A STUDY ON SERVICES SUPPLY CHAIN FOR BUSINESS ANALYTICS

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ABSTRACT

The service industry has grown significantly for developed economies and is a major contributor to the global economy[1]. Integration and management of the supply chain in services can result in significant value additions and growth. There is presently very little understanding about how this could be driven in the services industry, such as business analytics. Business analytics is an emerging field that focuses on using statistical tools and techniques to iteratively mine data and draw insights from historical behavior. Additionally, organizational resources such as teams with relevant analytical skills and experienced leadership coupled with analytic tools and technologies are required to deliver value.

The existing framework in services supply chain management is service-centric, and the factors defining it were derived based on industry and/or process. Process models and variance models in business analytics were previously studied with an enterprise level in view. Contrarily, in the services sector, value is created for the end customer through the integration of two or more enterprises (participants). The purpose of this study is to understand both formation and integration of the services supply chain (SSC) for business analytics as well as the factors that affect supply chain integration between key participants such as analytics buyer and analytics service provider. This understanding was eventually used to establish a framework that can be applied to integrate the service supply chain for business analytics.

In the first study, a case-study research approach was used to establish the propositions for the formation and integration of the services supply chain for business analytics. Data from 30 cases

[1] World Bank (2020). Services, value added (% of GDP). *The World Bank Group*, available at https://data.worldbank.org/indicator/NV.SRV.TOTL.ZS (accessed April 15, 2022).

were collected through a questionnaire. Data collected through semi-structured interviews, field notes, and documentation as well as engagement between analytics buyers and analytics service providers were analyzed. Findings revealed that formation of SSC for business analytics originates from a need to drive business value. A long-term relationship was initiated with a proof of concept and established with a contract that set the rhythm for engagement between the analytics buyer and analytics service provider. The key factors for the integration of service supply chain for business analytics were coordination between analytics buyer and analytics service provider, buyer participation, service standardization, service contract, and service performance measures.

The second study used structural equation modelling (SEM) to validate the set of hypotheses and the conceptual framework that was designed to link the key factors with the integration of the services supply chain. Prior to conducting large-scale survey, a two-step process that included item generation and pre-testing was taken into consideration while developing measurement scales for empirical study. A combination of factor analysis and multiple analysis within the outline of SEM was applied to investigate the structural link that exists between the measured variables and the latent components. Additionally, the conceptual framework emphasized the moderating influence of span size, the impact of control variables (location difference, tenure of relationship) and the mediating effect of service integration. It has been found that participants' coordination, service standardization, and service contract have a positive relationship with service integration, which results in better service performance measures. Further, it was observed that while there is a negative relation between buyer participation and service performance measures, there was no direct relationship between buyer participation and service integration. The result also shows that service integration acts as a mediator between participants' coordination and service performance, service standards and service performance, and service contract and service performance. The

association between buyer participation and service integration, as well as the relationship between service contract and service integration, are dampened by span size, however the relationship between participant coordination and service standardization with service integration is strengthened.

In the third study, factors affecting the service integration and service performance were used in a business analytics engagement between an analytics buyer and analytics service provider to improve the contract renewal rate. The analytics service provider used an unsupervised technique to cluster high-risk resellers with a low likelihood of contract renewal. The analytics buyer then took further action by using a proactive contact strategy in calling high-risk reseller for a contract renewal. The results were monitored over three quarters and the analytics buyer's renewal rate showed a significant improvement. A user interface application was developed as part of the deployment to allow the sales specialist to list and contact with high-risk (or underperforming) resellers on a quarterly basis.

Analytics service providers may have a strategic advantage if they have knowledge of the formation and integration of service supply chains for business analytics, particularly when establishing new relationships with analytics buyers. It is established that service integration mainly the processes, and information integration is critical. The participants' coordination, service standardization, and service contract should be improved for an effective and efficient services supply chain integration between an analytics buyer and an analytics service provider. A better service performance metric can be achieved with an improved service integration. This research finding will help analytics practitioners in managing services with better performance.

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ABBREVIATIONS

AVE- Average Variance Extracted

BAS- Business Analytics Service

B2B- Business-to-Business

BFSI- Banking, Financial Services and Insurance

BP- Buyer Participation

CFA- Confirmatory Factor Analysis

CFI- Comparative Fit index

CLF- Common Latent Factor

CNX- Concentrix

CPG- Consumer Packaged Goods

CR- Composite Reliability

CSAT- Customer Satisfaction

EFA- Exploratory Factor Analysis

FTE- Full-Time Equivalent

GDP- Gross Domestic Product

IT- Information Technology

KPI- Key Performance Indicators

IVR- Interactive Voice Response

ML- Machine Learning

MSV- Maximum Shared Variance

NPS- Net Promoter Score

PC- Participants' Coordination

PCLOSE- p-Value of Close Fit

PoC- Proof of Concept

RFP- Request For Proposal

RMSEA- Root Mean Square Error of Approximation

SCM- Supply Chain Management

SCOR- Supply Chain Operations Reference

SDL- Service Dominant Logic

SEM- Structural Equation Modeling

SEO- Search Engine Optimization

SLA- Service Level Agreements

SC- Service Contract

SS- Service Standardization

SSC- Service Supply Chain

SSI- Service Integration

TVE- Total Variance Estimate

USA- United States of America

Chapter 6: Conclusions and Future Research

This chapter sums up the study's main contributions by outlining the study's broad conclusions and summarizing its findings. The study's contribution is listed in two areas, categorized as theoretical and practical, respectively. The limits of the study and the scope of future research are then discussed.

6.1 Major finding of the study

The world economy benefits greatly from the service industry. Therefore, it's essential to understand the aspects of services supply chain for newer areas to exploit the opportunity. Business analytics is an emerging field in the services domain. The research conducted in the domain of business analytics has been very limited compared to studies that have already been done in the service industry that focused on supply chain issues that were more established in delivery. Additionally, the factors studied were based on industry and/or processes which were service-centric. Therefore, service supply chain in the business analytics service sector emerged as an area with a vast scope for research that will also differentiate it from a typical industrial service supply chain practice. The goal of this thesis was to understand how the service supply chain for business analytics was formed, how it was integrated, and what factors led to that integration. A framework for the integration of the service supply chain for business analytics was also proposed, along with a study of its applicability.

To understand the formation of the service supply chain for business analytics as well as its integration factors, a case-study design approach was followed. For the integration of the service supply chain for business analytics, factors like buyer participation, service standardization, service contracts, and service performance were studied. Here, 30 cases of business analytics value

creation between analytics service provider and buyer were taken into consideration. Empirical data was collected based on semi-structured interviews, field notes, and documentation for each case provided by the analytics service providers or analytics buyers. With the help of a group of propositions (P1 to P8) and a conceptual framework, this approach made a theoretical and empirical contributions to the literatures on service supply chain. The integration of the service supply chain for business analytics is driven by the coordination between the analytics buyer and the analytics service provider, analytics buyer participation, service standardization, service contract, and service performance. To assess the impact of integration, service performance is monitored using a range of metrics, including financial, operational, and customer experience KPIs.

This study validated the conceptual framework for services supply chain in business analytics using structural equation modelling. In this case, a relationship was formed and related between the coordination of participants, buyer participation, service standardization, service contract with service integration, and service performance indicators. The study offers the following important findings:

1. Participants' coordination and service integration has significant positive relationship.
2. Service integration mediates between participants' coordination and service performance measures with no direct relationship.
3. Buyer participation has no significant relationship with service integration.
4. Buyer participation has direct negative relationship with service performance measures without mediation from service integration.
5. Service standardization has significant positive relationship with service integration.

6. Service integration mediates between service standardization and service performance.
7. Service contract has significant positive relationship with service integration and service performance.
8. Service integration mediates between service contract and service performance.
9. The service performance measurements for financial is cost saving, operational is resource utilization and reliability, and customer experience is service assurance.
10. Span size strengthens the relationship between participants' coordination and service integration.
11. Span size dampens the relationship between buyer participation and service integration but not significantly.
12. Span size strengthens the relationship between service standardization and service integration.
13. Span size dampens the relationship between service contract and service integration.

The proposed service integration framework for business analytics was put to the test by addressing the problem of contract renewal for the analytics buyer. A better service integration and improved service performance measure were achieved by controlling factors including participant coordination, analytics purchasers' participation, service standardization, and service contract. An analytics service provider created an unsupervised model to group data into clusters with different contract renewal risks, analyzed the factors affecting contract renewal, and implemented a system for continuous operation. Based on silhouette score evaluations of three clustering approaches, the analytics service provider chose the K-means clustering model. After three quarters of testing, the solution increased the renewal rate by 4-7% and generated an additional $220K in quarterly income for the analytics buyer. In order to highlight low performing

or high-risk resellers and to take targeted actions, an application was also developed to deploy the model in regular operations.

6.2 Research contribution

Business analytics service is a new area of services and very little has been understood with respect to supply chain aspects. The know-how on the formation and integration of service supply chain for business analytics can give analytics service providers a strategic edge, especially when a fresh relationship with a buyer needs to be set-up. Understanding the start process and the aspect for integration remains a challenge for many service provider managers. Focusing on success during the probation stage helps ensure service supply chain sustainability, but success during the origination stage is mostly dependent on the buyer. The analytics buyer and analytics service provider must embrace the fact that during probation and regular operation stage the integration of service supply chain is key. The study also highlighted the importance of service supply chain integration elements such as strategic alliance, information integration, and process integration in business analytics.

The research findings will help analytics practitioners to effectively manage the service with improved service performance. It has been understood that service integration mainly the processes, and information integration plays an important role. In order to improve the service integration between analytics buyer and analytics service provider, the participants' coordination, service standardization, and service contract should improve. The improved service integration results in an improved service performance metrics. Analytics service provider must be very cautious about involving buyer as mandatory participant. This may have a negative influence on service performance measures. The analytics buyer and analytics service provider should ensure

accomplishment of common goals, have structured roles and responsibilities, system for knowledge management, and deployment of competent team. To have service standardization the analytics service provider should follow structured procedures and manuals, systems, and quantified metrics for standard deliverables. While processes vary for customized deliverables and execution require creativity and skill of employee. During contract creation, the analytics buyer and analytics service provider should assure clarity in roles and accountability for task, capacity to analyze each other's performance, and have willingness to alter contractual terms and conditions. Consider one another to be interdependent partners and display a willingness to collaborate in order to achieve mutual objectives. Take the initiative and invest resources in performance monitoring efforts. Be willing to share data and information on contract, performance, and other relevant clauses. The span size of an engagement has mixed effect on relationship between these factors with service integration. So, optimum size of a team ensures better service integration and service performance.

Coordination between analytics buyer and analytics service provider is one of the key factors for the integration of service supply chain for business analytics. Study proposes that the role of relationship manager should be to coordinate and establish relationship between two organizations and that it should be distinct from the role of a delivery manager. It also suggests on establishing a strong relationship and engagement practice through an agreed governance structure by leveraging technology enabled interactions. During the integration of service supply chain for business analytics, the analytics buyer is required to participate by only providing inputs and reviewing the output. Also, service standardization is an important aspect, and its extent varies based on type of work. The opportunity for service standardization must be evaluated across the analytics value chain for better integration. In business analytics, contract legally binds the service

supply chain participants by creating a mutual agreement on the scope of work, responsibilities, and the commercials. A mutually agreed and well-articulated contract avoids risk of failure during a service supply chain integration for business analytics. The effectiveness of integration can be monitored and measured through service performance metrics such as cost reduction, revenue growth, improved turnaround time, quality, and CSAT. Analytics service providers must also be aware of the challenges that come with integrating services with analytics buyer. Gathering the right input from analytics buyer is critical to delivery and therefore, one approach to ensure their support is by linking the suggested value to the analytics buyers' end consumers.

6.3 Limitation and scope for future research

In service research, collecting retrospective data is a regular challenge, and interviewees must rely on their memories (Breidbach et al., 2013). By interviewing participants from a diverse set of cases, levels, groups, domains, and geographies can avoid such potential risks (Eisenhardt and Graebner's, 2007). In addition, the current study's service network is based on engagement between analytics buyer and analytics service provider, but the scope can be broadened in the future by integrating 3rd party tools and platform suppliers. The outcomes of case study were not context independent, as advised in the literature, because it was undertaken for the business analytics service industry. This study adopted a generalization technique through inductive theory development rather than a statistical technique. As a result, the study provides pioneering insights into the formation and integration of service supply chain for business analytics. This opened the possibility of using a deductive technique to test the propositions.

The data on business analytics service offerings were not included for this study; hence, the sample is not representative of all types of analytics service offerings. Therefore, it is possible that the

research findings should not be generalized at the offering level. Also, the unit of analysis is the interaction between the analytics buyer and analytics service provider. Individual buyer or personnel discretion is not investigated in this study. Consider the coordination of participants as one of the primary factors influenced by interpersonal interaction or communication, and this is a topic for further research.

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