

Service Oriented Architecture as a Dynamic Enabler of Customer Prioritization

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ABSTRACT

Today's dynamic marketplace demands firms to sense and respond quickly to customer requirements. Recent research has shown that customer prioritization leads to more sales and profitability. Though there are many tools such as CRM, statistical and data-mining packages that can help with customer prioritization, this paper bring to the fore-front Service Oriented Architectures' (SOA) potential as an underlying enabler of customer prioritization through dynamic customer relationships. SOA has the ability to proactively understand and enable the ability to deliver customer needs thereby improving a firms chance to retain its customer base and meet customer service expectations by optimizing the use of their customer service personnel. This conceptual paper describes how SOA holds promise as a form of business intelligence that dynamically 'informatess' business activities and decisions. A case illustration concerning the use of a Customer Priority Index (CPI) outlines how SOA can be a powerful enabler of customer prioritization.

Key words: *Customer priority, Service Oriented Architecture, SOA, Customer Priority Index, Customer prioritization, Dynamic customer relationships, Customer relationship management*

INTRODUCTION

There is growing interest in firms to build customer relationships and customer retaining strategies. The dynamic nature of the marketplace requires firms to explore avenues to improve their revenues while at the same time keeping a rein on their existing customer

base. Business acquisitions and mergers complicate how customer relationships and customer retaining strategies can be achieved. Firms are beginning to realize the need to prioritize their customer base whether existing or acquired, on a dynamic basis. Preferential treatment of customers results in positively influencing relationship commitment, increased purchases, share of customer, word of mouth, and customer feedback (Lacey, et al. 2007). Zeithaml, et al. 2001 argue that customer profitability can be increased and managed by sorting customers into profitability tiers (a Customer Pyramid).

Firms are moving away from static segmentation of their customers since it results in erroneous prioritization of customer segments (Homburg, et al. 2009) and seek to maximize customer lifetime value and customer equity (Kumar, et al. 2006; Venkatesan and Kumar, 2004). Also, the pay off from customer prioritization shows that higher average customer profitability and a higher return of sales is achieved since it (1) affects relationships with top-tier customers positively but does not affect relationships with bottom-tier customers and (2) reduces marketing and sales costs (Homburg, et al. 2008). Barriers in the form of organizational culture, structure, processes, and financial metrics of the firm deter a firm from becoming customer-centric.

Earlier strategies of firms to segregate their customer bases and support them with separate technology silos were often brought about by mergers and acquisitions and/pr corporate laws that require segmentation of their business units. Technologically speaking, such mergers created vexing issues such as identifying and removing duplicate technology systems, merging customer segments and bringing homogeneity in the business and services offered to the customer. Even without mergers, firms have been battling issues with lack of uniformity in the services to their different customer segments. As a result, corporations are faced with the challenge of managing large volumes of data and finding new ways to integrate information from different business segments (Sambamurthy, et al. 2003).

Faced with such customer and data integration needs, firms often turn to Business Intelligence (BI) tools that are data driven decision support systems (DSS) to help them gather and store data along with the capability to provide analytical capabilities such as slice and dice, ad-hoc queries and forecasting (Negash, 2004). BI tools have propagated into most areas of the firm such as marketing, finance, accounting and customer service. With mergers and acquisitions, Customer Relationship Management (CRM) has been a hot button issue for businesses for quite some time now (Shankar and Winer, 2006). The importance of customer retention through maintaining or exceeding service expectations has resulted in firms investing in customer relationship management (CRM), which is a business strategy that leverages marketing, operations, sales, customer service, human resources, R&D and finance, as well as information technology and the Internet to maximize profitability of customer interactions (Chen, et al. 2003). CRM also helps with targeting customer segments with tailored promotional activities (Reutterer, et al. 2006) and is increasingly important in current marketing research and practice (Terho and Halinen, 2007).

Research finds that customer management strategies change as more business intelligence is discovered about the value of the customer using CRM (Ryals, 2005). CRM has proved critical in helping firms make more money by enabling them to identify the best customers and then satisfy their needs so that they remain loyal to the firm (Payne and Frow, 2005). However it should be noted that Customer Relationship Management technology is a complex suite of applications. Implementing this technology successfully to improve customer relationship performance requires a thorough understanding of organizational information processes (Jayachandran, et al. 2005).

Though there are several BI and CRM tools in the market that thread through the various architecture silos in an attempt to establish good customer relationships and retention strategies, Service Oriented Architecture (SOA) with its ability for establishing homogeneity and commonality in the business services provided to the customer, provides a dynamic method for firms to retain their customer base and improve customer relationships across segments. SOA is a technological service paradigm designed to integrate business segments by providing automated handshake mechanisms using meta-relationships (Knorr and Rist, 2005).

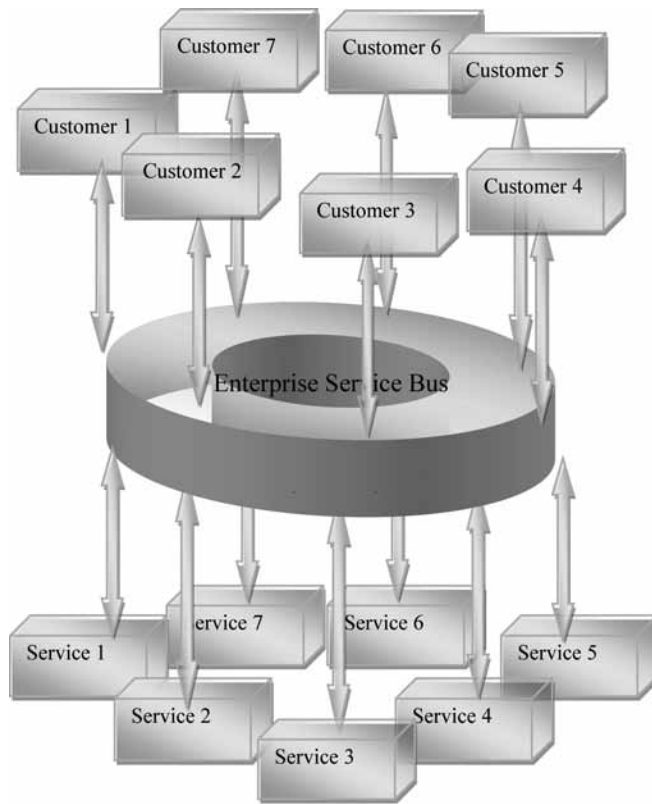
SOA is a computing architecture which not only builds information systems but helps to integrate and organize computing resources (Ren and Lyytinen, 2008). SOA creates services that are independent of each other and are used by all customer segments within the firm. How and what each service should do for a particular customer or customer type is determined by a business rule engine. This real time mechanism has the ability to tie-up disparate components included within a particular service and presents the data uniquely to each customer. This feature not only ensures homogeneity in the information presented to the customer but also enhances the visibility to the service. The capability for homogeneity and visibility in SOA presents the firm with the ability to dynamically gauge the priority attached to each service from its entire customer base.

We propose the concept of SOA intelligence through the creation of the Customer Priority Index (CPI) which exploits the homogeneity and visibility in the business process to benefit the firm in the areas of customer relationships, customer retention and provide better capability for the firm to plan its customer support activities. The following sections discuss the principles behind the creation and implementation of SOA in a firm. This is followed by an explanation of the basis to create the CPI model, a case study and its benefits of implementing the SOA intelligence stage.

SOA IMPLEMENTATION—GUIDING RULES AND PRINCIPLES

Proper deployment of SOA usually occurs in conjunction with the re-design of business processes to make them more integrated, streamlined, and flexible (McAfee 2005). A Service Oriented enterprise organizes itself around autonomous components called services that interact with similar entities within the business ecosystem. Existing systems

Figure 1. Enterprise Service Bus



can be integrated into a SOA via programming a service-oriented facade around the systems in order to make them compatible with SOA (Baskerville et al., 2005). The Enterprise Service Bus (ESB) could be called the nerve center for SOA. The ESB can be used to combine these services to form a composite business process fulfilling the customers' need. The ESB, as shown in figure 1 coordinates the interaction between different customer segments with the common services offered by the firm. Also it interfaces with the data layer and provides the necessary information in a consistent manner. The ESB has the ability to communicate using various protocols that allows legacy applications and new applications to effectively talk with one another. Any new customer requirement is fulfilled by connecting the appropriate services together, orchestrated by the ESB providing a secure and consistent way of delivering the information to the customer.

The Business Rule Engine (BRE) helps to merge sub-components of a service based on the segment that a customer belongs to and delivers relevant information with the help of the ESB. The BRE maintains a list of the services offered in a central repository. This information includes the interface of the service, the inputs required, output produced, communication protocols and the service level expected. This information

about a service is then used by the business rule engine to identify appropriate services for a customers' need and then eventually facilitate service orchestration.

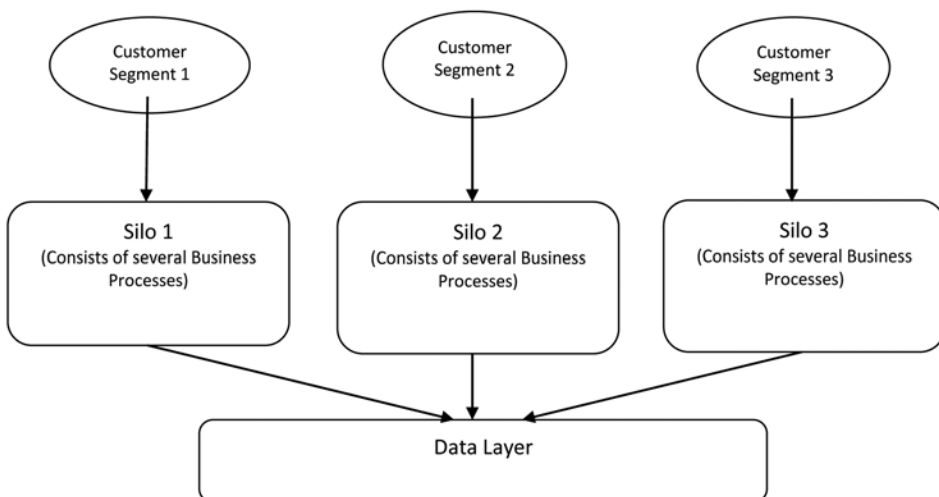
SOA BUSINESS INTELLIGENCE

SOA may deliver great opportunities for multiple areas of application, but it always depends on the business strategy whether a new technology, system, or infrastructural paradigm matches with the organization's requirements and thus with the resulting IT strategy (Luftman, 2000; 2003). Firms use business intelligence (BI) in domains such as marketing, finance and accounting. The clarity in the information gathered from service usage and their priorities in business transactions provided by SOA can help companies augment their business intelligence techniques in domains such as finance, accounting, and marketing and improve CRM efforts. An important bottom line revenue impact for any organization is its customers. Firms also can focus more easily on its actual core competencies and even better utilize them by offering particular services to other firms (Lammers, 2004). For many companies, the biggest immediate potential gain of using SOA intelligence is in the area of customer prioritization which drives customer profitability by reducing marketing and sales costs and thus implies a more efficient use of marketing resources (Homburg et al. 2008).

SOA intelligence is one such BI approach to CRM. The following sections lead to an elaboration of the Customer Priority Index (CPI). Addressing perplexing business issues, namely customer homogeneity and the addition of the service layer brought about by the SOA implementation helps to explain the creation of the CPI.

1. **Customer Homogeneity** - Architecture implementations prior to SOA, typically served the needs of homogenous groups of customers. Their service expectation lev-

Figure 2. Homogenous sets of customers with unclear delineation of business and services used



els were reasonably well understood by their service management groups. This led to the development of silos, each serving a particular group as shown in figure 2.

However, SOA implementation dismantles these silos and extracts similar functionalities to create a set of common services that are accessible to all customers. As a result, the company is typically forced to adopt a much more generic internal Service Level Agreement (SLA) for its entire spectrum of customers. This potentially negative immediate consequence of SOA prevents the firm from catering to the unique needs of its different customers, which may cause misalignment of service level expectations of a customer relative to the service levels actually delivered.

2. **Addition of the service layer** - Furthermore, the introduction of SOA results in the creation of an additional common service layer critical to all operations and adds overhead to service management, as shown in figure 3. The current mechanism of using generic SLA's may lead to misalignment of resources and priorities. Krafzig, Banke, and Slama (2005) proposed a hierarchical perspective on SOA, in which includes the Application Front End, the Service, the Service Repository, and the Service Bus. Accordingly, only the Service child has children, consisting of Contract, Implementation, and Interface. Finally, the proposed hierarchy is composed of Business Logic and Data, children of Implementation.

To address these potential problems of misalignment between expectations and delivered services, firms may resort to just raising their generic service level to meet the requirements of the customer with the highest service level expectation. Though the so-

Figure 3. The addition of a service layer creates overhead for Service Management

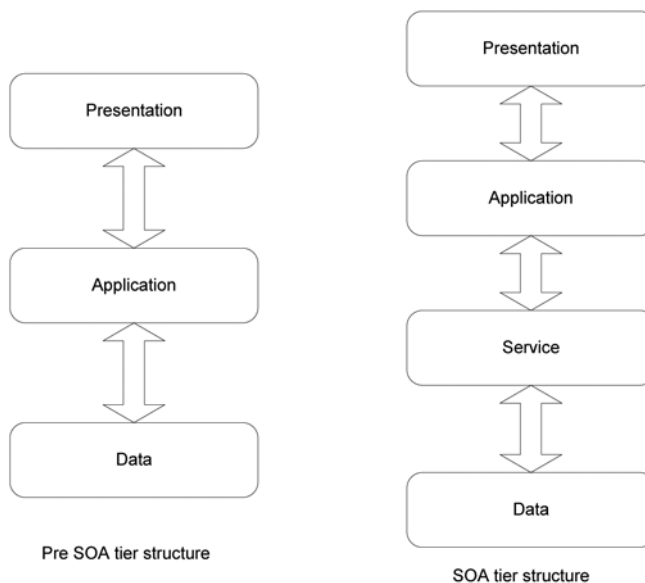
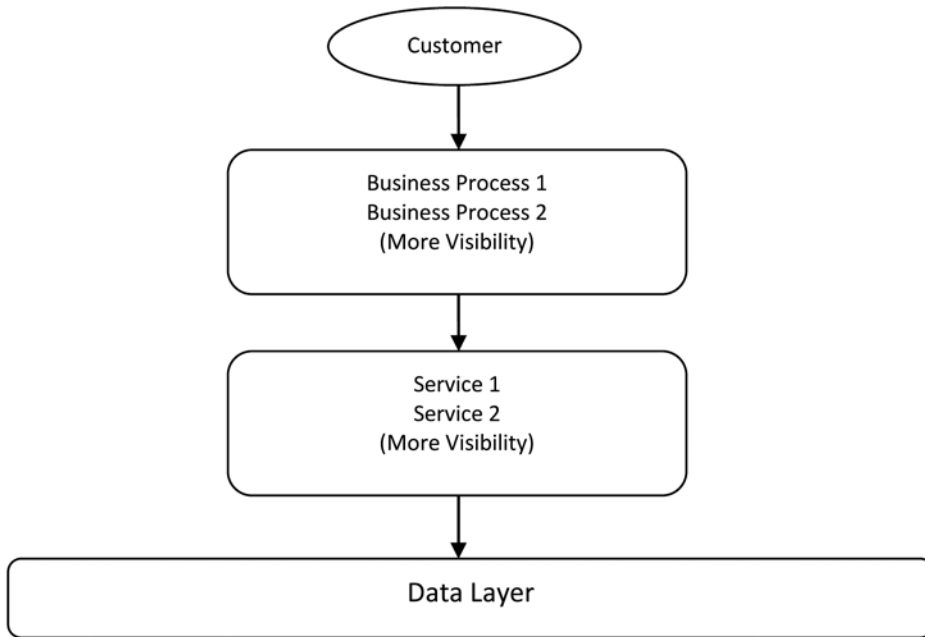


Figure 4. SOA improves visibility into the business process and component services used by customer base



lution is simplistic, this means that all customers will get a similar “highest” level of service from the company, regardless of their specific needs or expectations. This will effectively neutralize the financial benefits realized by componentization and reuse, by tying up valuable resources and possibly offering the highest levels of services to customers with lower expectations or demands. Clearly, under this scenario, SOA is not achieving the promise of analyzing the needs and expectations of each customer, and using derived information to prioritize and assign its resources appropriately.

Resolution of these critical problems requires focus on a vital attribute of SOA; namely, visibility into the components of a business process. SOA breaks up business processes into reusable, independent components, which means the data is now available at the component level rather than at the business process level as shown in figure 4. The presence of interrelationships among different service processes complicates monitoring and evaluation of service performance (Sen and Deokar, 2008). The links that services allow are of many sorts: company-to-company, activity-to-activity, agent-to-agent, or person-to-person. Thus, each individual service can be plugged into the business process which makes the business process change more flexible, enabling new types of collaborations between businesses (Haugen 2000). From a business intelligence perspective, SOA differentiates the components (services) that makeup a business process, resulting in a granular view of the services used by the customer. This property of SOA can be exploited to accurately determine customer priorities.

In the remainder of this section we will focus on the development of a potentially critical SOA capability to dynamically respond to customer segments. While we recognize that SOA capabilities can and will be developed, we focus on the creation of a Customer Priority Index (CPI) that could offer a strategic response to the two major problems discussed above and that would help firms with prioritizing their customers in a dynamic manner.

The business process and its service components are clearly identified in an SOA implementation. The CPI is the service plan for an individual customer created by exploiting the ability of SOA to reveal the service components that makeup the business process. The previously mentioned problems related to customer homogeneity and addition of the service layer can be resolved with the creation of the CPI. Not only does the firm benefit from the agility and speed to market promised by SOA, visibility into the business process offers the opportunity to better predict customer priorities leading to better customer service and proper alignment of internal service personnel.

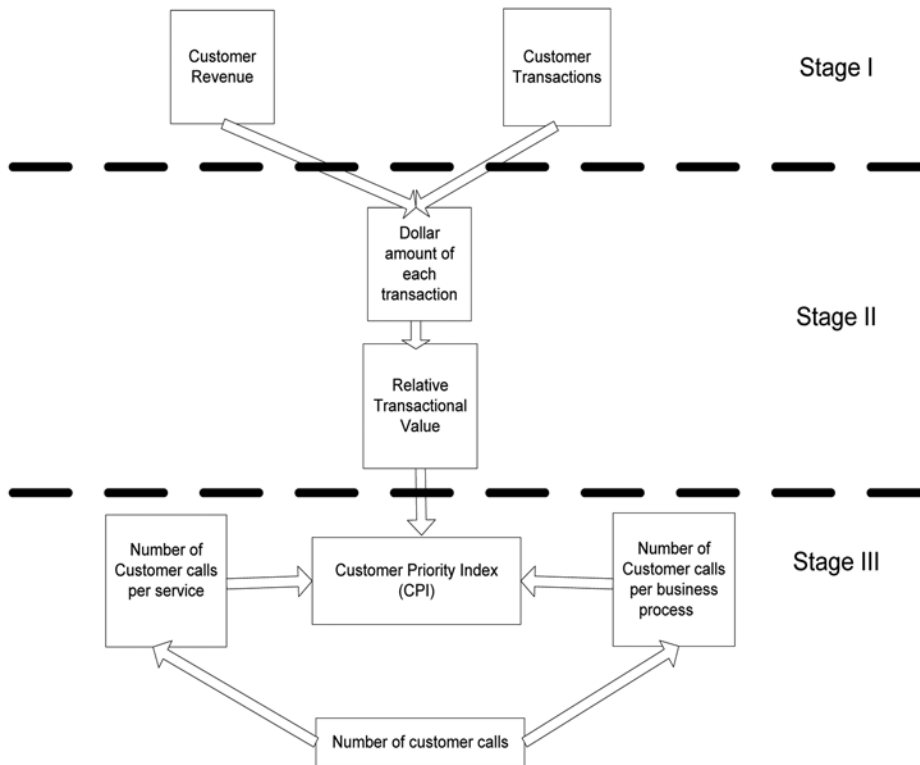
METHODOLOGY

This paper explains the creation of the CPI model through a case study example. The model has been reviewed through discussions in academia and industry. Many PhD students and several professors have reviewed the paper and provided their feedback. Also, this paper was reviewed by professionals working in the transportation, gaming and the medical industry. These include a Technical Principal and a senior business analyst who oversaw the SOA implementation in a Fortune 100 transportation company. The views of the Director of Sales Planning in the Fortune 100 transportation company were also incorporated. A senior IT manager responsible for SOA planning and operations in a prominent gaming company also offered his feedback along with a Senior Technical Analyst in a major pharmaceutical firm.

The SOA implementation for a CPI consist of the following steps:

1. Consult with relevant groups.
Enterprise Architects, Business leads from revenue, Marketing and operations. Technical leads for SOA development to prioritize, understand the business requirements for CPI.
2. Obtain revenue, transaction data and customer service logs.
Most firms collect a large amount of data from their daily operations. This data when used and processed properly can be invaluable to understand various aspects of the business. In order to calculate the CPI, data on revenue and transaction volume should be obtained from the appropriate departments. (Please refer to case study for more details).

Figure 5. Three Step process to calculate the CPI



3. Calculate CPI by analyzing transaction value and customer priority for service. This process consists of three stages as depicted in figure 5. The first stage begins by considering the following
 - a. Total number of transactions committed by the customer. This will include Business Process calls and individual service calls.
 - b. Total revenue the corporation earns from the customer.

The second stage consists of calculating 2 factors.

- a. Calculate the dollar amount of each transaction by considering the ratio of customer revenue and transaction from Stage 1.
- b. Calculate the relative transactional value by taking a ratio that compares a customer with the customer who has the highest transactional value. (Table 3)

The third stage calculates the CPI by tying the relative transactional value with the following information

- a. Number of customer service calls per customer broken down by service. (Table 1)
- b. Calculate the Ratio of the individual services to the total number of calls placed by the customer. (Table 1)

- c. Calculate the Ratio of the individual business process to the total number of calls placed by the customer. (Table 2)
4. Automate the creation of CPI.
To exploit the full potential of the CPI, it is important to automate the CPI generation such that a customer service agent can retrieve a customer's CPI in real time.
5. Educate customer service and technical support teams on how to use the CPI dashboard.
For the project to be successful, it is important to educate the end users and support teams on how a CPI dashboard works. Support teams need to understand what process is critical to keep the CPI functioning to remedy any issues.
6. Plan and test customer retention techniques before full implementation.
It is always necessary to test all project functionalities before implementation. Also, the implementation of the project should be carried out in a phased manner. It is also important to make sure that the user interface is easy to use and intuitive. By building prototypes of the dashboard for the users to test, the development and testing team ensures that the project is adopted and used widely within the firm.

Case study example

This case example is based on assumptions pertinent to a world leading transportation company. In this illustration, the firm offers various services to its customers. The shipping process is one such offering, made up of the rating, routing and tracking sub-components or "services". Their performance metrics met and in some cases exceeded benchmarks set by previous implementations. However, there were two issues that the firm was struggling to resolve.

1. The treating of customers as a homogenous group was causing disruptions in service levels. To fix this problem, the company raised their generic service level to meet the requirement of the customers with the highest expectations. The firm was allocating excessive resources for some customers (with lower expectations), while just meeting the minimum requirements for others (with higher expectations). In other words, the firm was expending considerable resources on providing mediocre service levels.
2. The support staff was working long hours to fix issues, often spending time on a lower revenue customer, thereby making higher revenue customers wait in line. Furthermore, the introduction of SOA resulted in the creation of an additional layer (the common service layer), critical to all operations and added overhead to service management. This, the current service contractual method of using generic SLA's was leading to misalignment of resources and priorities.

Table 1. Shows the service center calls made by the customer

Customer	Rating	Routing	Tracking	Total
A	5	3	2	10
B	6	4	7	17
C	3	6	4	13
D	4	4	3	11
E	2	3	6	11

As mentioned previously, the componentization of the business process should provide the firm with increased visibility. In other words, the company possessed a powerful lens to gain an insight into the patterns of customer behavior at a much finer level.

Visibility was operationalized using two factors:

1. The number of calls per service made by each customer.
2. The transactional value attached to a service per customer calculated as the ratio of the number of transactions to the revenue generated using that service.

It was seen that, in general, customers with higher transactional value called the customer call center more often to seek resolution to their issues. However, in some cases, it was noticed that customers with lower transactional value called the customer center with more calls than customer who had a higher transactional value. For instance, customer F, who had a \$50 value for every transaction, had called the customer center 3 times to have the tracking service fixed. However, customer G never called to report a

Table 2. Shows the breakdown by business process

Business Process			
Customer	Shipping	Reservation	Total
A	4	6	10
B	10	7	17
C	7	6	13
D	1	10	11
E	4	7	11

Table 3. The transaction value for each customer relative to the highest transaction value

Customer	Transaction Value (TV)	Max TV	Relative TV
A	5	30	0.166666667
B	10	30	0.333333333
C	15	30	0.5
D	20	30	0.666666667
E	30	30	1

problem even though their transaction value was \$70. Thus, each service held a value proposition that was different from one customer to another.

The CPI calculation takes the number of customer calls and their transactional value into consideration. To better conceptualize this, the customer center logs for the shipping process, made up of rating, tracking and routing service, were examined. Customers have the ability to avail the business processes or just an individual service. For instance, the rating service provides customers the ability to check the rates on shipping between two cities without having to make an actual shipment.

Five customers, A, B, C, D and E were examined. All customers utilized the business processes and the individual services. To demonstrate the calculation of the CPI, a hypothetical value was assigned to transactional value for each customer, Customer A - \$5, B - \$10, C - \$15, D - \$20, E - \$30. (Please refer to Tables 6, 7, 8)

Customer A's CPI for the rating service in the shipping business process is calculated as $5/10$ (from Table 1) * $4/10$ (Table 2) * $5/30$ (Table 3) * 100 = 3.33.

As summarized in table 4, Customer A has a higher CPI value than Customer D even though customer D has a higher transactional value. The service management area

Table 4. CPI calculation for Rating Service in Shipping Business Process

Customer	CPI (for rating service/shipping business process)
A	3.33
B	6.92
C	6.21
D	2.2
E	6.61

is able to prioritize their work by giving higher priority to A even though D had a higher transactional value. It should be noted that in the situation where the CPI's are similar, higher transactional value might decide who gets serviced first. E and B have similar CPI's. Given that Customer E has a higher transactional value than B, service management might prioritize customer E over B since E has a transactional value of \$30, whereas B only has a transactional value of \$10.

The implementation of the CPI score should be done with the help of firm's customer service phone system. Based on the CPI score, the phone system creates a queue and assigns customer service representatives appropriately. If the CPI score is high, the call is tagged as priority and an experienced customer service agent is assigned.

The CPI can help marketing improve the effectiveness of their campaigns by tailoring their message to target service and business priorities of the customer. As shown in

Figure 6. CPI calculation scenario

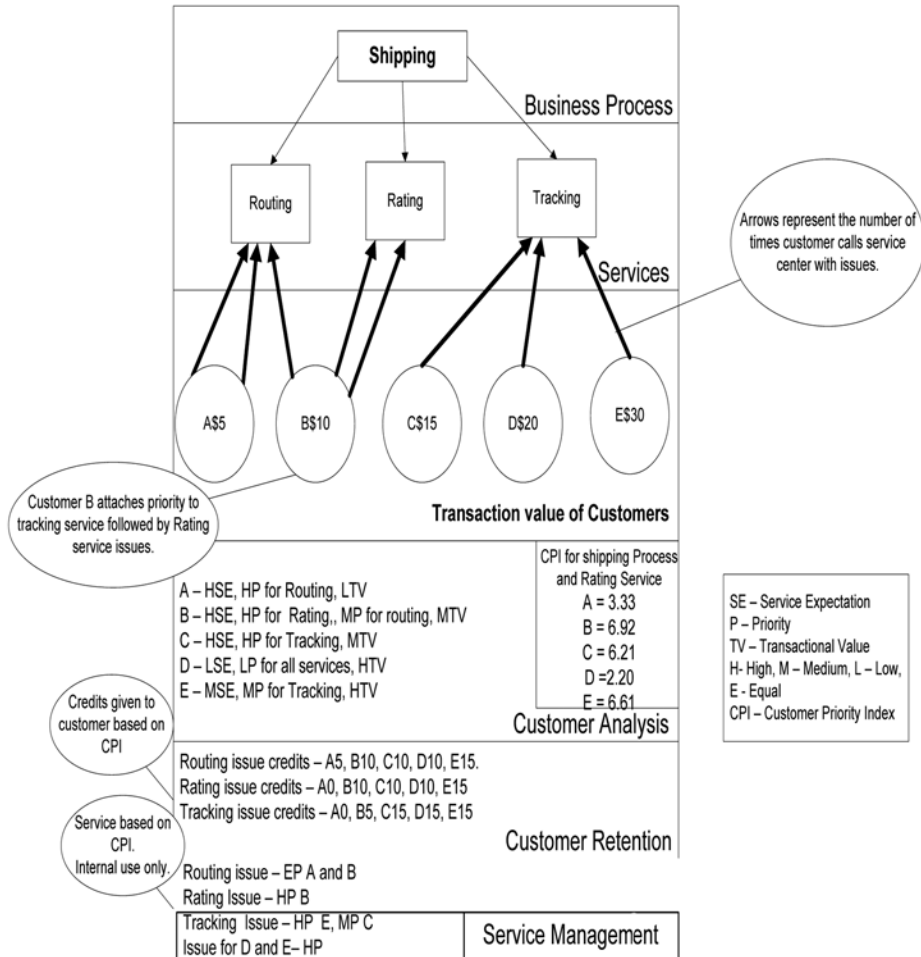


Figure 7. CPI - Inputs and Impacts

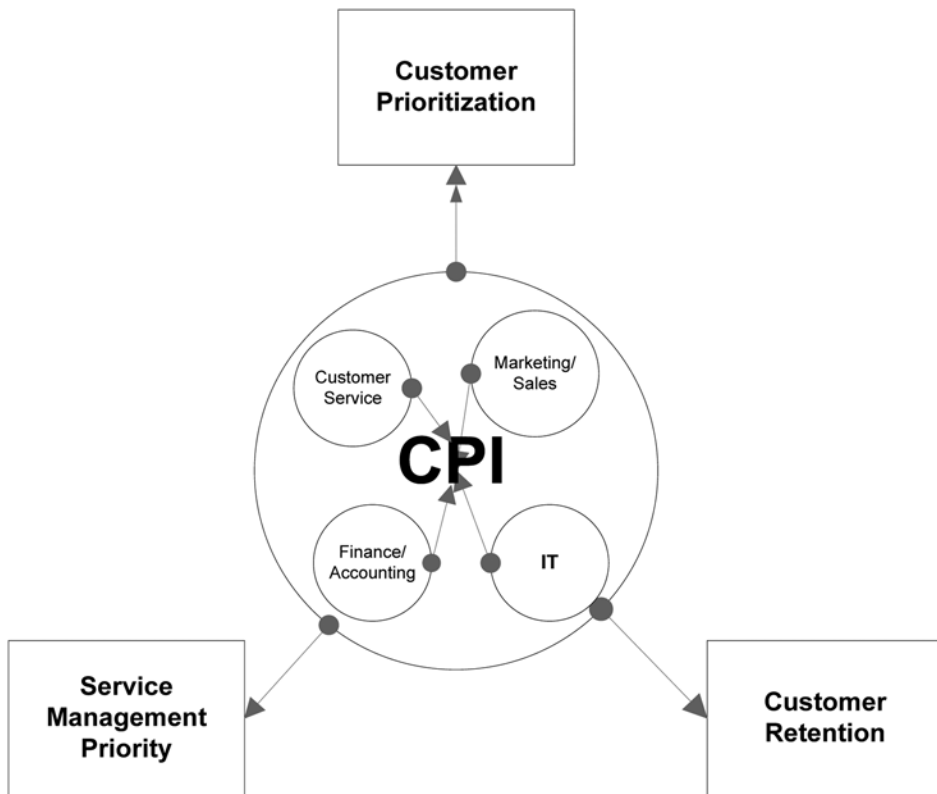


figure 7, based on the CPI, the customer retention program should be able to devise a credit system for each customer based on his service and business process. The CPI allows the firm's marketing department to understand customer B's priority for the rating service.

At the time of contract renewal with customer B, the firm can offer a higher service level to the rating service. Thus, this information has the potential to provide this shipping firm a competitive edge over its main rivals by both retaining existing customers and acquiring new ones.

The calculation of CPI helps with: 1) improving customer service quality by dynamically implementing customer prioritization thereby increasing customer retention and 2) managing service management priorities. Figure 7 explains the inputs that went into the creation of the CPI and its benefits to the firm. By exploiting the visibility and the ability to connect several functions provided by SOA seamlessly, a firm can develop priority indicators to drive their strategy. Also, SOA has the added potential of identifying customers that have the potential to migrate between segments and help marketing communicate with these customers in a more appropriate way.

DISCUSSION

Dynamic customer prioritization using the CPI considers the customers revenue per transaction and the number of service calls made by the customer. Since the index is “living,” the priority of the customers adjusts according to the customers daily transaction values and service calls placed. Compared to other BI tools, the CPI is much quicker with its index calculation since the transaction volumes are recorded at a level closer to the customer and does not require the time it typically takes for techniques that use data mining. The marketing department can react quickly to a change in the CPI and target their promotions and advertisement to the right set of customers thus saving time and money spent on such activities.

It should be noted that creating the CPI requires a lot of inter-departmental cooperation within the firm. Strong leadership commitment, organizational realignment, systems and process support, and revised financial metrics help ensure successful implementation (Shah, et al. 2006). Furthermore, firms should be keen on identifying customers that have the potential to migrate between segments and help marketing communicate with these customers in a more appropriate way (Thomas and Sullivan, 2005).

It is important to consider specific inputs based on the industry that the CPI is calculated. For instance, in the shipping industry, if a valuable document of historical nature is shipped, the cost of the transaction could be low, thus lowering the CPI. However, the high declared value of the document is not captured as an input for calculation of the CPI. If a customer does not solely use the firm to conduct its business but actively uses the firm’s competitors, even if the value of transactions is high, the volume from that customer is spread across the firm’s competitors thus proving a disincentive for the firm to use the CPI.

The implementation of CPI requires coordination amongst various departments of the firm such as Information Technology, accounting, finance, marketing and customer service. Due consideration needs to be given not only to the value of the individual transactions but also to the number of times a customer called the service department to report a problem. It is possible that a certain segment of customers may not call the service department to report a problem even though their transaction values are high. This could be due to the fact that the volume of transactions those customers do with the firm is high and that the loss of a percentage of their transactions does not raise sufficient concern to warrant a call to the service department. However, small businesses who transact at a lower values and volume with the firm would hold a higher value to the missing transactions. They would show a higher propensity to call the service department to inquire about the reasons for failure. Given this, it is important to factor the number of calls made by firms to the service department. Alternatively, Scenarios such as high value and high transaction calling the service department is likely and that will improve their CPI scores

even more. Also, Low volume low value customers may not call the service department and that will drive their CPI scores down. By placing emphasis on the transaction value and service calls, it should be possible to capture the priority of the customer base.

CONCLUSION

This paper conceptualizes the use of SOA as business intelligence tool to prioritize a firm's customers in a dynamic manner. It can be argued that since customer data analysis occurs at near real time, the CPI adjusts dynamically with customer use of the firm's services. It is anticipated that this article forms the basis for future empirical research exploring the validity of the proposed model like those developed through the CPI. The ability to prioritize the customer, and at the same time effectively manage the firm's customer service personnel would give a company a crucial head start in the competitive race to be more heterogeneous while being in greater control.

The CPI supports the notion that customers update their expectations of future use following an adaptive expectations approach, incorporating recent usage experiences into their next-period expectations (Lemon et al., 2002). Implementing SOA has its own advantages such as customer homogeneity and visibility into the business process. Also the business processes can be built based on existing services reusing them. Therefore, the development efforts can be reduced which in turn leads to a shorter time-to-market, offering greater flexibility at lower costs to the organization (Baskerville et al., 2005). Customer prioritization drives customer profitability by reducing marketing and sales costs and thus implies a more efficient use of marketing resources. Thus, managers can simultaneously enhance the efficiency of their CRM efforts and increase sales by prioritizing customers (Homburg, et al., 2008). This paper begins to provide managers with a step-by-step process for using the SOA implementation as a tool to prioritize customers thereby improving customer retention and better management of customer service personnel.

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