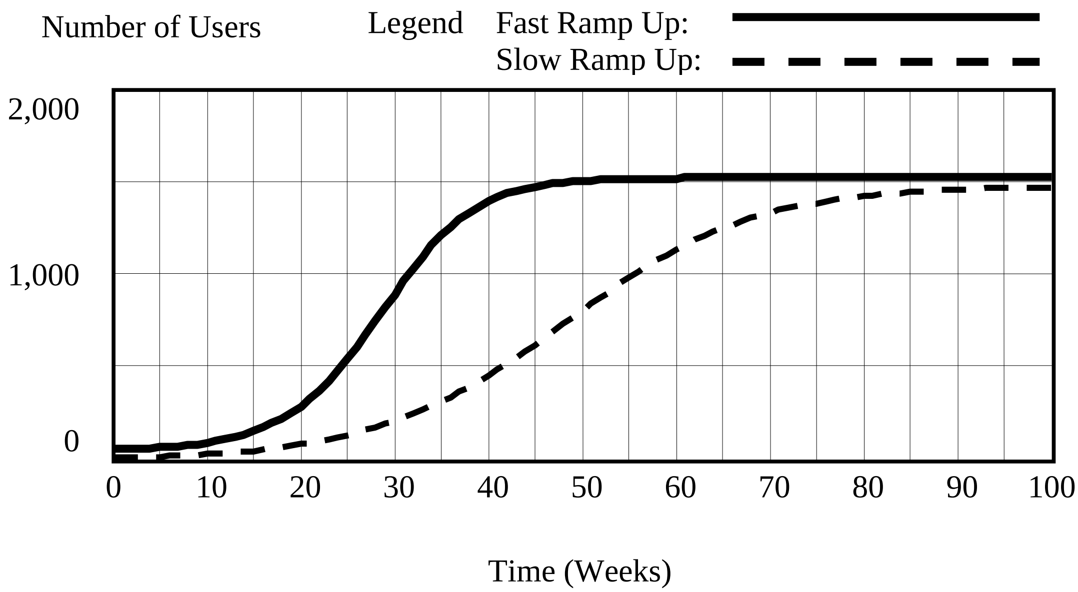


Figure 5: Size of the Installed Base in the Basic Case

Figure 5 shows the size of the total installed base for the basic case (i.e. BM-1 in figure 2) with the fraction of value added embedded in the software set at 100%. These results are preliminary in the sense that the parameters have not been calibrated to fit the case data. Arguably, even these stylized results are instructive because they highlight the relevance of managerial choices on the dynamics of the business model. The unit cost of the software license has been set at $100/use/week without loss of generality. Details on rest of the parameters are available. The fast ramp up rate corresponds to a one-year introduction cycle, while a slow ramp up has been set to replicate a two-year cycle. Figure 6 shows the corresponding unit costs.

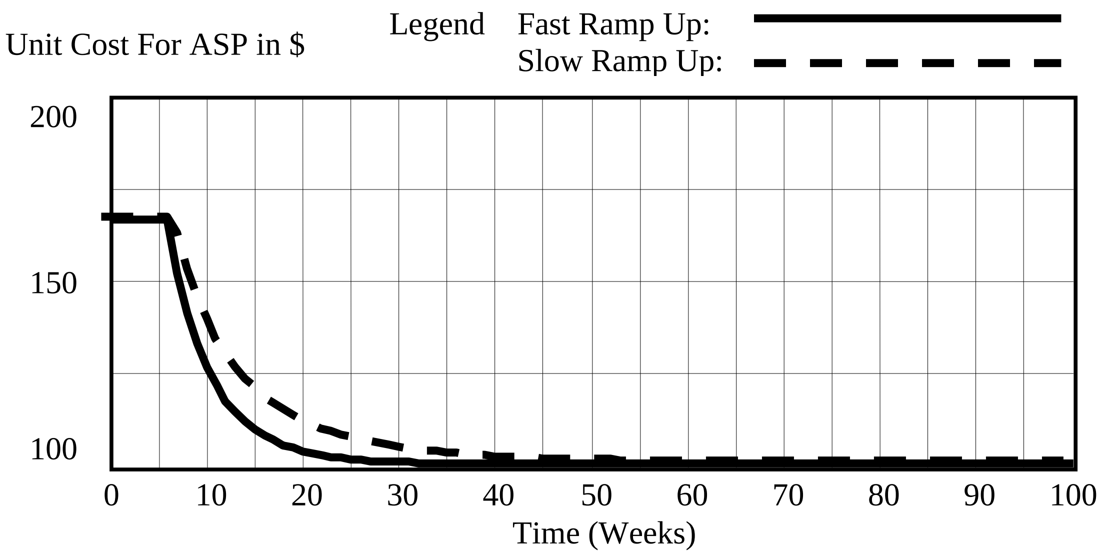


Figure 6: Unit cost in the Basic Case

These simulations confirm that the positive fixed cost keeps the unit cost for the ASP above $100, i.e. the cost of renting the application, regardless of the rate of ramp up. Recall that the ASP must bring its unit cost below $100 to make an application service transaction profitable. BM-1 cannot turn any profits. We now present the unit cost results for BM-5 with the data aggregation subsidy in place. Figure 7 shows the unit costs with value add (VA) fraction set at 100%, and figure 8 shows the unit costs with VA set at 0%.

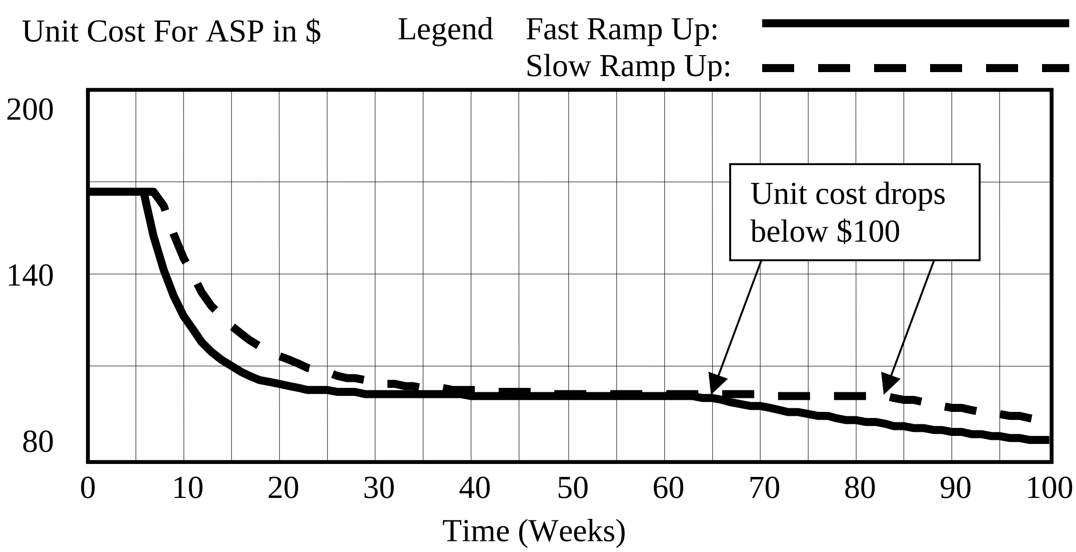


Figure 7: Unit Cost Without any Custom Service

VA fraction set at 100% corresponds to the case where the ASP embeds all its value add features into software and does not provide any customized service for individual users. VA fraction set at 0% corresponds to the reverse case, i.e. all the value added is provided through customized service and none of the VA features are hardwired into the software.

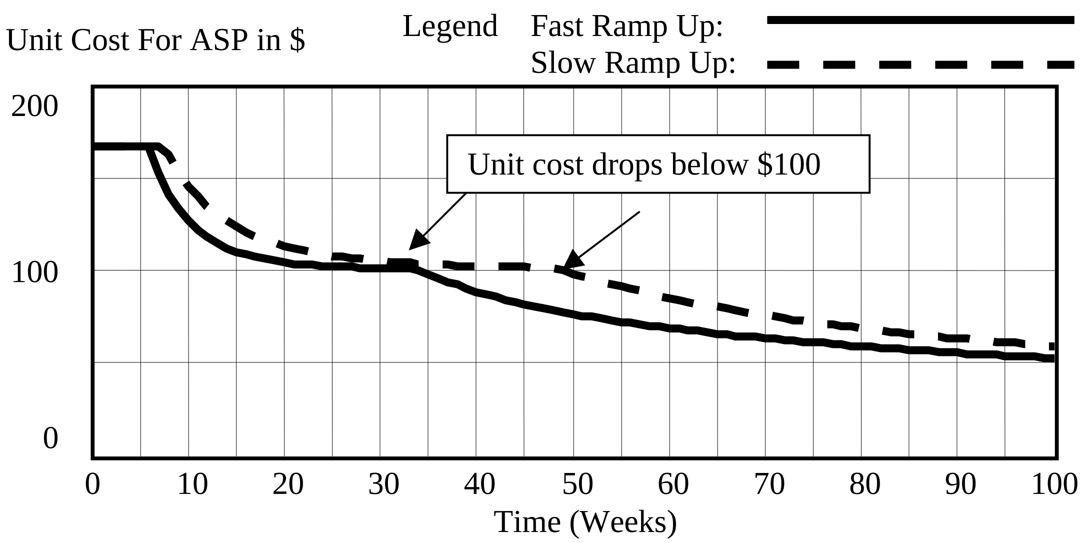


Figure 8: Unit Cost with Full Custom Service

Simulation results shown in figure 7 correspond to scenarios where the VA features are hardwired and the ASP does not provide any custom service. The subsidy causes the unit cost of service to drop below $100 in week 64 and 84 corresponding to a fast and slow ramp up. Similarly, the critical unit cost drops below $100 in week 34 and 49 when all the value add is provided through a custom service.

These results have several managerial implications. Running a fast ramp-up or getting big fast (GBF) is a good policy for the selected set of parameters. However, the manager needs to pay attention to the amount of custom service provided to the end users. The model has been run with a constant fixed cost for the two extremes of value added options. A manager is expected to have a reasonable understanding of the costs and time scales associated with adding hardwired features and providing custom service. She can select any amount of customization between 0 and 100% depending on the cost structure. Based on these simulation results, she will be well served by increasing the amount of customization as much as possible.

The preliminary model has certain limitations. Strategic considerations beyond the boundary of this model play an important role in interpretation of the results. In the case under consideration, the management team was acutely aware of the need to "hold the end user's hands" by providing custom services. Strategic value for such closeness with the customer goes beyond the results of the preliminary model. A closer relationship is likely to result in a higher customer loyalty. To paraphrase the customer support manager: "there is a lot of customer hand holding and education needed when you ramp up an ASP." Ironically, some competitor ASPs in this market segment had focused on expending their resources around hardwired solutions and are about to go under because of cost pressures and the lack of customer loyalty. The boundary of the preliminary model can be expanded to enumerate the effect of customer loyalty. Arguably, it will further reinforce the need to conduct a detailed dynamic analysis of the business model.

Conclusion

We posit that the existence of two loosely connected sets of positive loops is a generic characteristic for many information services in outsourcing settings. Based on a case evidence and some simplifying assumptions, we have shown that conventional wisdom, such as get big fast (GBF) policies, may not be adequate in developing a keen understanding of the data aggregation business model in a dynamic setting. More generally, in this paper we have developed a series of ASP related business models. Each one of these models has a unique profitability driver associated with it. Sustaining profits require going well beyond the conventional "get big fast (GBF)" wisdom. These settings call for analysis of coupling effects between broad business strategies and operational choices such as software architecture and service customization. System Dynamics provides a useful methodology to carry out such analyses.

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