Major Project

ON

Enhancing Service Delivery Capabilities Using ISM and Knowledge Management Framework: Learnings from SAP-LAP

Submitted By:

Anupam Sharma

Roll No: 2K14/MBA/502

Under the Guidance of:

Dr. Broto Bhardwaj

DELHI SCHOOL OF MANAGEMENT

DELHI TECHNOLOGICAL UNIVERSITY

BAWANA ROAD DELHI 110042

Jan-May, 2016

Certificate

This is to certify that the Project Report titled **Enhancing Service Delivery Capabilities Using ISM and Knowledge Management Framework: Learnings from SAP-LAP** which is submitted by **Anupam Sharma** in partial fulfillment of the requirement for the award of MBA degree in DSM - DTU, Delhi is a record of the candidate's own work carried out by him under my supervision.

Dated: (Dr. Broto Bhardwaj)

Place: New Delhi

DECLARATION

I, **Anupam Sharma**, student of EMBA 2014-2016 batch of Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-42 declare that the project **Enhancing Service Delivery Capabilities Using ISM and Knowledge Management Framework: Learnings from SAP-LAP** submitted in partial fulfillment of Executive MBA program is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge. The name of the organization and associated confidential information has not been revealed in adherence to the confidentiality.

This report is not being submitted to any other University for award of any other Degree, Award and Fellowship.

Place: New Delhi (Anupam Sharma)

Date:

ACKNOWLEDGEMENT

On the very outset, I would like to extend my sincere & heartfelt obligation towards all the persons who have helped me in this endeavor. Without their active guidance, help, cooperation & encouragement, this initiative would not have fructified.

I am extremely thankful and would like to pay my gratitude to my faculty & project guide **Dr. Broto Bhardwaj, Delhi School of Management** for her genuine concern, guidance and valuable inputs during the course of this project. I am also thankful to **Dr. P.K Suri, HOD, Delhi School of Management** for his continuous encouragement and cooperation during the stint of this project.

I extend my sincere gratitude to all the teaching faculties of Delhi School of Management who have contributed to my learning curve during the current course stint thereby making an implicit contribution to this project.

It's a matter of great pride in expressing my gratitude towards my parents, spouse, kids and friends who have always been supportive and encouraging in my endeavors for pursuing the EMBA program and sustaining the same during the preparation of this report.

Any omission in this brief acknowledgement does not mean lack of gratitude.

Anupam Sharma

EMBA 2014 – 2016

Delhi School of Management

Delhi Technological University

Abstract

Cloud computing and SaaS (Software as a Service) platforms are becoming increasingly prevalent as organizations globally are focusing on rationalization of their IT budgets and infrastructure maintenance is a key cost area. Cloud adoption enables organizations to transfer all their risks associated with Infrastructure maintenance to cloud service provider at significantly lower cost as compared to on premise infrastructure. As a result cloud business has acquired strategic importance for software product companies and last few years has witnessed an increasing trend of product offerings on hosted/cloud platforms to expand and retain customer base. With such huge potential in cloud offerings, the expectations of customers are far higher than the traditional on premise models

A typical end to end cloud service delivery of any software product/solution involves participation of multiple cross functional teams with varied background and capabilities and with their own process frameworks and knowledge level at times. The product support facet and service support facet of any SaaS (Software as a Service) delivery offering involves complex interplay of actors and processes which cause emergence of turbulent situations and are often difficult to handle and result in inefficiency and a perception of redundancy. Such a complex interplay also mandates proper knowledge management across the cross functional teams so as to ensure that the service delivery and quality is enhanced in an incremental way resulting in customer delight. An eclectic mix of process improvement and knowledge management strategy ensures near elimination of people specific dependency and continuous and sustained improvement in service quality.

The case in question is a typical example of intricacies involved in establishing and sustaining SaaS (Software as a Service) Cloud services and associated issues in a long term horizon. The aim of this report is to analyze the problems in overall service delivery quality of a Cloud service product company and proposing solutions for the same using the LAP-SAP, ISM, DMAIC and Knowledge Management frameworks.

Table of Contents

1.0 Introduction

1.1 Growth of Cloud Services

Cloud computing has seen steady growth and rapidly increasing demand. According to Forrester, the cloud market was valued at $40.7 billion in 2010. The cloud industry grew to a $150 billion market by the end of 2013 and Pike is forecasting the market to be worth $210 billion by 2015. According to Forbes, global SaaS (Software as a Service) software revenues are forecasted to reach $106B in 2016, increasing 21% over projected 2015 spending levels. A Goldman Sachs study published recently projected that spending on cloud computing infrastructure and platforms will grow at a 30% CAGR (Compounded Annual Growth Rate) from 2013 through 2018 compared with 5% growth for the overall enterprise IT.

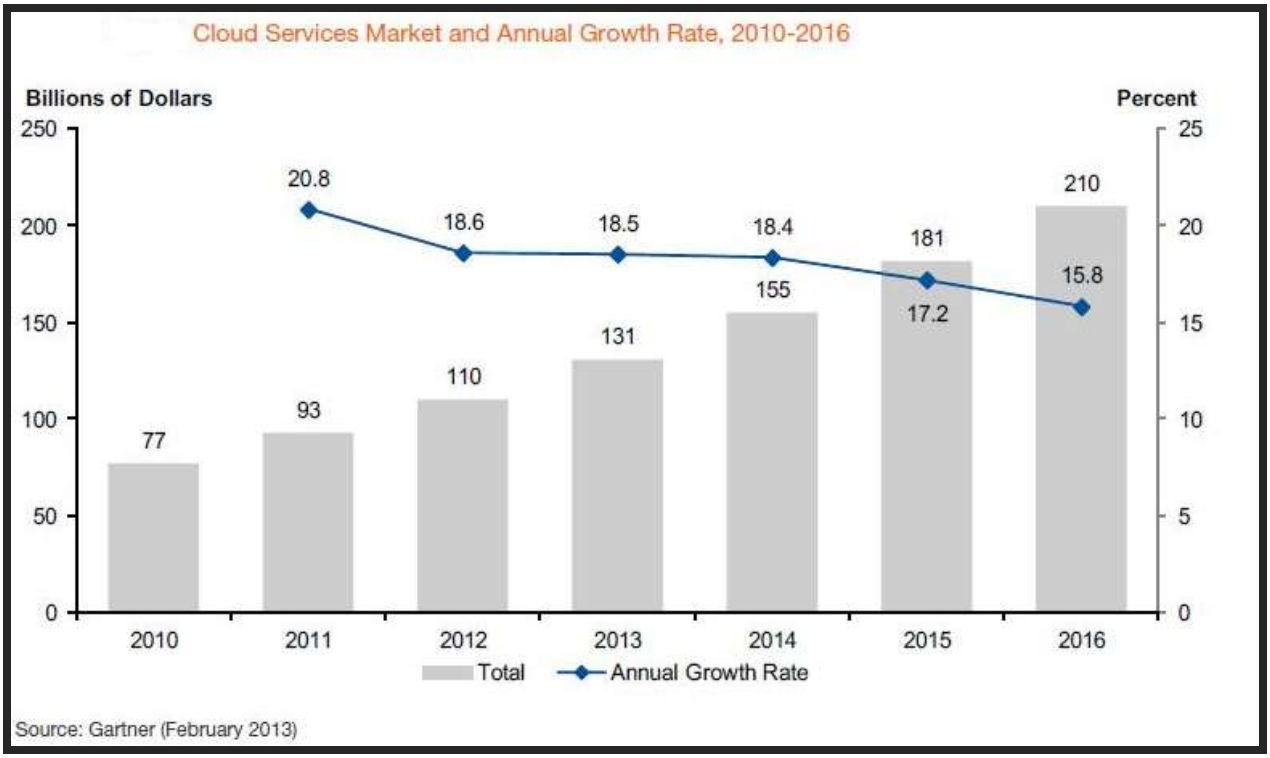

Figure 1 : Past and Projected Future Trends of Cloud Growth (Source: www.forbes.com, 2016)

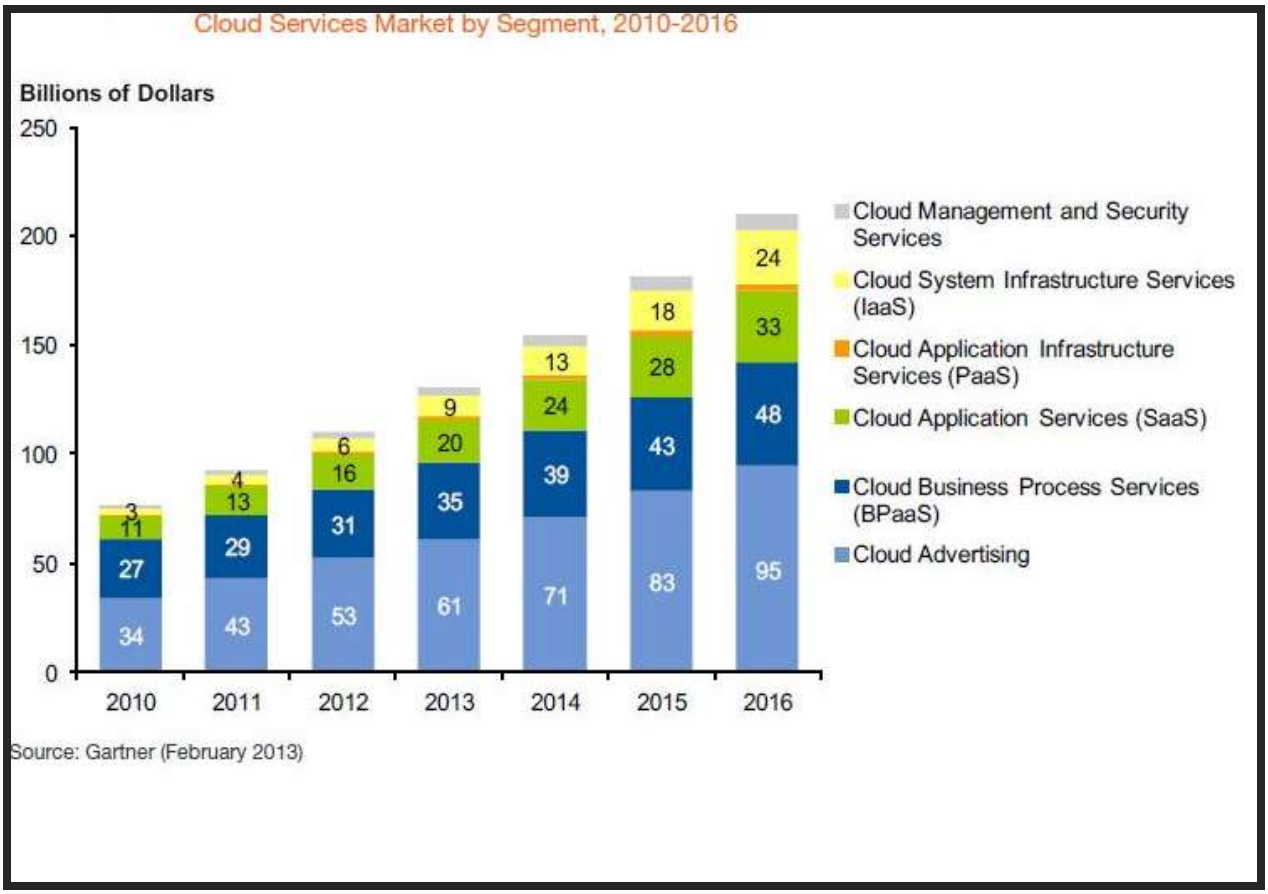

Figure 2 : Cloud Service Market Segmentation
(Source: www.forbes.com, 2016)

The cloud is not just for large corporations, small and medium businesses (SMBs) are also seeing value in the cloud. A large proportion of the growth of the cloud services sector is being driven by rapid adoption of Software-as-a-service (SaaS) platforms, which are saving businesses on the cost of licensing, management, and deployment of software and hardware for productivity and collaboration. Infrastructure-as-a-service (IaaS) is also expected to grow rapidly as a platform on which businesses will host their own SaaS (Software as a Service) solutions and for other business critical infrastructure deployments. Cloud marketplaces augment the existing benefits of the cloud: on-demand pricing that lowers capital expenditure, fast deployments that allow businesses to remain agile, reactive scaling both up and down, and flexible APIs (Application Programming Interface) that allow for the automation of

infrastructure orchestration. The cloud marketplace layer enhances the value of the cloud by providing centralized control for an increasingly differentiated set of vendors.

The substantial year-on-year increases in cloud uptake can be attributed to an erosion of cloud skepticism in the enterprise and the willingness of cloud vendors to hear what companies are saying and work towards providing platforms and marketplaces to meet their needs.

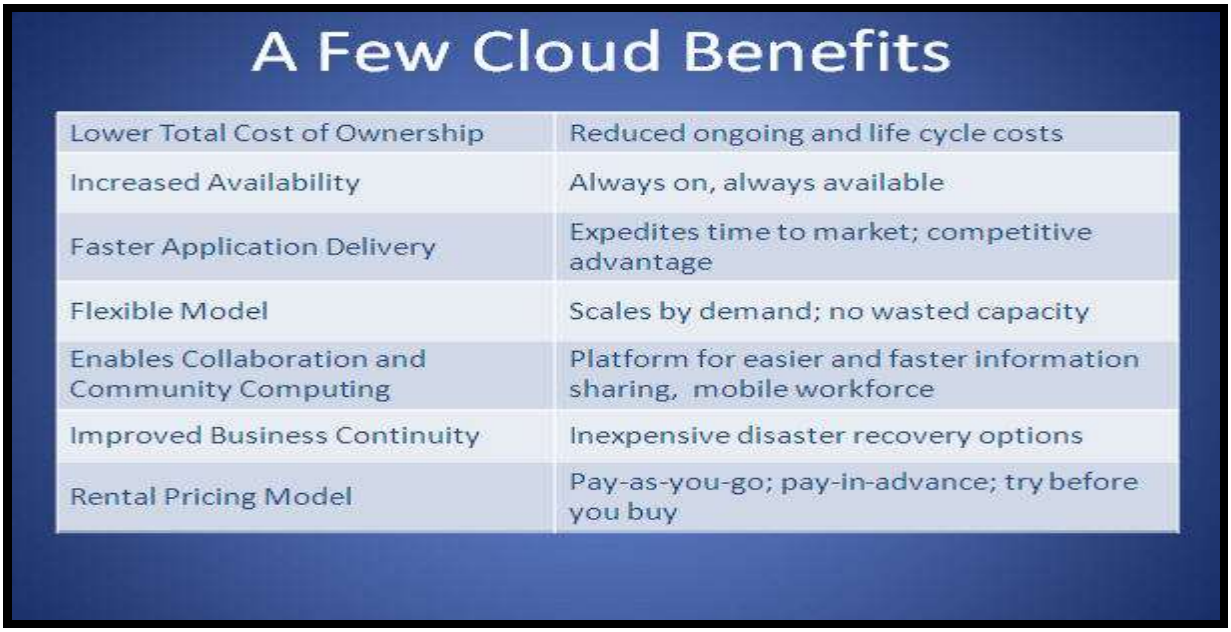

Figure 3 : Cloud Benefits
(Source: www.esri.com, 2016)

Many of the eminent consultancies and research firms have varying forecasts for the next few years however all have a consensus that cloud computing adoption is accelerating in enterprises on a global scale.

With such huge potential in cloud offerings, the expectations of customers are far higher than the traditional on premise models. The aim of this report is

- To analyze the problem of delays in Cloud environment commissioning and subsequent delays in revenue recognition.

- To analyze the problem of increased turnaround, response and resolution time of the Cloud service.
- To analyze problems in overall quality of Cloud service implementation and delivery.
- To find out solutions to above using the SAP-LAP and Knowledge Management framework.
- To identify the linkages and interrelationships between the customer satisfaction enablers using Interpretive Structural Modeling (ISM).

The report dwells on the issue from multi faceted perspective of process, governance, knowledge and operations.

2.0 Methodology

A case study of problem in question has been conducted using Situations-Actors-Processes (SAP) framework (Sushil, 2001)**.** The inputs from SAP-based analysis and field have been used to perform a Strategic Gap Analysis. DMAIC (Define, Measure, Analyze, Improve, Control) analysis has been used to analyze the problem of delay in environment commissioning which was one of the findings of the SAP based analysis. The issues identified through Strategic Gap Analysis have been analyzed through Process Management and Knowledge Management realms. The learning issues from analysis have been synthesized for recommending actions and expected benefits there from for ensuring sustainability of the offering using Learning-Actions-Performances (LAP) framework (Sushil, 2001) and Knowledge Management Model (Hedlund and Nonanka, 1993). The linkages and interrelationships between the key customer satisfaction enablers have been worked out through Interpretive Structured Modeling (ISM)

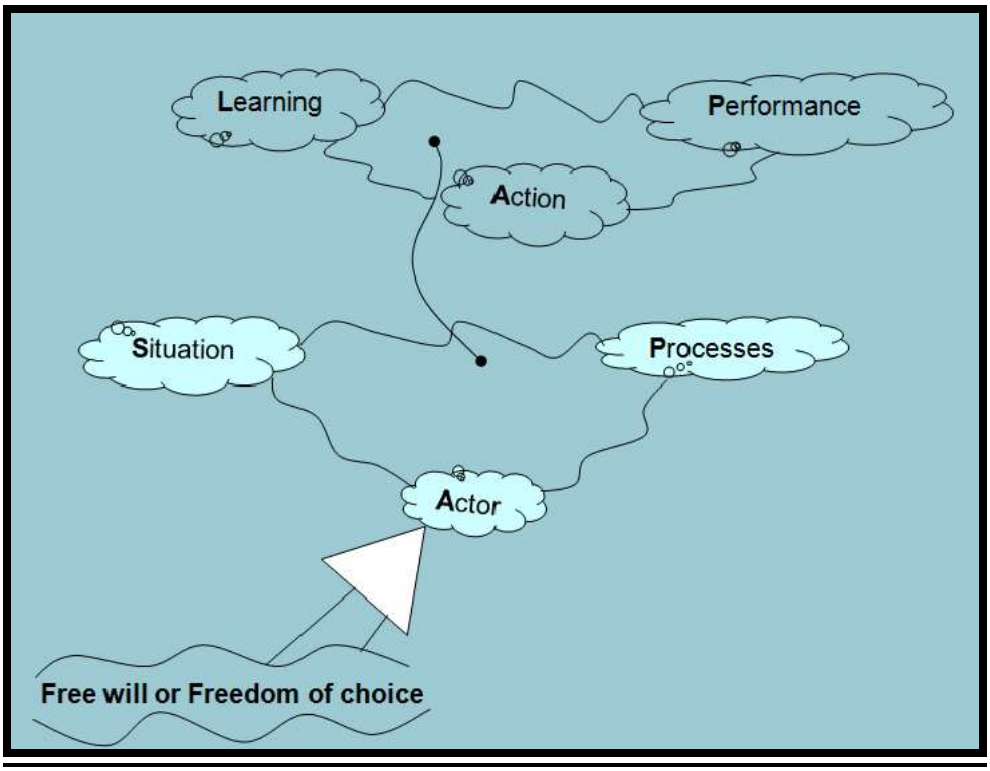

Figure 4 : SAP-LAP Framework
(Source: Sushil ,2001)

	INDIVIDUAL	GROUP	ORGANIZATION	INTERORGANIZATONAL DOMAIN
ARTICULATED KNOWLEDGE/ INFORMATION Cognitive Skills Embodied	Knowing calculus	Quality circle's documented analysis of its performance	Organization chart	Suppliers' patents and documented practices
TACIT KNOWLEDGE/ INFORMATION Cognitive Skills Embodied	Cross-cultural negotiation skills	Team coordination in complex work	Corporate culture	Customers' attitudes to products and expectations

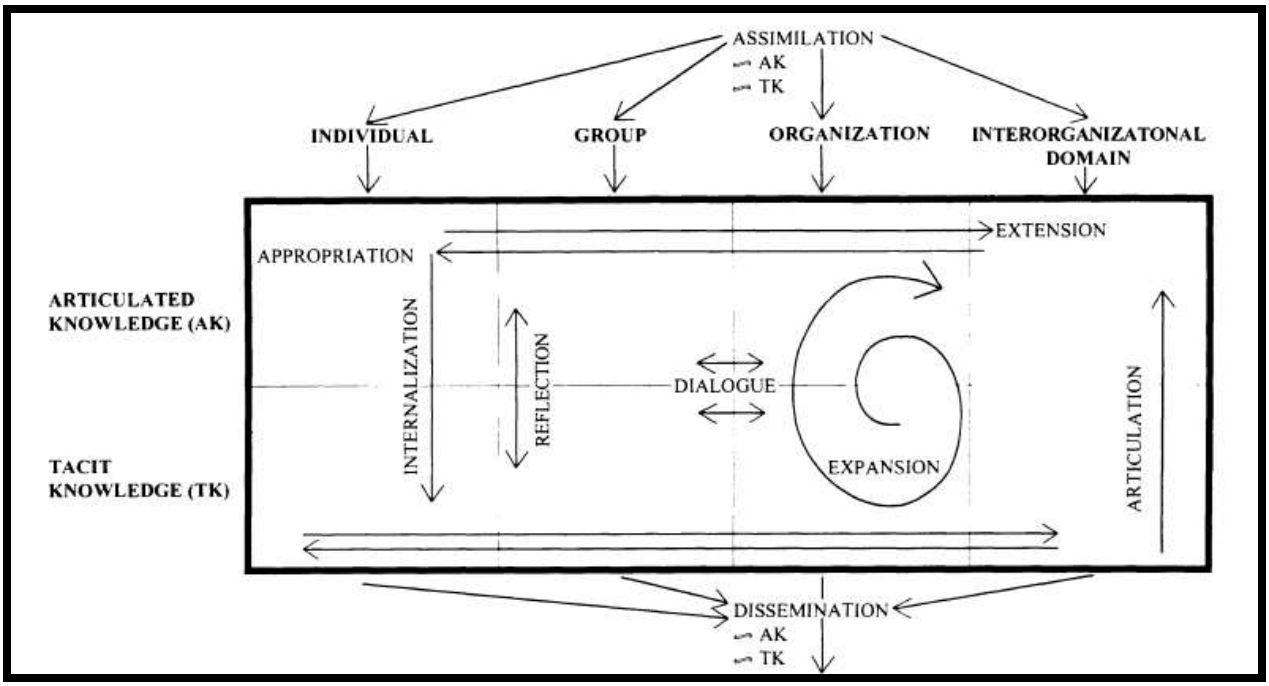

Figure 5 : Knowledge Management Framework
(Source: Hedlund, 1994)

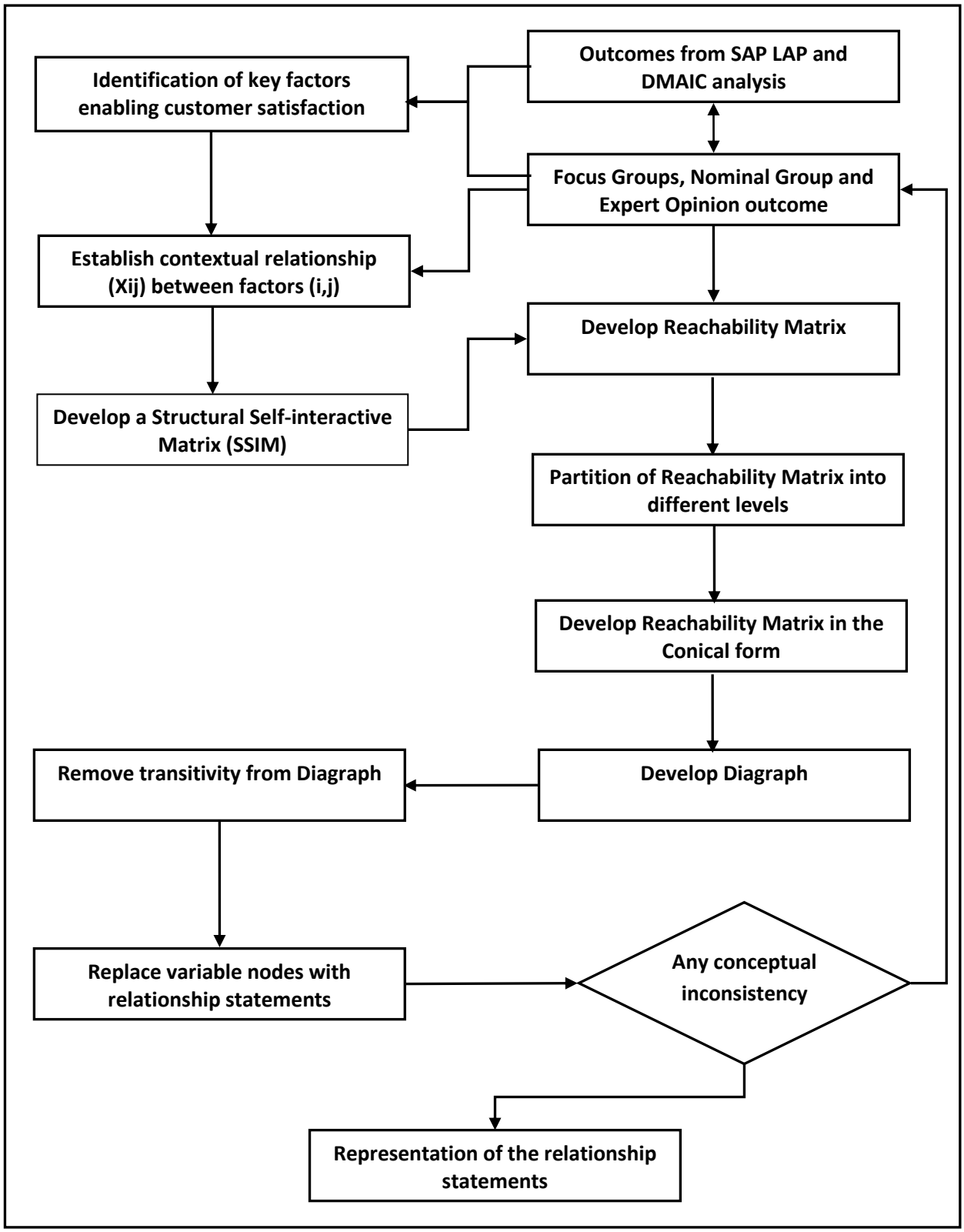

Figure 6 : ISM Process Methodology
(Source- Sohani, 2012 and Self Knowledge)

Figure 7: DMAIC Process
(Source: www.sapartners.com, 2016)

3.0 A Brief on Organization Background and Strategy

The organization **"ABC"** was formed with a goal to focus on developing innovative software solutions and services specifically for the specialized needs of companies across domains. Over the last 10 years the organization has grown revenues exponentially through a strong and innovative product suite as well as building strong executive and sales relationships with the world's leading companies. As part of its strategy for consolidation of the customer base across the industry, the organization completed many major acquisitions which enabled it to offer a suite of applications across business-process cycle. In the process, the organization carved a niche for itself by virtually eliminating the competition through acquisitions. The organization today partners with major industry players to provide solutions across business process cycles through its suite of software products.

As part of its growth strategy, the organization recognized the growth of Cloud services market. As next step of diversification and further customer consolidation, the organization felt a stringent need for offering the product on hosted/cloud platforms. The strategy was to tap the potential of growing cloud services market and to offer seamless end to end solutions to the customer wherein the hosting infrastructure and product licenses were to be offered to the customers as a suite. This would enable the customers to focus on core business and minimize the costs associated with infrastructure procurement and maintenance. In order to leverage the early entrant advantage in this area, the organization adopted the inorganic route by going on an acquisition spree. Figure8 illustrates the SaaS (Software as a Service) cloud model adopted by the organization as part of its growth strategy. The basic approach was to deliver its applications/products as a service to its customers.

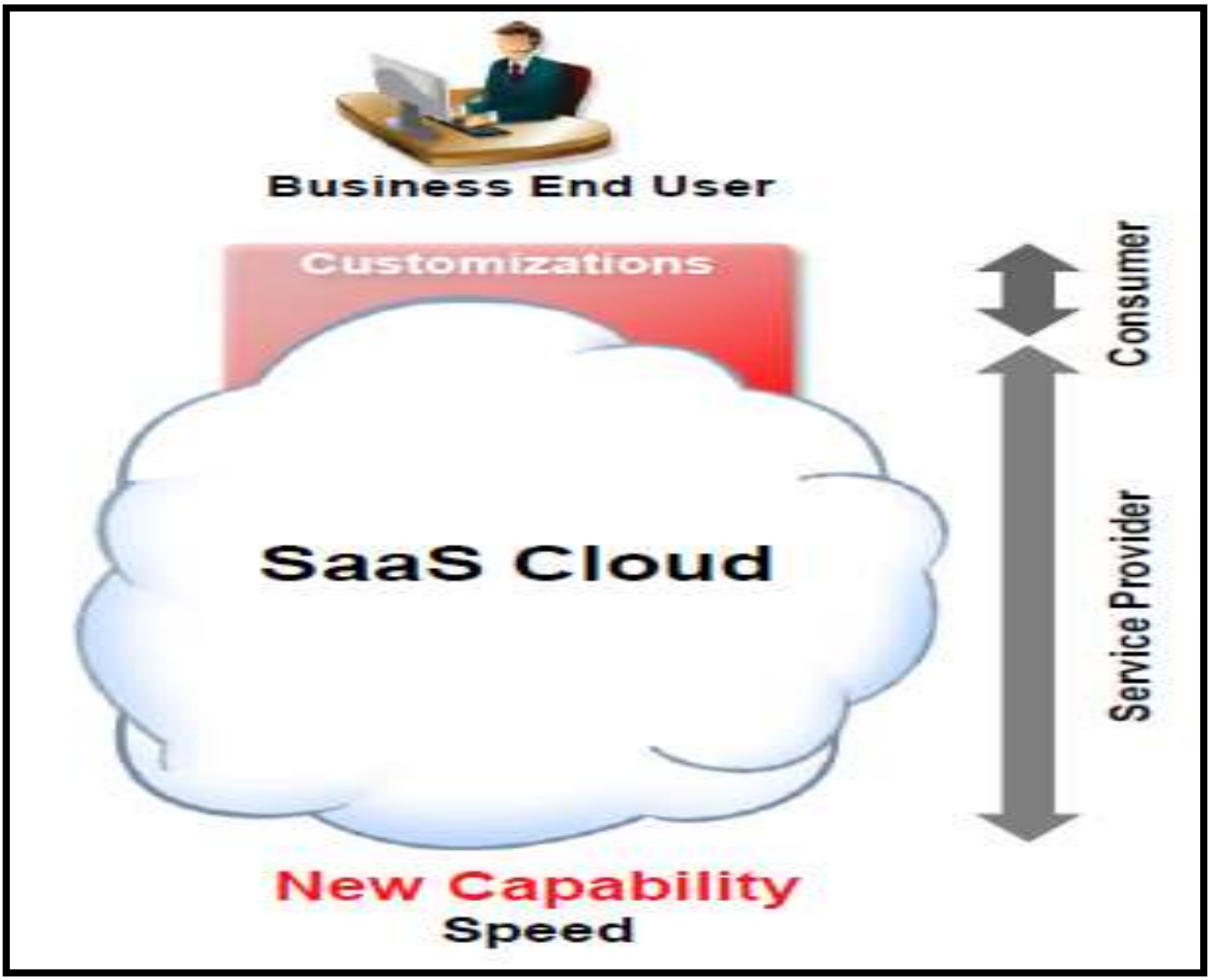

Figure 8 : Cloud Model Adopted by the Organization
(Source – Self Knowledge and Syntheis from Organization's Knowledge Base)

The organization today has become a formidable cloud player and offers a plethora of products as cloud service cutting across industries like Banking and Finance, Insurance, Pharmaceuticals, Manufacturing, Retail, Energy and Hospitality to name a few.

4.0 Case Description

4.1 Deployment Options

With the organization diversifying its offerings by adding cloud services to its portfolio, two broad options are available for the customers. These are as follows.

(a) **On Premise**- Traditional deployment which was being offered to all the customers before cloud. In this model, customer procures and owns the product licenses from the organization. The applications suites for which the licenses are procured are deployed on the platform and infrastructure maintained at customer premises. Infrastructure, Security and Platform management responsibilities are owned by the customer. Application Management activities are also owned by the customer. Customer has the option of engaging either with the organization or with one of its alliance partner for implementation of the product. Any business configurations done as the part of implementation are owned by the customer. A majority of the support and infrastructure activities are owned and performed by the customer.

(b) **SaaS (Software as a Service)** – SaaS model was effected with the organization entering the cloud business and offering its whole line of products on the hosted platform. In such an offering the product license, Infrastructure & Platform management and Application management are bundled as one service to the potential customer. This being a hosted environment, the organization owns the Infrastructure, Security & Platform management and Application Management activities. As in the case of an on-premise model, the customer has the option of engaging either with the organization or with one of its alliance partner for implementation of the product. Since SaaS (Software as a Service) is an end to end service, the organization has the accountability and ownership of all the components of the service with the sole exception of business configurations, which in this case are also owned by the customer.

The problem being analyzed through this report is specific to SaaS (Software as a Service) deployment model. Below diagram depicts the deployment models discussed above with their respective key characteristics and differentials.

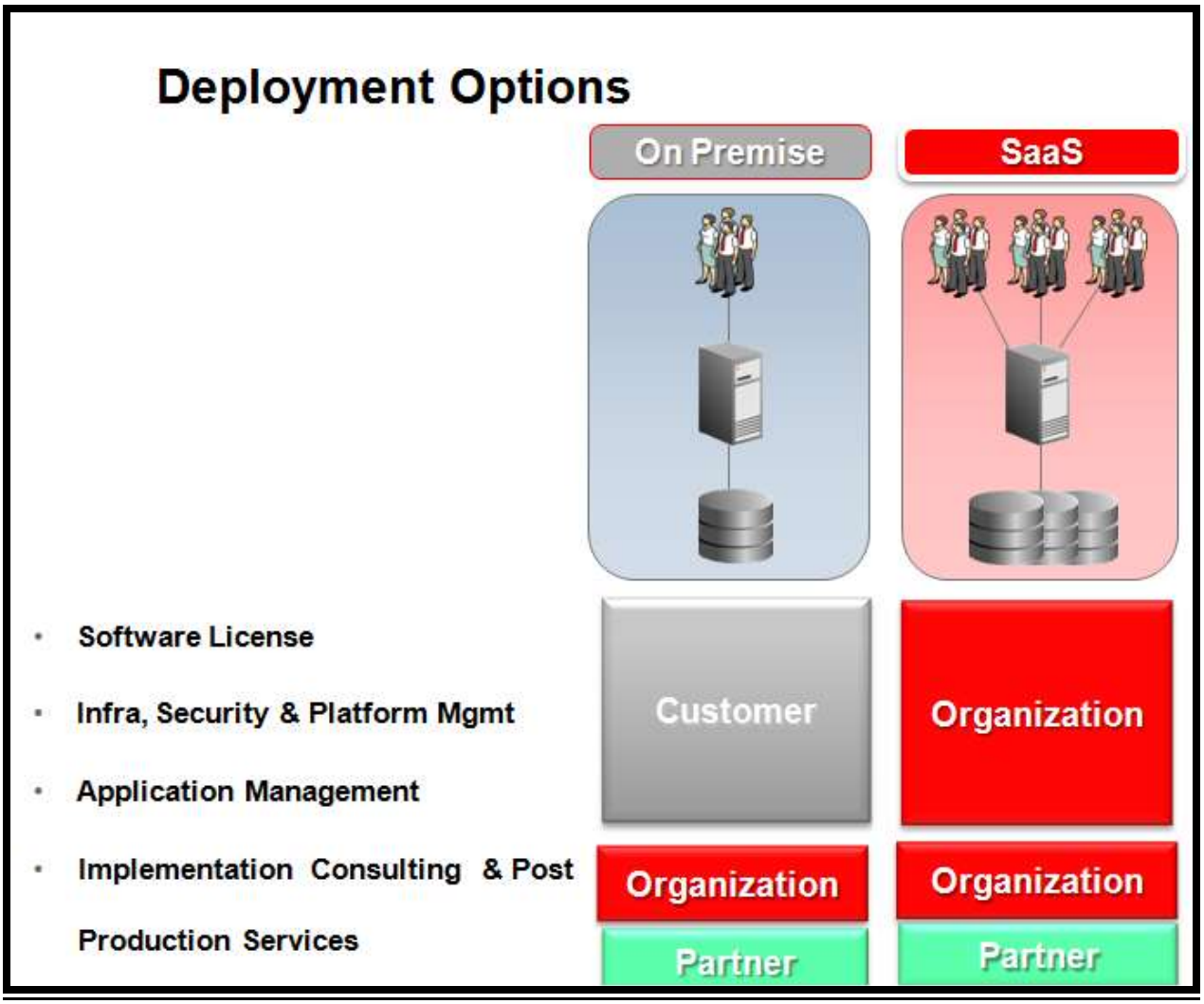

Figure 9: Deployment Options for Products

(Source – Self Knowledge and Syntheis from Organization's Knowledge Base)

4.2 Cloud Service Commissioning Process

Following sub processes are involved in Cloud Service commissioning Process.

a) **Contract Closure and Order Booking** – Post the closure of negotiations on a service with the customer, the Sales team presents the customer with a contract for the perusal. All the terms and conditions are mutually agreed upon both by the customer and the organization. Once all of the terms and conditions are agreed upon, the competent signatories from both the customer and organization sign the contract. Once the contract is signed, the corresponding order is booked so as to enable the Cloud Infrastructure and Environment delivery teams to analyze and act upon the order. Cloud Infrastructure and Environment delivery teams are the constituents of the overall Cloud Service Delivery team.

b) **Order Receipt and Verification** – The Cloud Environment Delivery team is notified of a new order booking. Post the notification, the competent product specific Application Manager from the Cloud Environment Delivery team analyzes the order for completeness of information needed to start the environment provisioning pertaining to the service which the customer has subscribed to. Order verification also involves determination of the size of the service. This is determined by the number of product licenses which the customer has procured. The customer size/service size is the key input in determining the infrastructure capacity of the service.

c) **Capacity Determination and Infrastructure Deployment**- After the size of the service is appropriately determined, the Application Management team identifies the infrastructure capacity needed to provision the environments for cloud service. The number of environments entitlements for a customer varies on the basis of determined size. The baseline hardware configuration is product specific however the number and size of processing, storage, server, database and network units may vary depending on the size of service. After the capacity for the environments of a service is firmed up, the

Application Management team does a capacity request with the Infrastructure team for capacity deployment. The Infrastructure team builds the environments as per the specifications of the capacity. Once the all the components of hardware are deployed, the environments are handed over to Application Management team for product specific installation.

d) **Product Technology Stack and Baseline Configuration** - Once the environments build is complete, the Application Management team installs the prerequisite software specific to a product. This is followed by actual product installation. Application Management team then does the baseline configuration or factory configuration specific to a product. Application Management team also configures the customer representatives as application administrators. This is followed by a sanity check for all the environments.

e) **Environment Release to Customer/Implementation Team** – Once all the baseline configurations are complete, the environments are released for use to the customer/implementation team. Customer billing is initiated only after the first environment is released to the customer for use. Established target for environment commissioning post the closure of contract is sixty calendar days.

Figure10 below gives a summary of all the constituent teams and their respective functions.

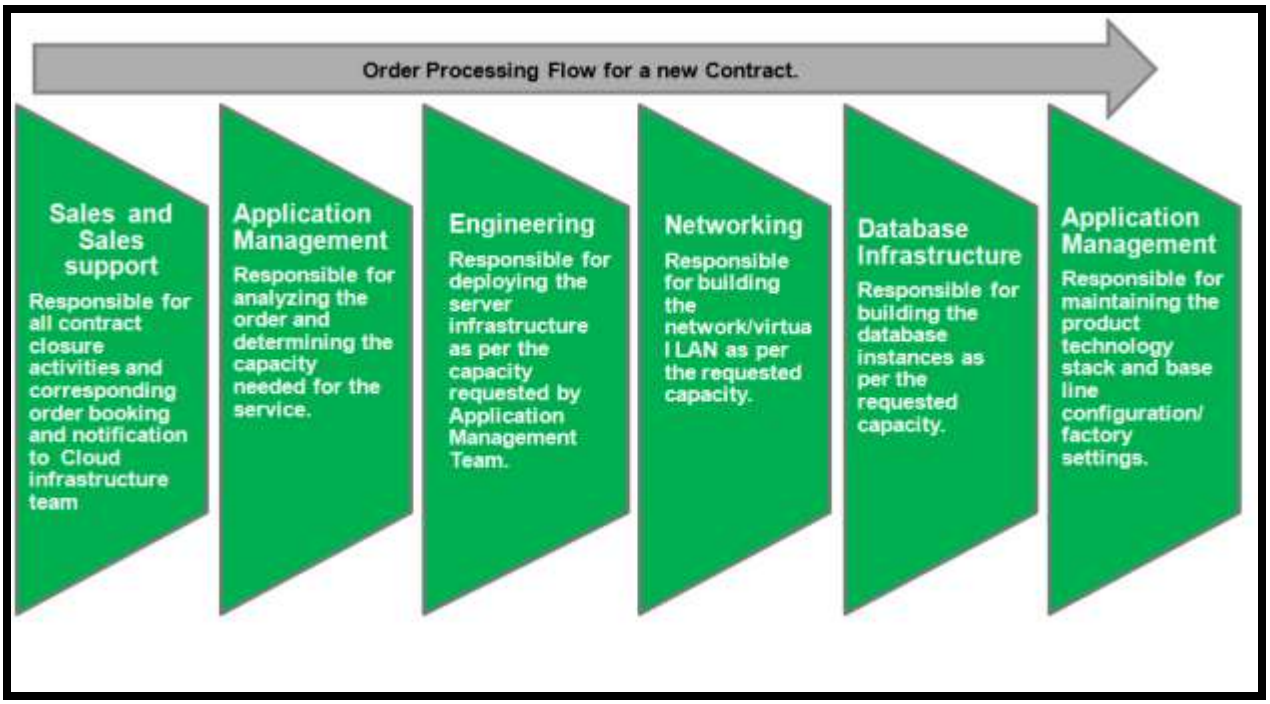

Figure 10: Cloud Service Environment Delivery Team Constituents and Order Processing Flow (Source – Self Knowledge and Syntheis from Organization's Knowledge Base)

All the above teams are shared pool of resources catering to multiple customers.

4.3 Cloud Service Delivery Constituents

As discussed above the SaaS delivery model has substantial sub functions which need to be performed by the organization. In order to provide seamless services to all the Cloud customers, several teams were constituted to cater to each of the function streams. These teams had proven expertise in individual areas assigned to them. The various constituent teams of Cloud service delivery with their individual responsibilities and attributes are as follows

(a) **L1- Global Helpdesk** – Responsible for registration, prioritisation and classification of received incidents. This team provides first level support for any cloud offering related incident reported by customers with the objective of providing solutions to such incidents and also provides regular updates to the customer on status of reported incident. L1 Support personnel are responsible for simple incident resolution and will escalate incidents requiring a greater level of technical expertise to L2 support personnel. This team has proven expertise in supporting on premise customer deployments for product specific L1 issues.

(b) **L2 Support**- L2 Support Staff provide support whereby the team triage, prioritize and investigate incidents reported directly by Software-as-a-Service (SaaS) customers and L1 Support. L2 Support personnel are software support specialists and will attempt to resolve the root cause of an incident or prepare a suitable workaround solution. As required they may escalate issues to other operational teams**.** The team was originally constituted for providing software support for on premise customers and was later engaged further to support SaaS customers also.

(c) L3 Support- L3 support is provided for issues and problems that are demonstrable in the currently supported release(s) of a licensed product, running unaltered, and on a certified hardware, database and operating system configuration, as specified in product documentation. L3 will work closely with the product development team in analysing core product issues and help development create hot fixes/patches. L3 support too was pre existent and the ambit has now been extended to SaaS customers.

(d) **Application Management Team –** Responsible for application deployments and managing product technology stack. Owns the implementation of various changes within the customer specific cloud environment through the change management, release management and access management processes. This team also manages and coordinate patches and releases based on customer's request. Responsible for resolution of environment specific incidents and performance issues. This is a core technical team with less focus on domain knowledge and has proven expertise in application management function.

(e) **Engineering** – Responsible for managing the server hardware, operating system and storage. Includes server and storage management within the hosting environments.

(f) **Database Administration** – Responsible for database support for all products in the cloud environment. DBA work focuses on database administration such that all applications within the cloud environment are performing optimally, monitored appropriately, and data is sufficiently backed up to ensure data protection and availability.

(g) **Networking** – Responsible for supporting all cloud environment networks. This team also does network design and implementation and also manages firewalls and VPNs.

(h) Implementation Team – Responsible for one time implementation of the product in question for a specific customer on cloud environment. This team is responsible for building the business configurations for the customer within the application. The team also coordinates any change in business configuration post go live.

Figure11 gives a summary of all the constituent teams and their respective functions. All the below teams are shared pool of resources catering to multiple customers.

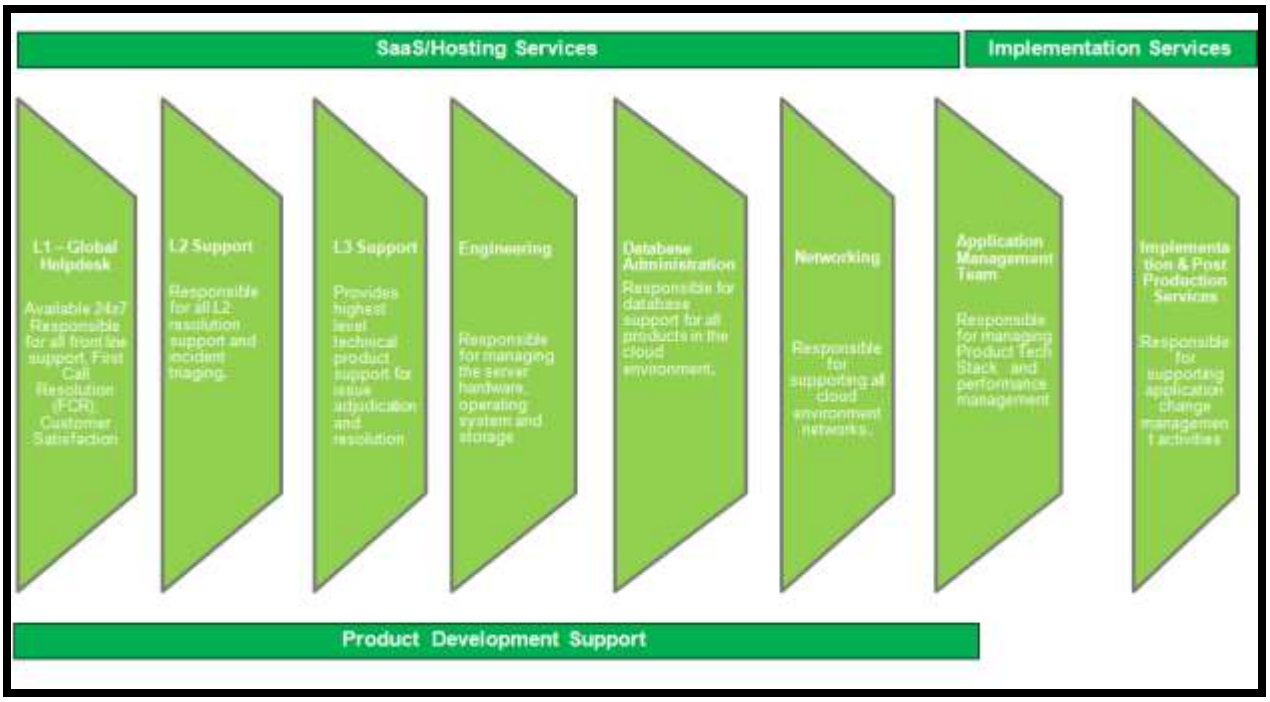

Figure 11: Cloud Service Delivery Team Constituents
(Source – Self Knowledge and Syntheis from Organization's Knowledge Base)

5.0 SAP Analysis

The situation, actors and process interplay in the context of the project is presented in this section.

5.1 Situation

Being the market leader the organization engaged with some key on premise customers to offer cloud services and was able to win substantial number of customers for end to end cloud implementations and services. After the early successful cloud implementations, the number of customers across the business lines signed up with the organization for its offerings. This resulted in an exponential increase in the scale of operations of cloud services. The organization swiftly acquired the infrastructure capabilities needed to enable the desired scale. With the expert teams and their respective internal processes in place, the higher management was confident of the best in class service for all its customers regardless of the scale. However as the projects progressed, the customers and internal stakeholders came back to the organization with concerns around spectrum of issues. There were escalations around lack of clarity on issues, inappropriate assignment of issues. Below items summarize the issues as reported by customers the during the various phases of a project

(a) Delay in Service Commissioning - Concerns were raised by the customers on delays in environment commissioning. Development environment commissioning was critical for the commencement of product implementation activities. Delays in environment commissioning had a cascading effect on implementation cycle, thereby leading to overall delays for the project. The customers also argued that they were able to raise an on premise product service in relatively lesser time thereby building a case for preference of on premise model over cloud model. Since the sought subscription was for a cloud service, the customer expected a faster turnaround as compared to an on premise service.

(b) Revenue Recognition Issues – Finance department raised concern around delay in revenue recognition. As mentioned in section 4.2(e), customer billing was initiated only

after the handover of environment to the customer for implementation. The substantial delay in service commissioning had an adverse effect on revenue recognition as the organization wasn't able to bill the customer. Finance department and the senior management also pushed for exploring opportunities in reducing the overall commissioning time.

(c) Deployment Phase – Concerns were raised by the customers on handover from sales to delivery. There were inherent delays in handover from sales to delivery where in the overall process of environment commissioning was impacted leading to the delay in environment deployment. Development environment commissioning was critical for the commencement of product implementation activities. Delays in environment commissioning had a cascading effect on implementation cycle, thereby leading to overall delays for the project. The customers also argued that they were able to raise an on premise product service in relatively lesser time thereby building a case for preference of on premise model over cloud model. Since the sought subscription was for a cloud service, the customer expected a faster turnaround as compared to an on premise service. Delays in environment deployment leading to overall delays in the project. Delayed handover from sales to delivery had a cascading effect. Internally, Application Management team also raised concerns on delay on handling of environments to them by Infrastructure team.

(d) **Implementation Phase**- Poor turnaround time on implementation and execution of business configurations as requested by customer. There were concerns on delayed resolution/workaround of product specific issues reported during the implementation phase. Internally, the Implementation team raised concern on critical baseline infrastructure configurations being missed during deployments resulting in a loop back to infrastructure team thereby inducing delays in the implementation cycle. Another common concern among internal and external stakeholders was conflicting updates on issues from different teams.

(e) **Post go live hyper care** – As in the implementation phase there were delays in resolution/workaround of product specific issues reported. Issues resulting due to variations in baseline infrastructure configuration occurred in substantial numbers for production environments. The issues were also encountered during the implementation phase however were not fixed in production environment.

(f) **Production Support –** There were substantial delays in release of new product patches for customer adoption. Subsequent to there were common concerns from customers around turnaround time and resolution time of incidents. The delay in incident resolution was having an adverse impact on service quality parameters.

5.2 Actors and Processes

There were several actors and processes which are interacting to create the above situations. Actors involved in different phases of are depicted in the table1.

Table 1: Participation of Actors in Different Phases

S.No	Actors	Phase			
		Deployment	Implementation & go live	Post go live hyper care	Production Support
1	Sales	✓	✓		
2	Engineering	✓	✓	✓	✓
3	Database Administration	✓	✓	✓	✓
4	Networking	✓	✓	✓	✓
5	Application Management Team	✓	✓	✓	✓
6	L1 – Global Helpdesk		✓	✓	✓
7	L2 Support		✓	✓	✓
8	L3 Support		✓	✓	✓
9	Implementation and Consulting		✓	✓	
10	Product Development	✓	✓	✓	
11	Account Manager	✓	✓	✓	✓
12	Delivery Manager	✓	✓	✓	
13	Customers		✓	✓	✓

Table 2: Actors and Processes Interaction

S.No	Process	Actors (As per table 1)
1	Contract Closure	1,11,13
2	Infrastructure Deployment	2,3,4
3	Environment Build	2,3,4,5
4	Access Management	2,3,4,5
5	Release Management	2,3,4,5,9,10,13
6	Request Fulfillment	1,2,3,4,5,6,7,8,9,10,11,12,13
7	Incident Management	2,3,4,5,5,7,9,13
8	Change Management	2,3,4,5,9,10,12,13
9	Problem Management	2,3,4,5,8,10
10	Outage Management	2,3,4,5
11	Notifications Management	2,3,4,5
12	Implementation and Business Configurations	9,12
13	Performance Management	2,3,4,5
14	Program Management/Governance	11,12,13

Table 3: Actors Participation and Processes Interaction for Cloud Service Commissioning

S.No	Actors	Sub Processes/Steps					
		Contract Closure and Order Booking	Order Verification	Capacity Determination and Build Specification	Infrastructure Deployment	Product Installation and Baseline Configuration	Environment Release
1	Sales	✓	✓				
2	Application Management Team	✓	✓	✓		✓	✓
3	Application Manager	✓	✓	✓		✓	✓
4	Engineering				✓		
5	Networking				✓		
6	Database Infrastructure				✓		
7	Implementation and Consulting						✓
8	Product Development			✓			
9	Delivery Manager					✓	✓
10	Customers	✓					✓

6.0 DMAIC Analysis for Cloud Service Commissioning Delays

The SAP analysis described in the previous section showed that delay in service commissioning was one of the major factors hampering customer satisfaction. This section attempts to define the problem in detail, measure and analyze the environment commissioning process and suggest actions for improvement and control subsequently. Twenty different customers, each subscribing to a different cloud product offering were picked for the purpose of analysis. The selection was done in a way that ensured that all the industry domains found representation in the selection. The products chosen for the purpose were the top revenue generators for the organization.

6.1 Define

Data for eighty four commissioning spanning across past twelve months was selected for the purpose of quantifying and defining the magnitude of the problem. Key findings were as follows:

- **Problem** - Delay in service commissioning. 26% of the service commissioning exceeded the period of 45 days. Lack of coordination between the cloud services delivery team. Defects/Issue in environments handed over to the customer for usage.
- **Customer Impact –** Delay in product implementation. Increased response time. Dissatisfied customer.
- **Business Impact -** Delay in revenue realization of $478,224.
- **Goal –** To reduce the commissioning time to 45 days. Current average is ~65 days.
- **Process** – The cloud service commissioning process has been described in section 4.2.

Table 4: Critical to Quality and Critical to Process Chart

Critical to Quality	Voice of Customer
Reduce environment commissioning time to 45 days.	Delays in environment commissioning.
Defect free and issue free environment/service delivery.	Deliver environment right the first time.

Voice of Business	Critical for processes
Reduce/Eliminate delay in revenue realization and revenue losses.	Eliminate non value added activities and bottlenecks.
Increase customer satisfaction.	Timely and flawless environment delivery to the customer.

6.2 Measure

Out of eighty four commissioning done over past twelve months, twenty two were found to have exceeded the threshold of 45 calendar days. Table5 below shows the time taken in days to perform individual commissioning steps by respective teams for the delayed commissioning. The last column shows the additional days lost after the lapse forty five calendar days period post closure of contract.

Table 5: Time Consumed for Performing Key Commissioning Steps

	Order Information		Commissioning			Analysis	
Customer	**Order Booking (In Days)**	**Order Verification (In Days)**	**Capacity Determination and Build Specification (In Days)**	**Infrastructure Deployment (In Days)**	**Application Baseline Configuration (In Days)**	**Total Commissioning Days**	**Days Lost (after lapse of deployment period)**
Customer 1	7	6	11	22	18	64	19
Customer 2	7	5	16	11	8	47	2
Customer 3	5	8	2	10	24	49	4
Customer 4	8	6	1	10	24	49	4
Customer 5	6	4	5	30	16	61	16
Customer 6	7	5	1	40	30	83	38
Customer 7	5	4	4	12	27	52	7
Customer 8	3	4	1	25	22	55	10
Customer 9	5	9	1	24	28	67	22
Customer 10	6	3	3	17	17	46	1
Customer 11	6	4	4	22	38	74	29
Customer 12	5	7	5	20	37	74	29
Customer 13	8	4	4	37	45	98	53
Customer 14	10	12	4	25	10	61	16
Customer 15	10	16	3	20	9	58	13
Customer 16	5	6	3	35	20	69	24
Customer 17	5	4	14	13	47	83	38
Customer 18	9	10	5	28	32	84	39
Customer 19	6	6	10	29	40	91	46
Customer 20	5	3	10	28	45	91	46
Customer 21	3	2	17	33	36	91	46
Customer 22	2	3	14	16	14	49	4

Due to the inherent delays in the service commissioning, there were delays in revenue realization. The delay in commissioning was taking a toll on overall project timelines of the customer thereby denting the reputation of the organization. The direct impact of the delay was on revenue recognition. Table6 below depicts the scale of delay in revenue loss thereby resulting in late realizations.

Table 6: Revenue Realization Delay due to Delays in Commissioning

Customer	Days Lost	Yearly Revenue	Daily Revenue	Total Revenue Lost	Percentage Revenue with late realization
Customer 1	19	$330,189	$905	$17,187.92	5.21%
Customer 2	2	$250,672	$687	$1,373.55	0.55%
Customer 3	4	$131,709	$361	$1,443.39	1.10%
Customer 4	4	$140,483	$385	$1,539.54	1.10%
Customer 5	16	$132,879	$364	$5,824.82	4.38%
Customer 6	38	$200,176	$548	$20,840.24	10.41%
Customer 7	7	$499,244	$1,368	$9,574.54	1.92%
Customer 8	10	$273,600	$750	$7,495.89	2.74%
Customer 9	22	$48,900	$134	$2,947.40	6.03%
Customer 10	1	$70,818	$194	$194.02	0.27%
Customer 11	29	$378,654	$1,037	$30,084.84	7.95%
Customer 12	29	$678,656	$1,859	$53,920.61	7.95%
Customer 13	53	$55,585	$152	$8,071.29	14.52%
Customer 14	16	$250,678	$687	$10,988.62	4.38%
Customer 15	13	$101,052	$277	$3,599.11	3.56%
Customer 16	24	$869,944	$2,383	$57,201.80	6.58%
Customer 17	38	$566,489	$1,552	$58,976.94	10.41%
Customer 18	39	$695,482	$1,905	$74,311.78	10.68%
Customer 19	46	$381,784	$1,046	$48,115.24	12.60%
Customer 20	46	$177,611	$487	$22,383.85	12.60%
Customer 21	46	$330,189	$905	$41,612.86	12.60%
Customer 22	4	$48,900	$134	$535.89	1.10%
Total	**506**	**$6,613,695**	**$18,120**	**$478,224.15**	**7.23%**

Statistical calculations on the sample provisioning data were done and following measures were calculated:-

- **Mean** – Average of commissioning times for the selected sample of eighty four commissioning.

- **Standard Deviation** - Standard deviation of commissioning times of the selected commissioning.

- **Defects per Unit (DPU**) – In the context of the current problem, this was derived by dividing the number of delayed commissionings by total number of commissionings in the sample data.

- **Defects per Million Opportunities (DPMO) –** This was derived as follows

  DPMO = (DPU X 1,000,000) / Opportunities of error in a unit

  Opportunities of error would be 1 as service commissioning either would be delayed or commissioned on time. Hence there was only one error scenario.

- **Process Capability Index (Cp)** – The derivation is shown in the table7. Process is capable only if Cp>1.

Table 7: Process Capability

Process Capability Calculations	
Upper Specification Limit (USL)	**45**
Lower Specification Limit (LSL)	**1**
Specification Width (PW)	**44**
Standard Deviation / Sigma	**19.924**
Process Width (PW)	**119.54**
Mean	**39.64**
Process Capability Index (Cp)	**0.368**

- **Sigma Level –** It was identified on the basis of standard DPMO-Sigma level look up table.

Table 8: DPMO and Sigma Level

Sigma Level Derivation	
Total Number of Commissionings	**84**
Delayed Commissionings	**22**
Opportunities of Error	**1**
Defect per Unit (DPU)	**0.2619**
Defect per Million Opportunities (DPMO)	**261905**
Sigma Level	**2.14**

Distribution of time expended during each phase of the commissioning process was analyzed and the largest time consuming phase/activity for each delayed commissioning was identified. Pareto Analysis of the same led to the below distribution.

Table 9: Pareto Analysis Distribution

Category	Count
Network Setup	**8**
Order Booking	**7**
Application Setup	**6**
Server Setup	**1**
Total	**22**

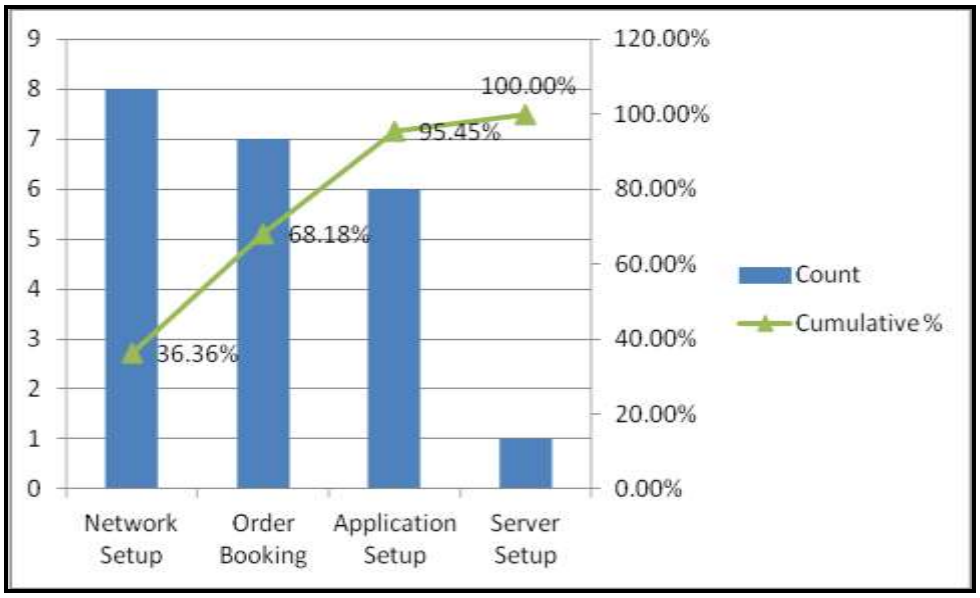

Figure 12: Pareto Analysis for Cause of Delays in Commissioning (Source – Self Knowledge and Synthesis from Comissioning Data)

Following were the key findings from the Measure phase:-

1. Current process is not capable.
2. Since specification width is within process width, breakthrough improvements are needed.
3. Network Setup, Order Booking and Application Set up are the vital reasons for the delay in service commissioning.

6.3 Analyze

Based on the findings from Measure phase, the process and the underlying data was further analyzed to understand the underlying factors contributing to the delays. Depending on the outcome of the analysis, the action plan for eliminating the problem was to be proposed and implemented. The findings from the data were vetted with pre nominated representatives of the cross functional teams to cross check the actual existence and severity of the causes. The key findings are presented in the cause and effect diagram below.

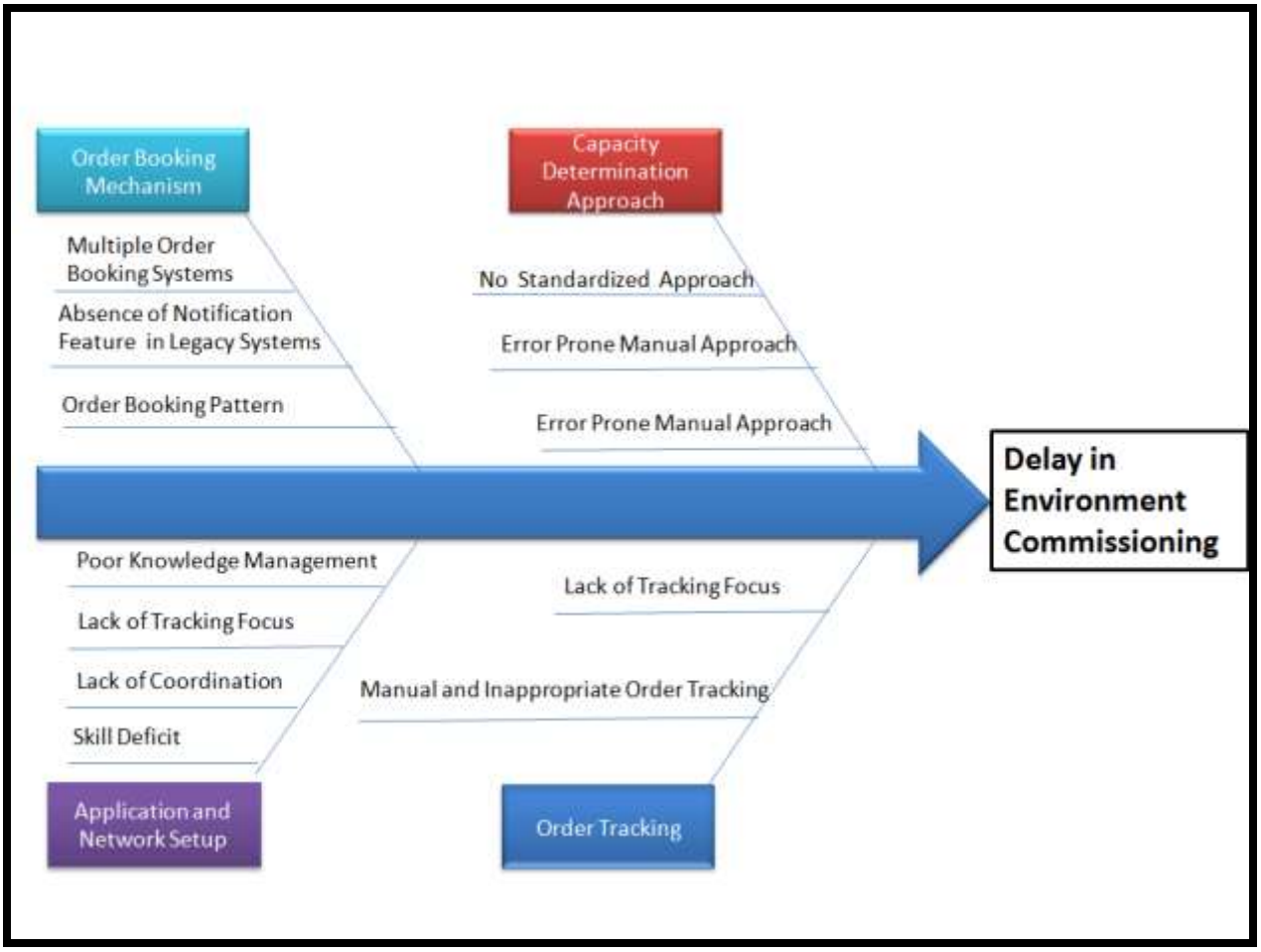

Figure 13: Fish Bone Diagram Depicting Various Causes for Delay
(Source – Self Knowledge and Synthesis from Comissioning Data)

The above causes are described next:-

(1) **Order Booking Mechanism** – Post closure of contract with the customer, the Sales teams from different business units were using different system to book orders. The prime underlying reason was acquisition of the business units by the organization and incomplete integration. Some of the order booking systems had a mechanism which notified the Cloud Services team when an order was booked however some of the legacy systems didn't have this feature. Hence the Application Management team had to monitor the order booking system manually. The manual intervention induced delays.

(2) **Complexities in Determining the Capacity** – There was no standard method for determining the capacity of service for an order. As mentioned in section 4.2(c), the number of environments entitlements and the number and size of processing, storage, server, database and network units for a customer varies on the basis of determined capacity. The Application Management team was intuitively determining the above numbers on the basis of number of licenses of a product procured by the customer. A capacity form specific to a product depicting the details of the size of the service was filled manually by the Application Management Team. A diligent analysis revealed that the capacity form format itself was complex and too tedious to be filled. A direct result was erroneous capacity forms. These errors at times percolated till the infrastructure deployment phase and had to be rectified once identified. The rectification process involved multiple to and fro transactions between the Engineering team and Application Management team. The deployment execution remained suspended during the rectification transactions. Post rectification of the capacity forms, certain deployments had to be rolled back due to change in build specifications. This in turn induced substantial delays in overall service commissioning.

(3) **Order Tracking Issues** – Application Management Team had the responsibility to verify order, determine capacity and initiate an environment build request. In most of the cases, it was observed that the team didn't have a focus on following up and tracking

the commissioning request. It was evident as order tracking was not the primary forte of Application Management Team hence diligent follow ups with the constituent teams were missing. Figure14 shows the interactions between the cloud constituents teams for the purpose of service commissioning. As is evident, there is no overarching entity which can manage the service commissioning holistically.

(4) Order Booking Pattern – A diligent analysis of the orders across the product lines revealed a common booking pattern. It was observed that sixty five percent of the orders booked during any quarter were booked in the last few days of the quarter. This hefty scale of bookings towards the end of quarter created a peak in the normal operation cycle wherein the shared pool of Cloud Service Environment Delivery Team was poured with more number of orders then the monthly average. The peaks also contributed to the delays as there was a spillover of effort. Table10 shows the order booking trend of a few representative product.

Table 10: Order Booking Trend of Five Products

Product	Total Orders During a Quarter	Orders Booked in Last Week of the Quarter	Orders Booked in Last Week as Percentage of all Orders
Product A	7	5	71.43%
Product B	17	8	47.06%
Product C	6	4	66.67%
Product D	9	6	66.67%
Product E	10	6	60.00%
Total	**49**	**29**	**59.18%**

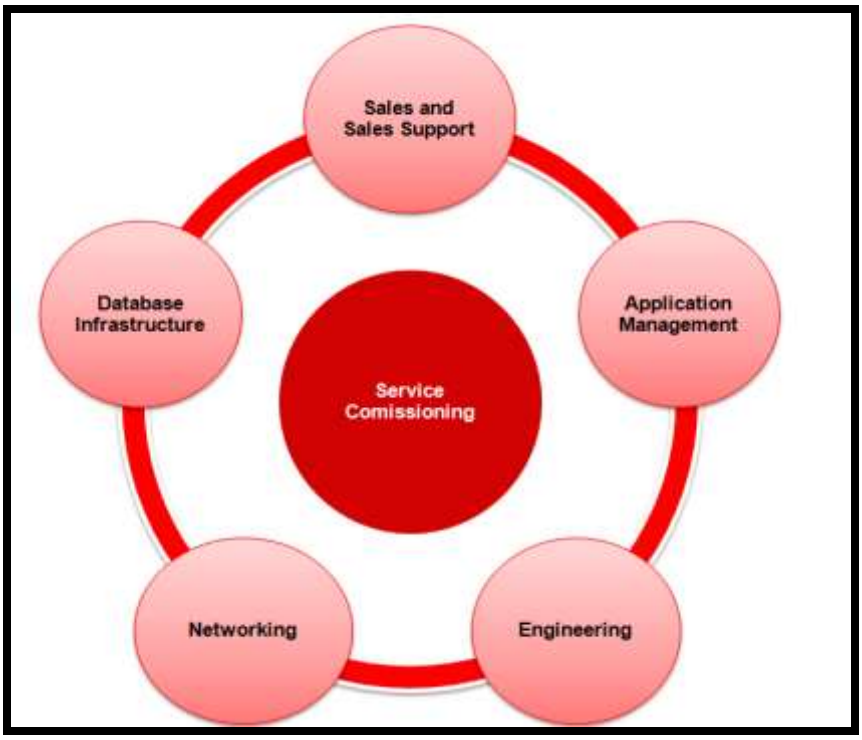

Figure 14: Integrations and Interactions Cloud Service Environment Delivery Team Constituents
(Source – Self Knowledge)

Table11 shows the key indicative activities classified into three buckets:-

A. **Customer Value Added** – Activities adding value to the customer. These need to be optimized.

B. **Operational Value Added** – Activities adding value to business. These need to be minimized.

C. **Non Value Added** - Activities adding no value. These need to be eliminated.

Table 11: Categorization of Key Processes

Sr. No.	Activity	Customer Value Added	Operational Value Added	Non-Value Added
1	Contract Closure	Yes	Yes	
2	Order Booking		Yes	
3	Manual Order Initiation			Yes
4	Order Booking in Legacy Systems			Yes
5	Order Verification			Yes
6	Capacity Determination		Yes	Yes
7	Build Specification	Yes	Yes	
8	Order Tracking		Yes	
9	Manual Product Set up			Yes
10	Product Installation	Yes		
11	Rectification Transactions between the cross functional teams.			Yes
12	Infrastructure Deployment	Yes	Yes	
13	Environment Release	Yes		

6.4 Improve

The following corrective actions were proposed for resolution of the problem in question.

1) **Common Order Booking Framework**- It was proposed that the Cloud Service Environment Delivery Team should get all the order booking notifications through a single channel. Also manual notifications should be stopped from immediate effect. In order to achieve this, a common booking system was put in place. To ensure business and operations continuity, initially all the erstwhile booking and legacy booking systems were integrated with the new system through a data feed. The synchronization between the new system and all the old system happens twice a day and the new system is the only source of all booking notification to cloud team. All the sales teams across the globe will eventually book orders in the new booking system however the phase out of older systems will happen in a staggered manner.

2) **Standardization of Capacity Parameters -** In order to expedite capacity determination, a standard sizing metrics were proposed for all the products. As per the new standardization, the customer would be classified as Small, Medium or Large depending on the number of licensed procured by the customer for a particular product. The number of environment entitlements was also standardized product wise as per the classification of the customer. Appropriate number of processing, storage, server, database and network units were associated with each sizing metric. The standardized product specific sizing metric along with the standard deployment architecture ensured that time spent on capacity determination and specification is minimized. This further helped in automation of infrastructure deployments. Table12 below shows the sizing metrics for two representative products.

Table 12: Sizing Metrics for Two Products

Product A			Product B		
Customer Size	No. of Procured Licenses	Environment Entitlements	Customer Size	No. of Procured Licenses	Environment Entitlements
Small	Less than 200	2	Small	Less than 300	2
Medium	Between 200 and 400	3	Medium	Between 300 and 800	3
Large	Greater then 400	4	Large	Greater then 800	4

3) **End to End Tracking of an Order -** Service Delivery Manager (SDM) was entrusted with task of end to end tracking of the deployment till implementation. While this was almost the case earlier too but the capacity determination and build specification responsibility lied with Application Management team. It was proposed that all the tracking and initiation activities should be owned by SDM as the individual teams will lose execution focus, if engaged in tracking activities. SDM for a project should be identified as soon as the contract is closed. The proposition sought the process to be changed in such a way that SDM is entrusted with the responsibility for order verification and determining the capacity and build specification. Standardization of capacity parameters and build automation ensured that this transition to SDM is seamless. An SDM will work closely with all the constituents of Cloud Service Environment Delivery Team to ensure that environment commissioning is on schedule and proper timelines are being adhered. Further to streamline the process, a workflow interface should be designed from the new order booking system which will trigger a notification to assigned SDM and Infrastructure team as soon as an order is booked in the system. This workflow should culminate after the environment has been fully commissioned by the Infrastructure team. The new arrangement is pictorially depicted in the figure15.

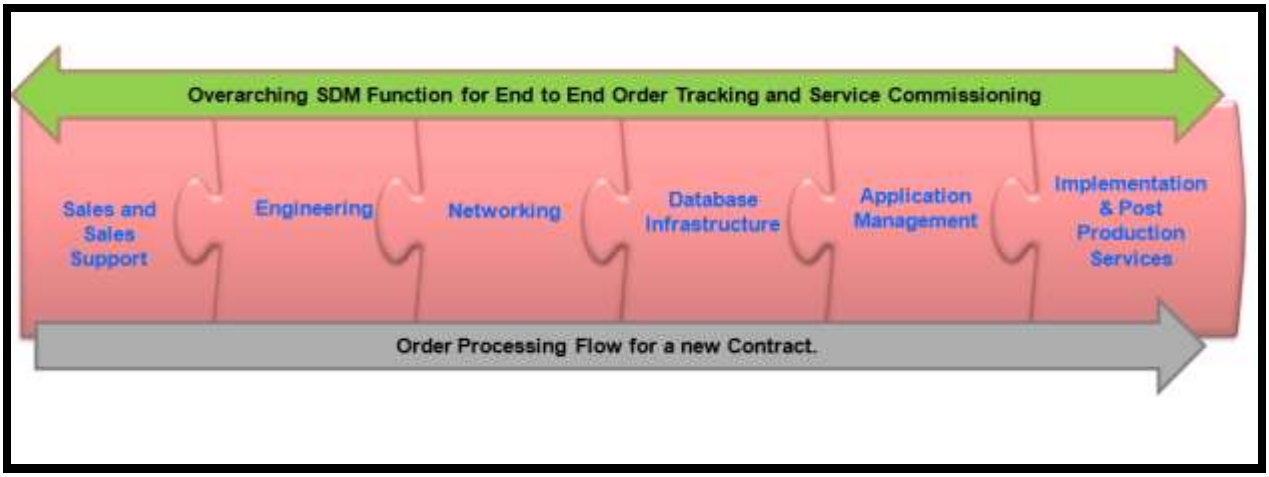

Figure 15: Enhanced and Modified Integration Framework of Cloud Team.
(Source – Self Knowledge and and Syntheis from Organization's Knowledge Base)

4) **Automation of Infrastructure Deployment and Product Installation –** It was proposed to automate the majority of installation steps for all the products. All the Product Development teams have been engaged with the Application Management Team to develop the installation scripts which will take all the parameters at the start of the set up and will perform the installation with minimal/unavoidable manual intervention. A portal development is in progress which will enable the Service Delivery Manager to enter the build specification online in a deployment portal. After the build specs are marked complete, the VM (Virtual Machine) manager tool will automatically trigger allocation of processing, storage, server, database and network units from the respective pools as per the build specification.

5) **On the Shelf Infrastructure Inventory –** In order to handle the peaks resulting from the quarter end booking it was proposed to have ready to use pre deployed product specific infrastructure deployments of all the capacity sizes. Since these deployments were not initiated in response to an order booking, they were termed as on the shelf infrastructure. This deployment will provide leverage to the Cloud team to offload the relatively high number of orders at the end of the quarter. Depending on the size of the customer, an available and matching product specific infrastructure will be tagged to an

order once the order is booked. This will be done on a first come first serve basis for the orders which are booked towards the end of quarter. Since the infrastructure was in place, the team will straight away proceed with the product installation saving a substantial time and decreasing the overall lead time for the orders. The number of on the shelf inventory deployments to be maintained was forecasted on the basis of two factors.

a. Product specific order trends in past four quarters.
b. Current sales pipeline having 90% chances of realization during the current quarter.

6) **Knowledge Management** – To address the problem of skill deficit and lack of coordination between the cloud constituent teams, certain Knowledge Management initiatives have been proposed. These are discussed in detail in section 10.

Table13 summarizes the CTPs along with the root cause and probable solutions.

Table 13: Solutions Summary

S.No	CTP	Root Cause	Proposed Solutions
1	Order Booking	Multiple order booking channels with no synchronization mechanism.	1.1 Single channel order booking notification for Cloud Delivery Team.
			1.2 Synch up mechanism between the various order booking systems.
2	Capacity Parameters	No standardized sizing metrics.	2.1 Standardised sizing metrics across products.
3	Order Tracking	No end to end tracking of order and associated handoffs during commissioning process.	3.1 SDM as an overarching authority to track an order end to end.
			3.2 Automated workflow for tracking and assignment of tasks.
4	Infrastructure Deployment and Product Installation	Manual Effort.	4.1 Product installation automation
			4.2 Automated hardware/virtual machine commissioning
5	Order Booking Pattern	More order towards the end of quarter	5.1 Ready inventory of infrastructure

6.5 Control

The control phase is already in progress as this report is written. Following threshold have been defined for each phase of service commissioning.

Table 14: Phase Wise Thresholds

Commissioning Phase	Threshold (In Days)
Order Booking	2
Order Verification	4
Build Specification	5
Infrastructure Deployment	14
Application Baseline Configuration	15
Total	**40**

Breach of any threshold defined for a phase will trigger a notification/escalation to a pre configured set of roles in the workflow. For most of the cases, these are the functional managers who own the delivery for a particular phase. Any breach will solicit their intervention through a notification so as to enable them to follow up with right person performing the task and get the issue resolved at the earliest so as to ensure smooth commissioning of the environment. The threshold has been purposely kept below 45 so as to ensure that the Control Limit (40 days) is well within the Specification Limit (45 days). Control/Improve actions pertaining to skill deficit and multi team dynamics have been described in subsequent sections.

7.0 Problem and Gap Analysis

It was attempted to analyze the situation and understand the underlying factors contributing to the situation. Depending on the outcome of the analysis, the action plan for eliminating the problem was to be proposed and implemented. Twenty customers were picked for the purpose of analysis. In order to ensure appropriate coverage of issues it was decided that these customers will span across product lines being offered on Cloud. A careful analysis of the situation for all the three customers led to the following findings:-

(1) **Triaging of Incidents** – A diligent analysis revealed that there were severe issues in triaging of incidents. Most of the Incidents beyond the ambit of L1 team were triaged wrongly. For example, an incident related to environment was triaged to L2 team where as it should have been assigned to Application Management team. These wrong assignment induced delays in incident resolution where in identification of an incident as a wrongly triaged candidate and subsequent assignment to the correct team consumed majority of incident resolution time thereby resulting in customer dissatisfaction. Such delays were evident both in Implementation and Post go live phases.

(2) **Internal Assignment and Transfer of Incidents** – A thorough analysis of the incidents revealed a common pattern. All the inter team assignments within cloud service delivery team and transfer transactions were being done on the original incident ticket logged by the customer. For example while investigating an incident if L2 support needs some environment specific information from the Application Management team then it would transfer the original incident ticket to Application Management team and would wait for a response. All these hops and transfers were being notified to the customer end user who has originally logged the incident ticket. This added to the frustration of the customer. Using the parent incident ticket as logged by customer for internal inter team transaction was a cause of frustration of the customer as it appeared more of a

lack of ownership issue. Further as a natural extension of this issue an implicit finding which came out after the analysis of many issues was that the Cloud service sub teams at times ended up communicating with each other through the customer. There were instances wherein the support analyst told the customer that the issue was not within the scope of his sub team and should be routed as appropriate. This scenario is depicted in the figure16.

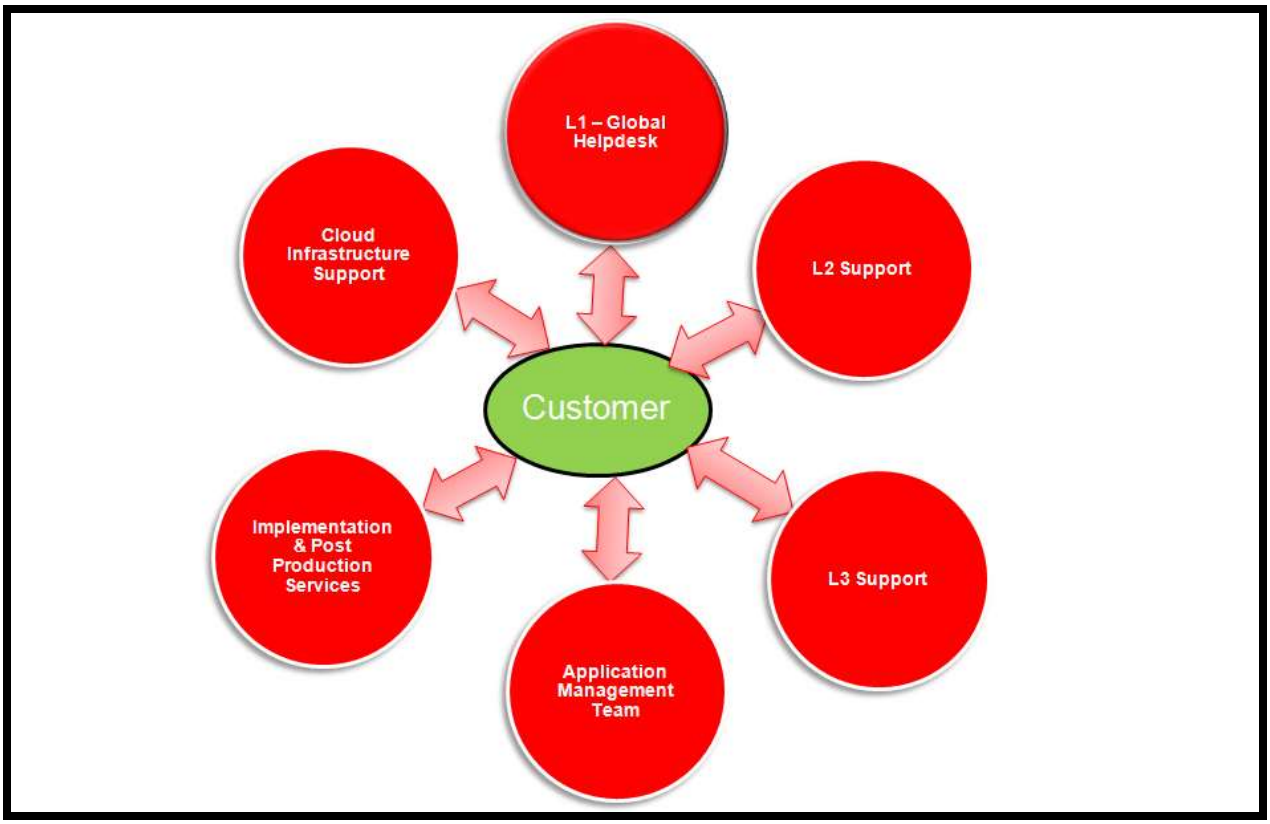

Figure 16: Disintegrated View of Customer Interaction by Subteams (Source – Self Knowledge)

(3) **Cloud Service Delivery Team Composition**– The team composition was a mix baggage. While teams like L1, L2, L3 support and Implementation had a sound product/functional

knowledge, teams like Application Management and Infrastructure were very strong technically. It was further observed that Application Management and Cloud Infrastructure team were constituted through one of the acquisitions done by the organization. Hence there was a need to sensitize these teams on domain and sensitivity of the business function being supported by the software product. This would enable them to appreciate the urgency of issues in an effective way. Similarly L1, L2, L3 support and Implementation were well equipped for an on premise implementation but didn't have much exposure to service delivery model. Table15 depicts an indicative rating of various cloud constituent teams on four key factors in the form of a matrix.

Table 15: Indicative Rating of Cloud Constituent Teams on a Scale of 4

Team	Functional/Domain Knowledge	Product Technology and Platform Knowledge	On Premise Support	Hosted Service Delivery
Engineering	1	3	Not Applicable	3
Database Administration	1	3	Not Applicable	3
Networking	1	2	Not Applicable	3
Application Management Team	1	4	Not Applicable	4
L1 – Global Helpdesk	2	1	2	1
L2 Support	4	2	4	1
L3 Support	3	3	3	1
Implementation and Consulting	4	2	4	1

(4) **Inconsistencies in Environment Baseline Configuration and Resolution of Issues** – A large sample of incident and environment build tickets for the selected customers was analyzed for the effectiveness of resolution (response time, resolution time and first time right) and overall quality of incident documentation (audit log summarizing the history of the ticket and steps taken during resolution). This analysis revealed several inconsistencies summarized below:-

- Similar issues took same or higher resolution time even after multiple reoccurrences.
- No resolution standardization achieved for reoccurring incidents.
- Members of the same team had different approaches in resolving similar kind issues. These approaches led to varied resolution times.
- There was a pattern of repetition of issues resulting due to wrong configuration in same set of parameters across the customers.
- A substantial effort and time was attributed to clarifications and approvals for documented and pre approved configurations.

(5) **Customer and Account Management Issues** – A general concern across customers was on Account Management. This had traditionally been a strong forte of the organization for the on premise customers hence the expectations for cloud services were at par with on premise. Account management involves engaging with the customer on health and performance of service and to identify avenues for improvement and optimization of the service. This also involves recording customer concerns and requirements around the service and devising ways of resolving the issues through deliberations with internal teams. On deep diving, it was found that Sales executive was engaging with the customer for Account Management activities even after the contract closure. Each project had a Service Delivery Manager assigned (after contract sign up) who had very frequent interactions with the customer. This at times resulted in contradictions in messaging as the sales function had the inherent limitation on having the latest update on any delivery issue from the team.

8.0 LAP Synthesis

Previous section depicts the analysis of the situation, identified gaps and its implications at the various stages of the project. These have been derived using SAP analysis, interaction with key team members and diligent analysis of the underlying data extracted from service management tools. The following are the leanings based on situation analysis using SAP model. The following actions are proposed for improvement of the service and resolution of the problem in question:-

1) **Incident Triaging Process Improvements –** Table15 depicted the relative scale of individual teams on four key factors critical for the efficient cloud service delivery. It was observed across the projects that majority of issues reported till the Implementation phase were related to Application Management or Infrastructure. Similarly majority of issues reported Post go live phase were related to product (L2 and L3 issues). As per Table15 L1 global helpdesk has the required expertise for resolving and triaging product issues from its on premise experience. Hence the process should be modified to enable L1 global helpdesk to pass on all the cloud service incidents to Application Management team which should triage the incident as appropriate. The responsibility of triaging the issue till Implementation phase should lie with Application Management team and L1 global helpdesk will take charge of triaging *Post go live* phase onwards. Such an arrangement will ensure that most of the incidents don't end up in a wrong assignment till the implementation phase. L1 global helpdesk team should simultaneously be trained by extension of their knowledge base through a knowledge management system to capture various scenarios of incident triaging. A simultaneous training in the previous phases will ensure elimination of all the triaging errors by L1 global helpdesk in subsequent phases of the project and even for all the phases of subsequent customers. This arrangement should be sustained for substantial projects for wee customers. Once L1 global helpdesk acquires the relevant expertise in triaging, the Application Management team can be relieved from triaging activities.

2) **Process Touch Points and Integration** – While the processes of individual teams are comprehensive the touch points within the inter team processes are not defined appropriately. Absence of such touch points and integration mechanism is leading to issues of incident transfer and internal assignment as mentioned in Problem Analysis section. The process should be modified to mandate that any internal transactions within the sub teams for a resolution will be done through internal tickets rather than the transferring the parent ticket logged by the customer. All such internal tickets should be linked to the parent ticket to ensure proper tracking of an issue at any point in time. Internal operational level agreements need to be agreed upon for various types of possible internal transactions. An integrated process framework should be defined which eliminates any ambiguity through proper definition of touch points and handovers between sub processes. Figure 17 depicts the changes in customer interaction which can be achieved post implementation of the above process changes.

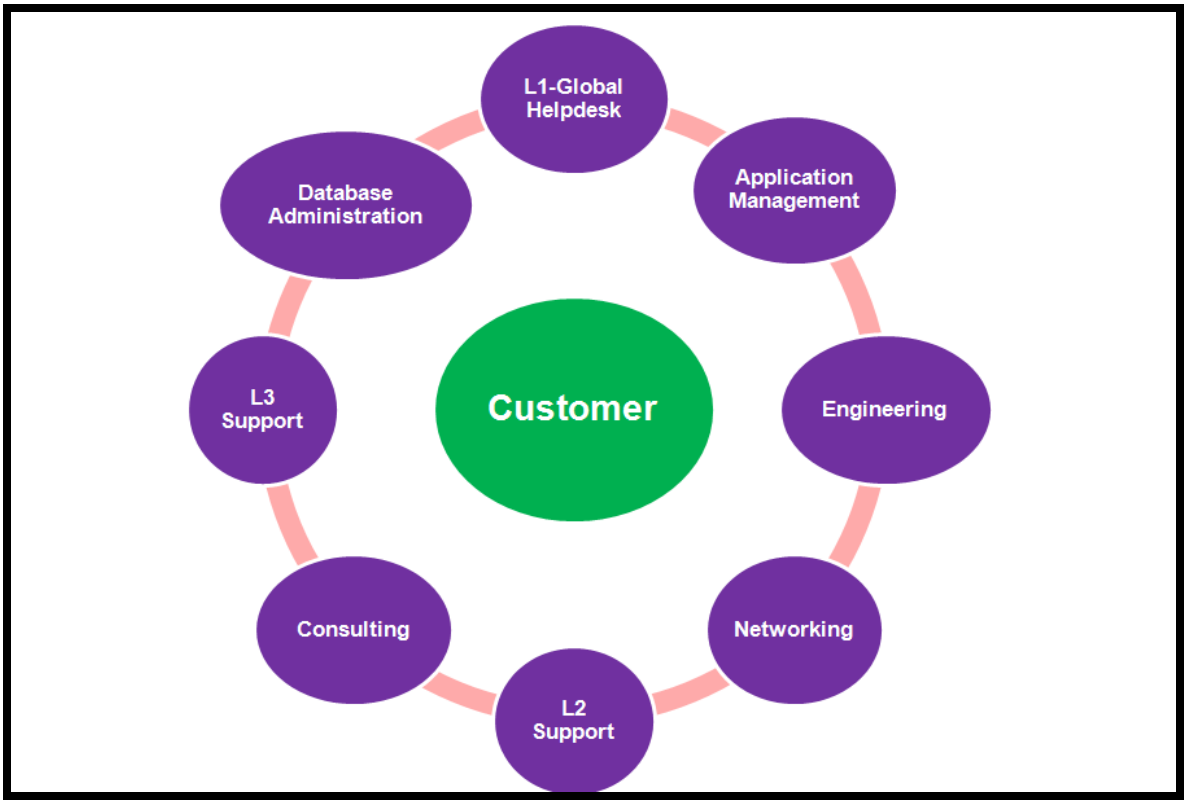

Figure 17: Integrated View of Customer Interaction by Cloud Services Team (Source – Self Knowledge and Syntheis from Organization's Knowledge Base)

3) **Account Management Changes –** In order to maintain a single channel of communication with customer on non transactional issues, only Service Delivery Manager should be authorized to engage with the customer post contract closure and the sales executive should engage with the customer during pre sales and pre contract closure phases.

9.0 Customer Satisfaction Enablers Analysis Through Interpretive Structural Modeling (ISM)

9.1 Identification of Key Factors Enabling Customer Satisfaction

The outcome from SAP-LAP analysis and DMAIC analysis were synthesized for identifying the key factors which will enhance the customer satisfaction in context of the given problem. The synthesized outcomes were put to discussion through creation of cross functional focus groups having adequate representation from all the constituent teams of Cloud service. Account Managers of all the twenty customers identified for the purpose of this study were entrusted with the task to represent the customer opinion in the focus groups discussions. The focus groups vetted the outcomes through iterations of brainstorming, nominal group and Delphi methods. After every iteration, the Account Managers would touch base with their respective customer representatives to have their feedback. Following key customer satisfaction factors were identified at the end of the above exercise.

Table 16: Key Customer Satisfaction Enabling Factors

S. No	Factor	Source
C1	Cloud Service Delivery Team Composition	SAP-LAP Analysis
C2	Issue Triage	SAP-LAP Analysis
C3	Internal Assignment and Transfer of Incidents	SAP-LAP Analysis
C4	Environment Baseline Configuration	SAP-LAP Analysis/DMAIC Analysis
C5	Inter and Intra Team Handovers	SAP-LAP Analysis
C6	Customer and Account Management	SAP-LAP Analysis
C7	Standardisation and Automation	DMAIC Analysis
C8	Response Time/Turnaround Time	SAP-LAP Analysis/DMAIC Analysis
C9	Resolution Time	SAP-LAP Analysis/DMAIC Analysis
C10	Environment Commissioning Time	DMAIC Analysis

9.2 Development of Structural Self Interaction Matrix (SSIM)

A study of the linkages among the factors would help in thorough understanding of the interrelationships between various factors, the role of the various teams involved in enabling those factors, and an appreciation of their problems. There was also a need for a structural relationship among the factors as the factors considered together may seem equally important and sometimes overriding each other. Such a situation makes it difficult to understand the situation clearly and decide a distinct strategy specific to the problem. Insights into interrelationships between factors will help devising an effective strategy and planning.

Cross functional focus groups formed in step 9.1 were then engaged in developing the contextual relationship among the factors. For analyzing the factors enabling customer satisfaction contextual relationship "influences" was selected. This means that any enhancement in one factor will help influence another factor positively thus enabling the other factor. Based on this, contextual relationship between the factors was developed. Keeping in mind the contextual relationship for each variable, the existence of a relation between any two variables (i and j) and the associated direction of the relation was questioned. Four symbols (V, A, X, O) were used to denote the direction of relationship between factors (i and j) during the analysis of the factors in developing SSIM (Table17)

- V: Variable i will influence j ;
- A: Variable j will influence Variable i ;
- X: Variables i and j will help influence each other; and
- O: Variables i and j are unrelated.

Table 17: Structural Self-Interaction Matrix

i/j	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	V	V	X	O	X	V	X	V	V	V
C2	A	V	V	A	V	X	O	V	V	O
C3	X	A	V	A	X	X	X	V	V	V
C4	O	V	V	V	X	V	A	V	V	X
C5	X	A	X	X	V	A	A	V	V	V
C6	A	X	X	A	V	V	V	O	O	O
C7	X	O	X	V	V	A	V	V	V	V
C8	A	A	A	A	A	O	A	V	X	X
C9	A	A	A	A	A	O	A	X	V	V
C10	A	O	A	X	A	O	A	X	A	V

9.3 Development of Reachability Matrix

SSIM was converted into the initial reachability matrix by substituting the four symbols (i.e., V, A, X or O) of SSIM by 1s or 0s in the initial reachability matrix. The SSIM was converted into a binary matrix, by substituting V, A, X and O by 1 and 0 as per given case. The substitution of 1s and 0s were done according to the following rules-:

- If the (i, j) entry in the SSIM is V, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
- If the (i, j) entry in the SSIM is A, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1.
- If the (i, j) entry in the SSIM is X, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry also becomes 1 and
- If the (i, j) entry in the SSIM is O, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

Table 18: Initial Reachability Matrix

i/j	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	1	1	0	1	1	1	1	1	1
C2	0	1	1	0	1	1	0	1	1	0
C3	1	0	1	0	1	1	1	1	1	1
C4	0	1	1	1	1	1	0	1	1	1
C5	1	0	1	1	1	0	0	1	1	1
C6	0	1	1	0	1	1	1	0	0	0
C7	1	0	1	1	1	1*	1	1	1	1
C8	0	0	0	0	0	0	0	1	1	1
C9	0	0	0	0	0	0	0	1	1	1
10	0	0	0	1	0	0	0	1	0	1

9.3 Partition of Reachability Matrix into Levels

From the final reachability matrix, for each factor, reachability set and antecedent sets were derived. The reachability set consisted of the factor itself and the other factors which it might influence. The antecedent set consisted of the factor itself and other factors, which might influence it. Thereafter, intersection of these two sets was derived for all factors. One by one the enablers having the same reachability set and intersection set are eliminated during consecutive iteration. The factors for which the reachability and the intersection sets were the same occupy the top level in the ISM hierarchy. The top-level factors are those factors that will not lead the other factors above their own level in the hierarchy. Once the top-level factor was identified, it was removed from consideration. Then, the same process was repeated to find out the factors in the next level. This process was continued until the level of each factor is found. Below tables depict the various iterations done for determining the levels of the factors. The factors identified during an iteration are color coded with different colors so as to enable identification.

Table 19.1: Partition Iteration 1

Factor	Reachability	Antecedents	Intersection	Level
1	1,2,3,5,6,7,8,9,10	1,3,5,7	1,3,5,7	
2	2,3,5,6,8,9	1,2,4,6	2,6	
3	1,3,5,6,7,8,9,10	1,2,3,4,5,6,7	1,3,5,6,7	
4	2,3,4,5,6,8,9,10	4,5,7,10	4,5,10	
5	1,3,4,5,8,9,10	1,2,3,4,5,6,7	1,3,4,5	
6	2,3,5,6,7	1,2,3,4,6,7	2,3,6,7	
7	1,3,4,5,7,8,9,10	1,3,6,7	1,3,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9,10	1,2,3,4,5,7,8,9	8,9	
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.2: Partition Iteration 2

Factor	Reachability	Antecedents	Intersection	Level
1	1,2,3,5,6,7,9	1,3,5,7	1,3,5,7	
2	2,3,5,6,9	1,2,4,6	2,6	
3	1,3,5,6,7,9	1,2,3,4,5,6,7	1,3,5,6,7	
4	2,3,4,5,6,9	4,5,7	4,5	
5	1,3,4,5,9	1,2,3,4,5,6,7	1,3,4,5	
6	2,3,5,6,7	1,2,3,4,6,7	2,3,6,7	
7	1,3,4,5,7,9	1,3,6,7	1,3,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	9	1,2,3,4,5,7,9	9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.3: Partition Iteration 3

Factor	Reachability	Antecedents	Intersection	Level
1	1,2,3,5,6,7	1,3,5,7	1,3,5,7	
2	2,3,5,6	1,2,4,6	2,6	
3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
4	2,3,4,5,6	4,5,7	4,5	
5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
6	2,3,5,6,7	1,2,3,4,6,7	2,3,6,7	
7	1,3,4,5,7	1,3,6,7	1,3,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9	1,2,3,4,5,7,8,9	8,9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.4: Partition Iteration 4

Factor	Reachability	Antecedents	Intersection	Level
1	1,2,6,7	1,7	1,7	
2	2,6	1,2,4,6	2,6	4
3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
4	2,4,6	4,7	4	
5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
6	2,6,7	1,2,4,6,7	2,6,7	
7	1,4,7	1,6,7	1,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9	1,2,3,4,5,7,8,9	8,9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.5: Partition Iteration 5

Factor	Reachability	Antecedents	Intersection	Level
1	1,6,7	1,7	1,7	
2	2,6	1,2,4,6	2,6	4
3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
4	4,6	4,7	4	
5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
6	6,7	1,4,6,7	6,7	5
7	1,4,7	1,6,7	1,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9	1,2,3,4,5,7,8,9	8,9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.6: Partition Iteration 6

Factor	Reachability	Antecedents	Intersection	Level
1	1,7	1,7	1,7	6
2	2,6	1,2,4,6	2,6	4
3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
4	4	4,7	4	6
5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
6	6,7	1,4,6,7	6,7	5
7	1,4,7	1,6,7	1,7	
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9	1,2,3,4,5,7,8,9	8,9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.7: Partition Iteration 7

Factor	Reachability	Antecedents	Intersection	Level
1	1,7	1,7	1,7	6
2	2,6	1,2,4,6	2,6	4
3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
4	4	4,7	4	6
5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
6	6,7	1,4,6,7	6,7	5
7	1,4,7	1,6,7	1,7	7
8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
9	8,9	1,2,3,4,5,7,8,9	8,9	2
10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1

Table 19.8: Partitioned Reachability Matrix with Finalized Levels

Factor	Reachability	Antecedents	Intersection	Level
C8	8,9,10	1,2,3,4,5,7,8,9,10	8,9,10	1
C10	4,8,10	1,3,4,5,7,8,9,10	4,8,10	1
C9	8,9	1,2,3,4,5,7,8,9	8,9	2
C3	1,3,5,6,7	1,2,3,4,5,6,7	1,3,5,6,7	3
C5	1,3,4,5	1,2,3,4,5,6,7	1,3,4,5	3
C2	2,6	1,2,4,6	2,6	4
C6	6,7	1,4,6,7	6,7	5
C1	1,7	1,7	1,7	6
C4	4	4,7	4	6
C7	7	6,7	7	7

9.4 Derivation of Conical Matrix

Conical matrix was developed by clustering factors in the same level across the rows and columns of the final reachability matrix. The drive power of a factor was derived by summing up the number of ones in the rows and its dependence power by summing up the number of ones in the columns. Driving power and dependence power ranks were calculated by giving highest ranks to the factors that have the maximum number of ones in the rows and columns respectively.

Table 20: Conical Matrix

i/j	C8	C10	C9	C3	C5	C2	C6	C1	C4	C7	**Driving Power**
C8	1	1	1	0	0	0	0	0	0	0	**3**
C10	1	1	0	0	0	0	0	0	1	0	**3**
C9	1	1	1	0	0	0	0	0	0	0	**3**
C3	1	1	1	1	1	0	1	1	0	1	**8**
C5	1	1	1	1	1	0	0	1	1	0	**7**
C2	1	0	1	1	1	1	1	0	0	0	**6**
C6	0	0	0	1	1	1	1	0	0	1	**5**
C1	1	1	1	1	1	1	1	1	0	1	**9**
C4	1	1	1	1	1	1	1	0	1	0	**8**
C7	1	1	1	1	1	0	0	1	1	1	**8**
Dependent Power	**9**	**8**	**8**	**7**	**7**	**4**	**5**	**4**	**4**	**4**	**60**

9.4 Formation of ISM Diagraph and Model

The structural model was developed with the help of final reachability matrix (Table21). The relationship between the enablers i and j is presented by an arrow which points from i to j. This graph is known as an initial directed graph, or initial digraph. The digraph was examined to eliminate transitivity of relationships. The final digraph was formed after removing the transitivity. The final digraph is shown in figure18. This final digraph is converted into the ISM-based model for devising the optimal strategy for enhancing customer satisfaction. After identification of the levels of the factors through a number of iterations, the relationship between the factors was drawn indicating the serial number of the enablers and the direction of the relation with the help of an arrow. The final model arrived at is represented by figure19. As per the model, Standardization and Automation is the key factor enabling customer satisfaction and influences all the enablers up in the hierarchy. Environment Baseline configuration and Service Delivery Team Composition also influence significant number of factors hence are critical for customer satisfaction.

Table 21: Consolidated Conical Reachability Matrix with Driving Power, Dependent Power and Factor Levels

Factor	i/j	C8	C10	C9	C3	C5	C2	C6	C1	C4	C7	Driving Power	Level
Response Time/Turnaround Time	C8	1	1	1	0	0	0	0	0	0	0	**3**	**I**
Environment Commissioning Time	C10	1	1	0	0	0	0	0	0	1	0	**3**	**I**
Resolution Time	C9	1	1	1	0	0	0	0	0	0	0	**3**	**II**
Internal Assignment and Transfer of Incidents	C3	1	1	1	1	1	0	1	1	0	1	**8**	**III**
Inter and Intra Team Handovers	C5	1	1	1	1	1	0	0	1	1	0	**7**	**III**
Issue Triage	C2	1	0	1	1	1	1	1	0	0	0	**6**	**IV**
Customer and Account Management	C6	0	0	0	1	1	1	1	0	0	1	**5**	**V**
Cloud Service Delivery Team Composition	C1	1	1	1	1	1	1	1	1	0	1	**9**	**VI**
Environment Baseline Configuration	C4	1	1	1	1	1	1	1	0	1	0	**8**	**VI**
Standardization and Automation	C7	1	1	1	1	1	0	0	1	1	1	**8**	**VII**
	Dependent Power	**9**	**8**	**8**	**7**	**7**	**4**	**5**	**4**	**4**	**4**	**60**	

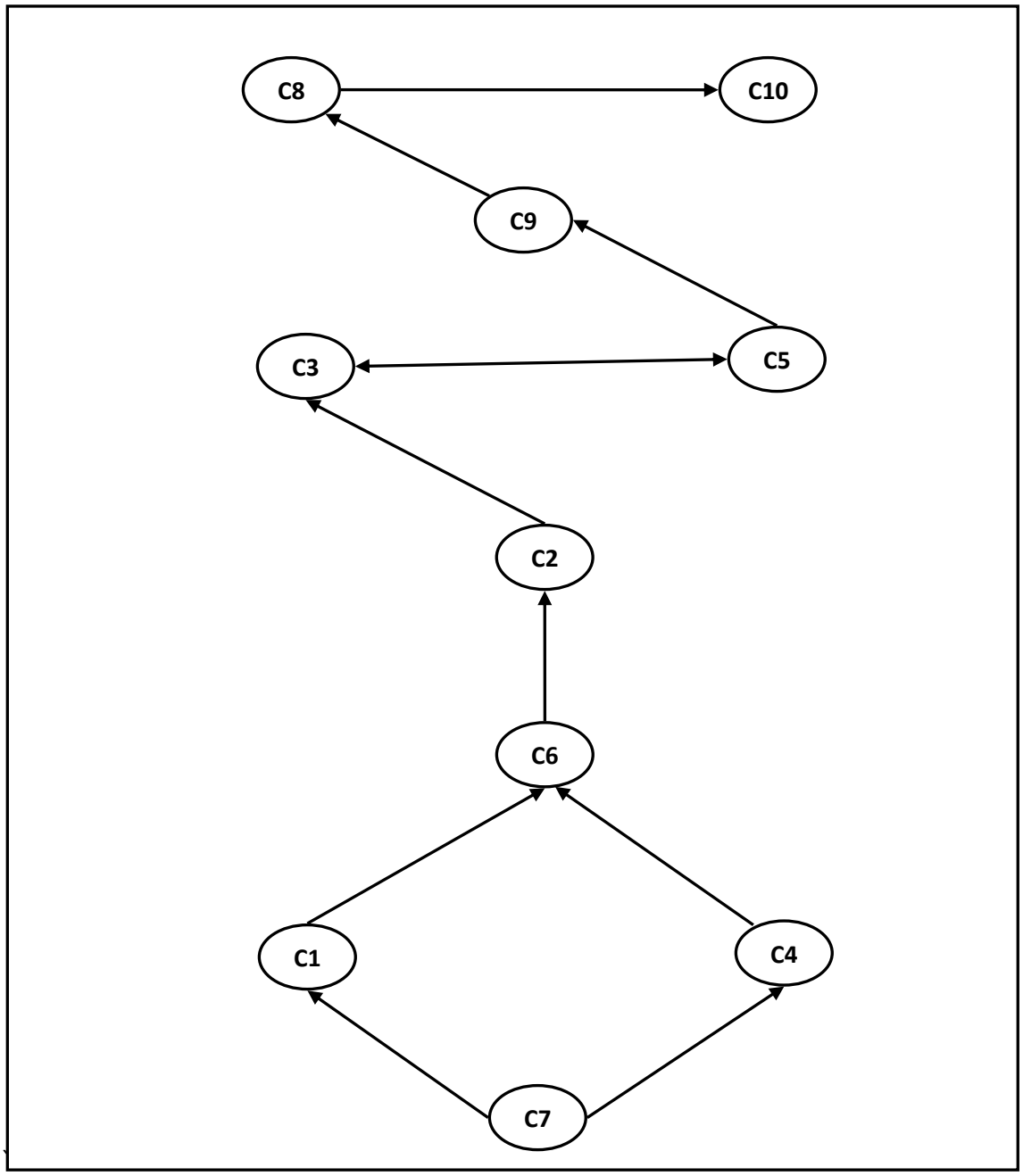

Figure 18: Final Diagraph after Removing Transitivity
(Source – Data Synthesis and Self Knowledge)

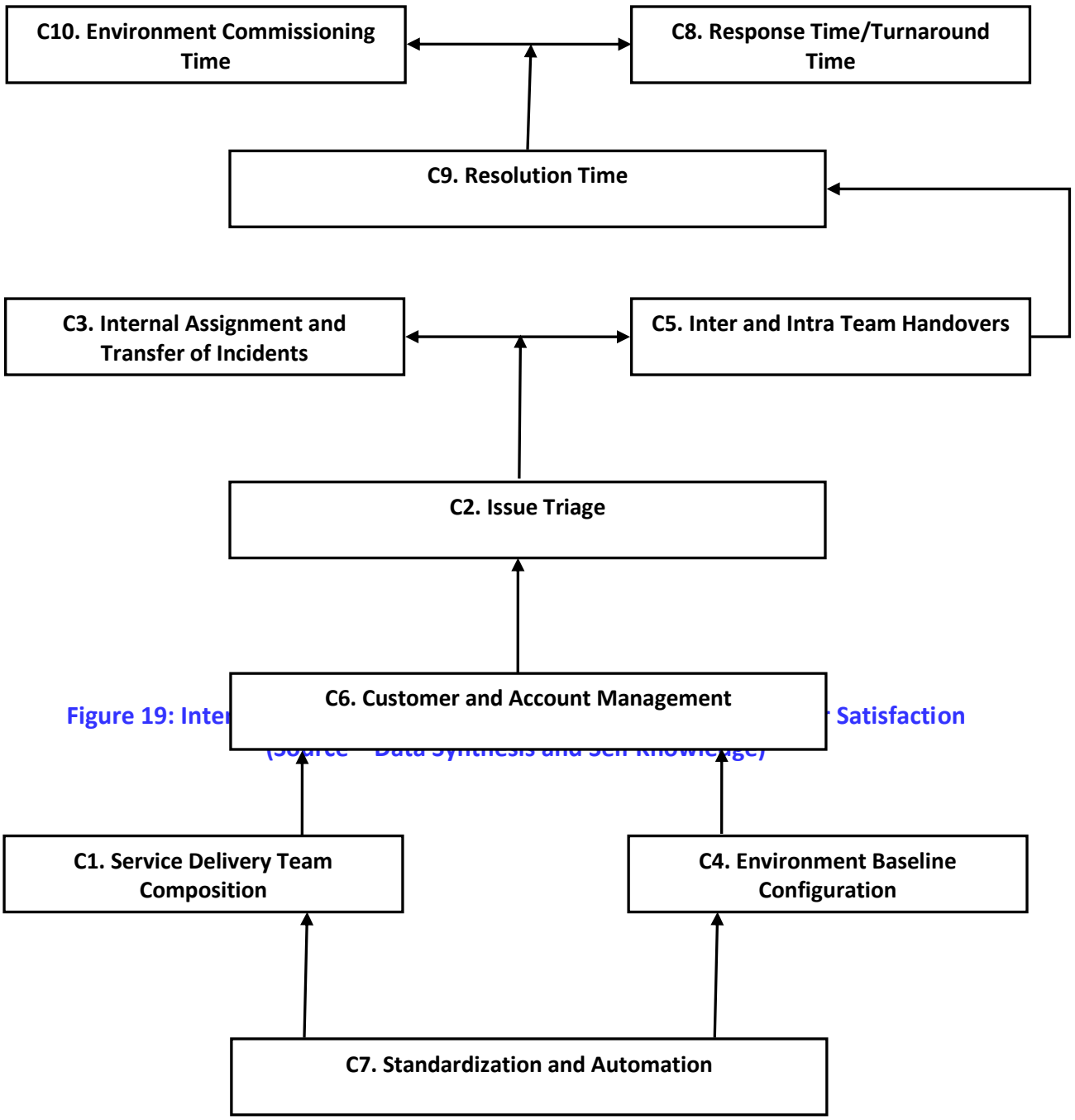

Figure 19: Inter Satisfaction

(Source – Data Synthesis and Self Knowledge)

9.5 MICMAC Analysis and ISM Conclusion

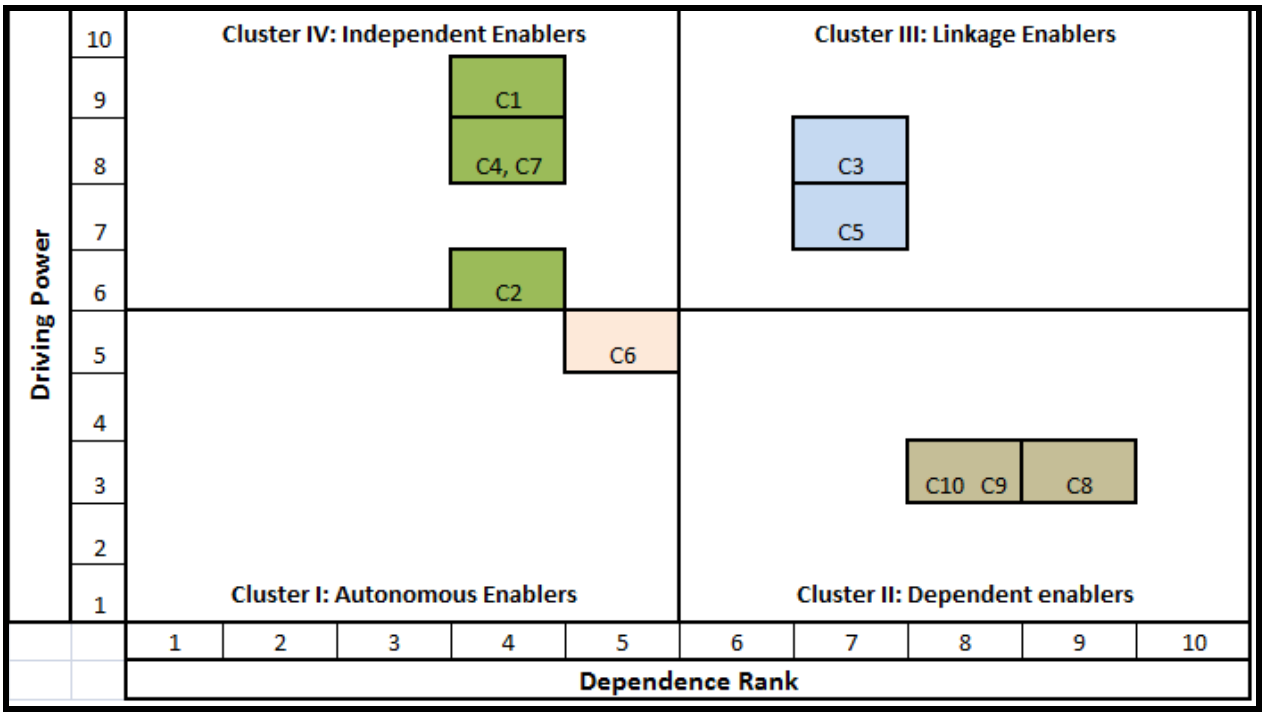

Figure 20: Clustering of Factors for Enhancing Customer Satisfaction – MICMAC Analysis (Source- Data Synthesis and Self Knowledge)

MICMAC analysis helps to analyze the driving and dependence power of individual factors and also helps in classification of these factors. The factors are classified into four types of clusters:

1. **Autonomous Enablers –** These have weak driving power and weak dependence and are relatively disconnected from the system. They have very few strong linkages.

2. **Dependent Enablers-** These have weak driving power but strong dependence.

3. **Linkage Enablers-** These have strong driving power and dependence. Any impact on these enablers will impact the other enablers and a resultant impact on the linkage enabler itself, thereby increasing the consolidated impact.

4. **Independent Enablers –** These have strong driving power and weak dependence. These enablers condition other enablers while not being impacted themselves in return.

Clustering of the factors pertinent to customer satisfaction based on ISM is shown in figure20 above. The categorization of the factors and subsequent analysis is presented below:-

- **Autonomous Enablers**- Only factor in this cluster is **C6- Customer and Account Management**. This is in alignment with the nature of the factor. Account Management is done beyond the realms of the delivery process framework and is more of a customer management activity. MICMAC analysis suggests driving and dependence power of 5 for this factor which is on the boundary hence this factor has the potential to become either and Independent or Dependent enabler.

- **Dependent Enablers** - Following factors fall into dependent cluster:

    - **C8- Response Time/Turnaround Time** –
    - **C9 – Resolution Time**
    - **C10 – Environment Commissioning Time**

  Above factors have high dependency on the factors at higher levels. Hence the impacting factors will have to be enhanced in order to enhance these dependent factors.

- **Linkage Enablers** - Following factors fall into dependent cluster:

    - **C3- Internal Assignment of Transfer and Incidents**
    - **C5 – Inter and Intra Team Handovers**

  The above two linkage factors have high dependence as well as driving power. These fall in the middle levels of the ISM hierarchy.

- **Independent Enablers –** Following factors fall into independent cluster:

    - **C1 – Cloud Service Delivery Team Composition**
    - **C2 – Issue Triage**

- **C4- Environment Baseline Configuration**
- **C7- Standardization and Automation**

The above independent enablers have less dependence ranking but high driving power hence any enhancement in these enablers will enhancement in these factors will enhance the other factors and will improve the overall customer satisfaction as well.

ISM and MICMAC analysis suggest that C7-Standardisation and Automation is the key factor which at that can enhance the other factors and itself drive the customer satisfaction to a great extent. Standardization of products and processes will directly enhance factors like Issue Triage, Response Time, Resolution Time, Environment Commissioning time along with others. Similarly Automation will enhance Issue Triage, Inter and Intra Team Handovers along with others. Standardization will also enhance Environment Baseline Configuration. These independent factors have high driving power hence can enhance other factors as well to achieve high degree of customer satisfaction hence management should focus on enhancing these. These factors are strategic enablers due to their high driving power. The DMAIC analysis presented in the earlier sections also emphasized on the need of both standardization of capacity sizing and automation of product and hardware installation for eliminating the commissioning delays. There is a convergence in DMAIC and ISM findings in this context.

C6-Customer and Account Management has moderate driving and dependence power hence is a key enabler. This will need focus from both middle and top management. C1-Service Delivery Team Composition and C4-Enviroment Baseline Configuration have a very high driving power and less dependency hence any enhancement in these factors will enhance customer satisfaction many folds. Both these factors are at sixth level in the ISM hierarchy and hence are critical to customer satisfaction. The findings of LAP synthesis suggests that Service Delivery Team Composition was directly impacted by merger and acquisition strategy of the organization. Hence this should be the key focus area of the top management as it can impact Issue Triage, Response/Turnaround Time, Environment Commissioning Time and Resolution Time substantially. Top management should ensure that any team/personnel taken onboard

through such an acquisition is well integrated within the organization set up and is well acquainted with the organization work culture. Mentoring programs should be developed for such teams so as to ensure smooth acclimatization of such teams in the environment and subsequently getting an optimal performance from them.

10.0 Knowledge Management

In order to remove inconsistencies in issue resolution and problem solving approach and provide an integrated service to the customer, as depicted in figure17 in LAP synthesis, various Knowledge Management options have been explored. Table15 depicted the expertise level of Cloud Service teams in various knowledge areas. Problem and Gap analysis findings assert the need for the constituent teams to adopt a more holistic approach for resolution of issues and efficient service delivery. This mandates inter team and intra team knowledge transformations and transfer as appropriate. In order to determine the right transformations for the Cloud Service teams, ticket data for past one year for the selected customers was analyzed. The focus of the analysis was the issues which required cross functional team and expertise. All such issues will require regimented effort from the participating teams. The process gaps for such model have been addressed in LAP synthesis. Based on the gaps in interaction and issue handling in past ticket data, different type of knowledge transformation strategies have been recommended. The following knowledge management strategies are being proposed on the basis of N Form Model (Hedlund, 1994) :-

- **Articulation –** Refers to articulation of tacit knowledge. This is primarily an intra team knowledge transformation. Key components of Articulation can be Intelligence Development and Intelligence Generation. Intelligence Development can span across teams wherein people acquire knowledge beyond their individual team areas thereby developing a holistic view of the service. For example if there is an issue wherein the application is unable to connect to a database then the database administration team should be able envisage that a probable reason could be network port configuration which is beyond the realm of the database team but impacts them frequently. Intelligence Generation is the actual articulation of the acquired tacit knowledge. In the above example all such instances can be documented for the future reference.
- **Reflection –** Interplay of tacit and articulated knowledge. Can happen inter team and intra team. Reflection can involve learning from both external and internal

environment. Learning from external environment can happen by adopting best practices of the market by individual teams. This is a manifestation of explicit knowledge. Learning can happen internally within the team through knowledge sharing sessions which involves sharing of tacit knowledge by individual team members.

- **Extension –** Extension is transfer/transformation of knowledge from lower to higher agency levels in the issue resolution hierarchy. This transformation primarily involves multiple teams. This form of transformation strategy primarily involves transfer of articulations of a team to other participating cloud teams. Customer and market feedback is also captured as knowledge and transferred to teams as appropriate.
- **Appropriation –** It is the reverse of extension involving multiple teams. Appropriation can be achieved through focused training programs for team members so as to prepare them for anticipated issues and challenges. These formal trainings ensure that the frequent changes to the service due to change in products as mandated by the agile markets are well communicated to the teams. Also the teams are sensitized on anticipated issues due to these changes.

Figure21 shows the knowledge transformation matrix which depicts the recommended knowledge transformation strategies between various teams.

Cloud Delivery Teams	Engineering	Database Administration	Networking	Application Management Team	L1 - Global Helpdesk	L2 Support	L3 Support	Implementation and Consulting	
Engineering	Articulation	Reflection, Extension	Extension, Appropriation	Extension, Appropriation	Extension	Extension	Extension	Extension, Appropriation	Assimilation
Database Administration	Reflection, Extension	Articulation, Reflection	Extension, Appropriation	Extension, Appropriation	Extension	Extension, Appropriation	Extension	Extension, Appropriation	
Networking	Extension	Extension, Appropriation	Articulation, Reflection	Extension, Appropriation	Extension	Extension	Extension	Extension	
Application Management Team	Extension, Dialogue	Extension, Appropriation	Extension, Appropriation	Articulation, Reflection	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	
L1 - Global Helpdesk	Appropriation	Appropriation	Appropriation	Extension, Appropriation	Articulation, Reflection	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	
L2 Support	Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Articulation, Reflection	Extension, Appropriation	Extension, Appropriation	
L3 Support	Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Extension, Appropriation	Articulation	Extension, Appropriation	
Implementation and Consulting	Extension, Appropriation	Extension, Appropriation	Appropriation	Extension, Appropriation	Extension	Extension, Appropriation	Extension, Appropriation	Articulation, Reflection	
	Dissemination								

Figure 21: Knowledge Transformation Matrix for Cloud Teams
(Source – Self Knowledge and Syntheis from Hedlund and Nonanka, 1993)

Assimilation and dissemination involve both articulated and tacit components and span within and across teams. Also internalization will be intrinsic to such an arrangement and happen both at an individual level and team level. In order to facilitate the above transfer and transformations, following steps has been recommended:-

- **Expanding the Realms of I-Learn Portal** – I-Learn portal is the incremental knowledge base and querying system of the organization. Current access configurations segregate the access of infrastructure, application configuration and product issues. It has been recommended to allow access to all the categories regardless of the nature of the teams. This is in line with Extension and Appropriation knowledge management strategy recommended for teams. Merger and integration of knowledge base articles which pertain to similar issue but are distributed across these categories has been initiated. An enhanced workflow has been introduced which mandates cross functional

review of the new knowledge base articles so as to ensure quality of knowledge base documents. Technical capabilities of the portal are being enhanced so as to include more effective related searches which will enable the team to search for an issue resolution more swiftly.

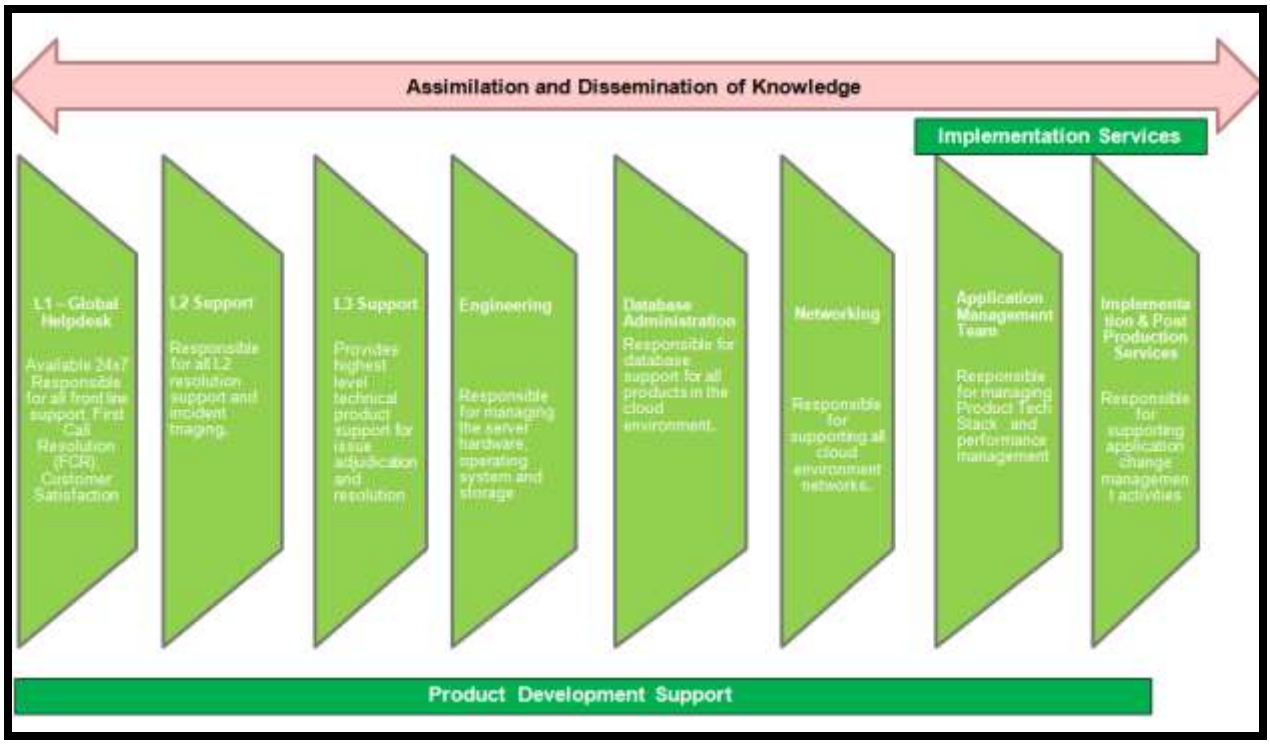

Figure 22: Assimilation and Disseminaton of Knowledge within Cloud Teams (Source – Self Knowledge and Syntheis from Organisation Knowledge Base)

- **Enhancement of Work Instructions** – In order to enhance Articulation within the team, individual teams have been asked to come up with work instruction documents which are the comprehension of iterative issues and configuration baseline activities. This will ensure nil or minimum misses and will also help in reducing the learning curve of new associates during induction.
- **Mandatory Knowledge Contribution** – One of the individual goals introduced for the team members is the mandatory contribution to the knowledge base. Any such document will have to go through a thorough cross functional team review before being finally released for viewing by wider audience.

- **Documentation of issue resolution and integration of Customer ticketing system with I Learn portal** – Resolution of all the issues resolved will have to be documented in the customer ticketing system. Further the ticketing system will be integrated with I-Learn portal to capture the efficacy of the knowledge base documents. Any issue resolved with the help of a knowledge base document will refer to that document. This will also help in capturing the metrics on the effectiveness of knowledge base articles.

10.0 Conclusion

SaaS (Software as a Service) based cloud services are becoming increasingly popular amongst medium and small size businesses as they offer ample opportunities for rationalizing and reducing the IT cost to a business organization. Hence more and more businesses are looking forward to adopt SaaS (Software as a Service) models. As a result more and more software product companies are entering into cloud business wherein they offer the product on hosted/cloud platforms to strengthen their customer base further.

The expectations from SaaS (Software as a Service) offering in terms of value proposition are far more than a typical on premise framework and the number of customer satisfaction variables which need to be managed are also relatively high. Since a typical end to end cloud service delivery of any software product/solution involves participation of multiple teams and a lot of client interaction, an early focus on development of inters team and intra team integration with regards to process touch points, operational agreements and knowledge consolidation is critical. ISM findings reflect the same where in Service Delivery Team Composition has come up as key independent customer satisfaction factor which can influence other factors as well. Team recruited through a merger or an acquisition can complicate the integration dynamics at times. A comprehensive SWOT analysis of the individual teams should be done as teams might have varied background and capabilities and their own process frameworks at times. The consolidated findings of process gaps and SWOT analysis should be the basis of adoption of right set of Knowledge Management (transformation and transfer) strategy for the individuals, teams and groups. Such an analysis should also be utilized to design the training plan of the teams. The training curriculum should focus on reducing the knowledge gaps identified during the analysis. Such an analysis also enables the refinement of integrated process framework.

Table6 depicted the revenue loss being incurred by the organization as a result of commissioning delays. ISM findings point to Standardization and Automation as key customer satisfaction enabler and DMAIC analysis lists Standardization and Automation as key variable in optimizing commissioning process. Both the methodology has a convergence on this hence this is a key enabler for success. While automation reduces the turnaround time and errors in any process, standardization is a pre requisite for achieving economies of scale and reducing probability of defects. Hence Standardization and Automation should be promoted wherever possible as it will enhance the other enablers too.

Managerial Implications

Standardization of deployment parameters across products will help the organization in removing the non value added activities and focus on customer value added activities and

operational value added activities. This will eliminate waste and bring down the operational costs significantly. Automation will simultaneously ensure quick deployments thereby optimizing the overall commissioning times. KM as an enabler will ensure that the reverse transactions happening along the deployment cycle between the cross functional teams are eliminated. KM enablement will overcome the problem of skill deficit and enhance cross functional expertise. This will minimize cost of attrition of the organization. Enhancement of factors from ISM and DMAIC findings together with KM enablement will ensure that the organization's working capital requirements are optimized and hence the savings in budgets can be utilized for more value added and revenue generating initiatives.

In such a volatile operating environment, such analysis should not be a onetime activity and should be iterated over a pre defined period to check and contain any gaps which might have crept in due to the environment volatility.

Research Implications

The methodologies used in this project were confined to the context of the business problem at hand and primarily used expert opinions for data analysis and nominal group techniques. Only the data relevant to the problem was collected. Managers can further use ISM, SAP-LAP and DMAIC to analyze the independent variable pertaining to a business problem and develop effective strategies to manage them for positive outcomes. Researchers can extend this to substantiate the findings using empirical studies and developing generic models for addressing such situations.

11.0 References

Sushil (2001) SAP-LAP Framework, Global Journal of Flexible Systems Management, 2(1), 51-55.

Sushil (2012). Interpreting the Interpretive Structural Model, Global Journal of Flexible Systems Management, 13(2), 87–106.

Hedlund Gunnar (1994) A Model of Knowledge Management and the N-Form Corporation, Strategic Management Journal, 15 (Special Issue), 73-90.

Sohani, Naina, & Sohani, Nagendra (2012) Developing Interpretive Structural Model for Quality Framework in Higher Education: Indian Context, Journal of Engineering, Science & Management Education, 5(2), 495-501

Upadhye, Nitin et al. (Dec 2014). INTERPRETIVE STRUCTURAL MODELING OF IMPLEMENTATION ENABLERS FOR JUST IN TIME IN ICPI, International Journal of Lean Thinking, 5(1).

Suri P.K. (2005) Strategic Insights into an E-governance Project, Global Journal of Flexible Systems Management, 6(3&4), 39-48

Suresh Sharma et al. - Transforming Regulatory Information Management in Life Sciences Organizations, Available at *http://www.tcs.com/resources/white_papers/Pages/Transforming-Regulatory-Information-Management.aspx* and last accessed on 29th Apr '2016.

http://www.sapartners.com/sigma-academy/ - Last accessed on 28th Apr '2016

http://www.esri.com/news/arcwatch/0110/feature.html - Last accessed on 28th Apr '2016.

http://www.forbes.com/sites/louiscolumbus/2013/02/19/gartner-predicts-infrastructure-services-will-accelerate-cloud-computing-growth/ and last accessed on 29th Apr '2016.

Cloud computing market- Available at *http://www.zdnet.com/blog/btl/cloud-computing market-241-billion-in-2020/47702* and last accessed on 30th Apr '2016.