Adoption, diffusion and consumer behavior in technopreneurship

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Abstract

Purpose – The purpose of this paper is to study the adoption and diffusion of technology including SAAS software and cloud computing for facilitating knowledge management (KM) in product innovation based on understanding of consumer behavior. Technopreneurship can drive sustainable product innovation by studying the patterns of consumer behavior. Sharing of consumer intelligence on cloud using SAAS is being used by several companies to drive innovation such as call centers in South Asia. However, there is no understanding role of knowledge management for understanding consumer behavior for product innovation.
Design/methodology/approach – The methodology uses case method of action research technique coupled with grounded theory development. Further, the study uses interpretive structural modelling (ISM) technique for interpreting the results for understanding consumer behavior patterns for enabling product innovation.
Findings – The findings suggest that enhancement of creative design based on consumer's study can lead to sustainable product development. The findings revealed that consumer behavior patterns embedded in the firm's intelligence captured in KM portal including customers' preferences and choices that can be developed into products. Knowledge management facilitated flexible manufacturing process, optimized capital expenditure using agility principles as per the study. Techniques and processes such as reactive scaling top down and bottom up and applying flexible APIs (Application Programming Interface) allowed the efficient automation of infrastructure orchestration and resource allocation. The involvement of vendors' knowledge base facilitated creation of market ready product offers leading to sustainability.
Research limitations/implications – The implications include the adoption of inter-disciplinary and inter country understanding of knowledge management application for understanding consumer behavior to lead to sustainable product development.
Originality/value – The scope and scale of technology entrepreneurship include the application of knowledge management for consumer behavioral studies that have huge contributions to make product development sustainable using greener planet, purpose and product (3P model).

Keywords Knowledge management, Innovation, Engineering, Entrepreneurship
Paper type Research paper

1. Introduction

The need for knowledge management in heavy engineering firms is to find the scope for better product innovation for survival and sustainability (Bhardwaj and Malhotra, 2013). There is a massive need to increase the company's ability to introduce innovations for sustaining competitive advantage (Clark and Fujimoto, 1991; Davila *et al.*, 2013; Tidd *et al.*, 2001). Continuously, launching new products in the market is important since product innovation is necessary for organizations to adapt to ever changing market conditions, technologies, policies and dynamics (Akova *et al.*, 1998). In this understand, I have chosen the definition of a product innovation made by the Organization for Economic Cooperation and Development in technoentrepreneurship. The need for such an understanding is to find the factors of adoption and diffusion of technology entrepreneurship which has not been studied before. The understand also include the role of employees' knowledge and intelligence about the customers insights and develop or modify the products or service or create the next generation sustainable product innovations based on these insights using knowledge management system innovation in Technology Entrepreneurship in South Asia. No similar studies have been done, and there is massive need to understand what helps these economies to absorb and diffuse technology to expand markets. This can also facilitate the expansion of creation of jobs for the global economy and avert the much feared global recession.

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Absorptive capacity of the organization needs to be enhanced for better knowledge discovery for sustainable product innovation (Lane *et al.*, 2001; Zahra and George, 2002; Lane and Koka, 2006).

A sustainable product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Innovation activities could be described as the efforts to create meaningful and focused change within a company's product or service potential. Further, innovation has been defined by Popadiuk and Choo (2006) as an idea that has been developed to commercialize. The concept of innovation is often related to the words novelty, commercialization and/or implementation. McDermott and O'Connor (2002) has defined innovation as new adoption and diffusion of technology or combination of technologies that offer benefits, and they further note that the evaluation of an adoption and diffusion of technology as innovative also needs to be related to existing technologies, both from an internal and an external perspective. The structure of the paper is as follows. First we did the literature review and based on that we found the gap in the literature of innovative technologies, then the hypotheses were formed and finally it was tested using empirical data and conclusions were drawn with respect to the analysis and insights presented for managerial and research implications.

2. Literature review

According to the Oslo Manual (OECD, 2005, p. 46) a minimum requirement for an innovation is that the product, process or method innovation must be new to the firm, which includes both innovations that the company is first to develop and those that are adopted from other firms. Following from this argument, an innovation is considered to be new to the market if the firm is the first to introduce the innovation in its market (OECD, 2005; Bhardwaj *et al.*, 2007).

Entrepreneurial innovations can be facilitated by technology innovation, adoption and diffusion. Entrepreneurial learning and knowledge discovery is influenced greatly by the learning process (Cohen and Levinthal, 1990). This could facilitate increased performance of an existing product, process or method to the development in technoentrepreneurship of entirely new products, processes or methods also known as corporate entrepreneurship. For one company, an innovation could be about an incremental product development in technoentrepreneurship resulting in increased product performance, whereas for another company, innovation could be based on major changes to their product portfolio, including a major element of novelty, both from an internal and a market perspective (Alpkan *et al.*, 2005; Altuntas and Donmez, 2010). According to Dewar and Dutton (1986) this range of innovation relates to the notion of radicalness, where incremental innovations are seen as a degree of new knowledge being created. Through diffusion of technology this may become mass phenomenon. Conversely, radical innovation is about revolutionary changes in adoption and diffusion of technology, involving deviations from existing practice and a high degree of new knowledge being generated. Tushman and Nadler (1986) argue that incremental innovation contains small increase in added features in new versions to a product line, whereas a radical innovation includes the application of a new adoption and diffusion of technology or a new combination of technologies to create new market opportunities (Bhardwaj *et al.*, 2007). Networking is another very critical success parameter that facilitates the knowledge sharing among the employees (Lee *et al.*, 2001).

Christensen (2006) discusses the term sustaining innovation in contradiction to disruptive innovation. A sustaining innovation does not have a disruptive effect on existing markets but could include both evolutionary (i.e. improving a product in an existing market in expected ways) and revolutionary (i.e. creating a new market by solving a problem in a radically new way) changes. Commonly, sustaining innovations improve customer value by providing a higher degree of product performance. A disruptive innovation, on the other hand, brings an entirely different value proposition to the market that has not existed before. Moreover, role of organizational controls in management knowledge is also very critical (Turner and Makhija, 2006; Alpkan *et al.*, 2010).

It is interesting to observe that policy of the government can facilitate the technology entrepreneurship provided it can give proper direction to the citizen to orient their minds towards continuous innovation. It's like making billion people to think innovatively sing technology. At present only a part of technology is being used for launching business. Here people's mindset is important that they should use technology and not the technology using them. Increasing environmental concerns have become a source of sustainable product innovation. For example, case understand of car industry would facilitate to understand how the diffusion and absorption of technology has and can facilitate sustainable product innovation in South Asia. The environmental regulations will exert immense pressure on manufacturing industries that may lead to innovations enabling a more sustainable world for coming generations (Bhardwaj, 2016). The automotive industry is one of many industries causing environmental pollution where cars have a significant impact on all phases of the life cycle; manufacturing, use, recycling and disposal of the product (Orsato and Wells, 2007). This industry is seeing a slump in present times due to stringent policy norms on environmental pollution standards that these companies have to maintain. If the companies can take it as cue for guiding innovations, it will be the next generation cars such as electronic cars. However, not only the need for innovation, but the diffusion of technology to make the product innovations reach the mass customers will enable its sustainability. As a consequence of the growing car market, the automotive industry accounts for 27% of CO_2 emissions in the world. Innovations such as Euro 2 norms have helped in developing less polluting cars. Development of automated cars as being developed by Tesla may further facilitate less accidents on the roads, but that is yet to be researched and developed. Automakers have also shown an increasing awareness of the environmental carbon footprints' impact of their products as environmental regulations and market demands for environmentally less destructive cars have increased. Mahindra and Mahindra has developed Reva cars facilitated by electricity. However, the challenge of these cars is that the Indian infrastructure lacks the facilities for charging. With the policy of the government to develop the fast charging pint through the country, markets like south Asia can be special hub for non-polluting cars enabled by electric or may be automated cars. With the dense populations and the ever increasing purchase power and disposable income, this would be very sustainable. However, these companies need to make their technologies for affordable for making it absorbable for the masses. The focus on reducing CO_2 has become a strong driver in the development in technoentrepreneurship of not only less environmentally destructive cars, such as Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV). The weight of the car is one essential factor that has an effect on CO_2 emissions for both conventional cars and for EVs and HEVs. A rough estimate suggests that a weight reduction of 100 kg results in decreased fuel consumption of 5% (Swedish Association of Green Motorists). A rule of thumb is that a 10% mass reduction results in a 4–6% decrease in fuel consumption indicating some of the potential in focusing on lightweight concepts in the automotive industry. Even though automakers understand and largely master technical difficulties with alternatives to the all-steel body, and despite various generations of aluminum-intensive prototype vehicles or low-volume, high-performance sports cars, the mainstream industry has even today largely retained the all-steel body (Alpkan *et al.*, 2003).

Given the all-encompassing environmental challenge facing the automotive industry, an aggravating circumstance is, however, that the industry is a mature industry characterized by mass- production, a dominant design and incremental development using technology

(Abernathy and Utterback, 1978; Clark and Fujimoto, 1991; Orsato and Wells, 2007). However, the limiting factor is not investing in abundant and real technology innovations but giving lip service to policies such as reduction in taxes on research and development in technology being reduced from 200 to 100% in near future.

The automotive sector has seen several innovations facilitated by technology. The rest mass-produced cars entered the market at the beginning of the 20th century. The moving assembly line by Ford was a prerequisite for the mass-production of cars, but the mass-manufacture of cars was not complete until the introduction of Budd's all-steel body in the 1920s. Already assembled and painted when it arrived at the assembly line, this eliminated bottlenecks in production. This monocoque structure, a supporting body, has prospered since then. Budd's adoption and diffusion of technology, to a large extent, shaped the automotive industry as we know it, resulting in several advantages both from a process and a product perspective, enabling the production of stiffer, stronger and cheaper cars.

The production of all-steel bodies became the primary activity of car plants, accounting for 75% of the investments, thereby requiring a large-scale production to finance the investments. While mass-production helped to create the automotive industry of today, the moving assembly line and the all-steel body, together with other circumstances, restrict the possibilities for change and the introduction of product innovations (Abernathy and Utterback, 1978). The demand for new products has simultaneously shortened product lifecycles, which has led to alliances and take-overs in order to share the investments and to platform development in technoentrepreneurship where automakers share components such as the powertrain (Clark and Fujimoto, 1991; Williams, 2006). The environmental challenge, particularly the need to reduce CO_2 emissions due to the imminent regulations on fuel economy in Europe, US and Japan, has, however, exerted immense pressure on automakers. The new European targets for emissions of the entire average new car fleet of 130 g CO_2 per km by 2015 and 95 g/km by 2020 demand major efforts and will force automakers to not only zoom in on the power train, but also to find weight-reducing solutions, thus questioning Budd's dominant design (Orsato and Wells, 2007). Previous research on environmental innovation in the automotive industry seems, however, to have predominantly focused on investigating the consequences of the combustion engine and different alternatives to propulsion like EV, HEV and fuel cells (van den Hoed, 2007; Aggeri *et al.*, 2009). Despite considerable success in developing high-strength steel, the all-steel body is still too heavy. Less research has focused on alternatives or modifications to the all-steel body and on the impact this particular adoption and diffusion of technology could have on the potential to develop lightweight concepts that can reduce the environmental impact of cars. Our review of previous research also indicates a lack of research that has been granted access to the operative level of automakers' initiatives toward developing environmentally sounder alternatives.

Furthermore, an increasingly global world with rapidly growing populations implies a growing demand for transportation. To achieve our potential for a good life style and a sustainable society our means of travel and consumption must change (Johan Rockström, 2014). This need can also drive next generation products and services. The whole idea of innovation is to connect with the source of innovation. These can be customer insights when shared among other employees and departments can lead to massive potential of sustainable innovation. For this, the employees need to listen to the customers' feedback with their hearts connect with the source. All the innovations' done by Einstein was using this theory of connectivity with the source that facilitated all his patents.

3. Meaning and definition of product innovation

Product innovation is one of the primary tools for strategic growth to improve the existing market share (Berry and Berkheiser, 2010) (Mola and Birkinshaw, 2009). These innovations may be facilitated by technology. Technopreneurs are now realizing the essence of innovation in their day-to-day working as new and modern adoption and diffusion of technology is adapted by competitors very quickly at world level (Adams and Jeanrenaud, 2008). Therefore, tough competitive edge gives the encouragement to organizations across the globe to learn the concept and application of innovation (Grant, 1996).

The impact of innovation on the performance levels can be seen in sales growth, change in market share, profit levels to output levels and competence (OECD Oslo Manual, 2005). Therefore, innovation becomes an important element of marketing strategies for technopreneurs to improve manufacturing processes that produce maximum output at minimum costs, to perform well-built in comparison to opponents in the market place, to improve the goodwill in the mindset of the customers (Coombes and Nicholson, 2013). In nutshell, to techno enterprises help to gain long-term survival in aggressive world (Andrews, 2007). Over the past twenty years, innovation has gained popularity amongst the researchers who tried to characterize the impact of innovation on performance levels (Dholakiaa *et al.*, 2010) (Amabile *et al.*, 1996). Innovation provides strategies to sustain continuous growth (Drucker, 2012).

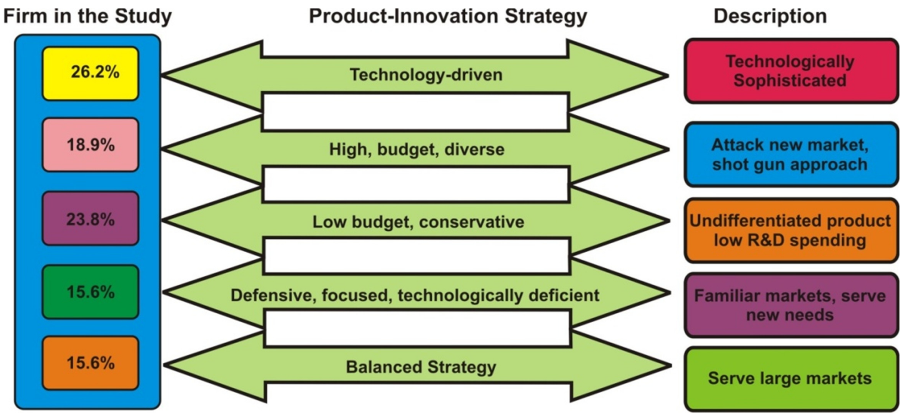
McAdam and Keogh (2004) examined the correlation between firms' concert and its awareness and alignment with modernism and further investigation. They established that the firms' preference to innovations was of crucial importance in the aggressive atmosphere. Observed the special effects of the chief innovations and copyrights to various business performance methods such as book-keeping, profit returns, stock prices and corporate expansions in terms of growth percentage (Alterowitz, 1988). However, innovative firms appear to be more resilient and less vulnerable to recurring changes and ecological demands than other firms. Figure 1 shows the strategies of product innovation in connection to performance of the organization.

This figure shows the experimental knowledge that evaluates the profits from adopting new-technology strategies that were done in Canada and only with business firms. Peak performance through product innovation and adoption and diffusion of technology plan was motivated by the business leadership players and a tactical idea of the business (Cooper *et al.*, 2016).

4. Product innovation and knowledge management

There is a significant relationship between knowledge management and product innovation. However, there are several challenges for fostering radical innovations. Challenges fostering radical innovations are the conflicting demands to explore new opportunities in parallel with daily business aiming for ambidextrous organizations. Technological innovations require resources. There is a necessity to plan for future growth when dealing with everyday engineering activities and competing with scarce resources. There is a need to balance between legitimacy problems and radical projects (Leifer *et al.*, 2000; Dougherty and Hardy, 1996). The tendency to focus on innovative projects depends on organizational, managerial and environmental factors (Lavie and Tushman, 2010). These include risk-taking culture, leadership that motivates innovations, management support by providing resources, flexibility to achieve the goals, providing time for innovations and rewarding innovative approaches (Bhardwaj *et al.*, 2007).

Organization structure has been one of the limiting factors of knowledge management and its implementation in product innovation. The literature supports the argument that too much formalization is deleterious for radical projects, which ought to be managed in an informal way (Eisenhardt and Tabrizi, 1995). Furthermore, established and tall organizational structures prohibit radical innovations (Christensen, 2006). Therefore, there is a need for innovative companies to have more informal and flat structures to facilitate knowledge management across all departments.



Source(s): Robert G. Cooper, "New Product Strategies: What Distinguishes the Top Performers", Journal of Product Innovation Management, June 1984, PP. 151- 164

Figure 1.
Strategies of product innovation in connection to performance of the organization

Resource based view (RBV) provides opportunity to analyze the commitment of resources towards innovations (Barney, 1991). A commitment to existing technologies and markets and unwillingness to cannibalize existing products and their own investments results in a focus on incremental improvements of core technologies (Assink, 2006). For example, taking the case understand of auto sector further, there is a need for automotive industry to follow the examples of simultaneous engineering like technology innovations by established entrepreneurs including Aditya Birla like entrepreneurs manage to achieve new environmental solutions (Bergek *et al.*, 2013). However, to survive in the 21st century a shift in the industrial paradigm is necessary, including new propulsion alternatives and different value propositions to customers facilitated by innovative technology to opening new frontiers of customer and market reach. The automotive industry, it is argued, has reached the end of its present constitution and in future will be characterized by adoption and diffusion of technology, market and innovative technology entrepreneurial business model diversity. Present challenges to the dominant paradigm come from both policies and lack of implementation infrastructures inside and outside the industry not only at firm and country levels but also at global level.

A company's ability to successfully introduce radically new products and services is a key success factor for sustaining competitive advantage (Davila *et al.*, 2013; Bhardwaj *et al.*, 2006). Arguably, this is particularly true for the automotive industry, where being innovative and providing innovations are questions of survival rather than merely a matter of staying competitive. The last decade has been characterized by take-overs, mergers and discontinuances in this branch of business, in continuous attempts to gain economies of scale through platform consolidation and various types of joint ventures aimed to achieve increased product coverage without increasing the risk. Principles of lean production (Womack *et al.*, 1990) have been largely influential in creating increasingly efficient development in technoentrepreneurship and manufacturing processes, yet many automotive entrepreneurs are still struggling to stay alive. For example, with policies like diesel cars to be banned from the market, companies like Maruti Suzuki are facing great challenges to stay afloat. In particular, smaller manufacturers with niche products cannot compete with the large-scale efforts of their bigger competitors, and need to innovate their way out of the crisis.

5. Components of knowledge management

Knowledge management includes intelligence generation, dissemination and responsiveness to the market needs. Bhardwaj and Lai (2013) studied the role of green strategy for sustainable techno entrepreneurship.

5.1 Intelligence generation

Intelligence generation has inertial tendency in innovation. Intelligence generation has been conceptualized as a mental process, in which a variety of oppositions are created through active communications among universe, persons, firms and the environment surrounding (Nonaka and Toyama, 2002). Wiig (1997) defined intelligence generation as understanding, focusing and managing organized, unambiguous and intentional intelligence structure, rejuvenation and use. The use of intelligence generation to increase performance advantage has also been emphasized. The term "intellectual capital" includes all types of firm intelligence that can be transformed into income, plus expertise and procedures, copyrights and exclusive rights, as well as the talent and practice of workers and dealings with clientele and contractors. The supply based view of the organization has led to an increasing interest in the idea that intelligence is a key resource that firms must proactively manage if they are to sustain competitive advantage. Theory of intelligence-generating entrepreneurs provides for technopreneurs to propose that intelligence generation is critical for product innovation (Nonaka and Takeuchi, 1998). Further, the author also addressed the question of how entrepreneurs organize the process of intelligence generation and dissemination and use it to design new products, services or systems (Covin and Slevin, 1991). Moreover, commercial firms tend to connect in higher level of knowledge scrutinizing behavior (Ramachandran *et al.*, 2006).

Maintaining good communication with external constituents, especially customers, facilitates the flow of information and other intuitive resources that are crucial for new business creation (Zahra, 1991). However, it is interesting to find that firms that have allowed the customers to co-create the next generation technological innovations were very successful (Prahalad, 2010). Given a closer attention into the shortage of intelligence process and their reasons, it is likely to examine whether alterations in the arrangement, the knowledge and message expertise are required to determine them.

H1. Intelligence generation influences product innovation significantly.

5.2 Intelligence dissemination

The sharing of knowledge about customer insights and intuitions would be greatly facilitating the sustainable innovations. Firms act on the basis of their market intelligence including their intelligence of customers and competitors. The concepts of intelligence dissemination have also been emphasized for innovation outcomes. Appropriate infrastructure and processes are the instruments for facilitating intelligence dissemination and facilitating adaptable groups to improve sharing of intelligence. The other factors include inter departmental interactions resulting in greater trust, self-disclosure, and commitment between product development teams (Francis and Sandberg, 2000), which added to the shared certainty of group members' dealings and boosts joint belief of possibility of innovations. Awareness about one another's beliefs about innovations fosters a safe environment facilitating risk taking for generation of alternatives leading to more effective decision-making (Nonaka and Takeuchi, 1998).

H2. Intelligence dissemination influences the product innovation significantly.

5.3 Research methodology

This understand is an attempt to quantitatively assess influence of intelligence generation and dissemination on high technology entrepreneurial firms in emerging country such as India. Thus, the utilization of a descriptive and empirical research design was deemed appropriate. Descriptive-Causal studies have been widely used to assess the impact of product innovation on the financial performance of the selected technopreneurs (Dharmaja *et al*, 2012; Aktan and Bulut, 2008). Case understand of the auto sector has been elaborated above as descriptive analysis and methodology. Further, the knowledge management system model was identified using case understand of these auto companies and collecting the data from these companies to analyze the factors that facilitate the sharing of information (Hussain, 2011). Detailed SAP-LAP analysis method was used to analyze the driving factors as per the situation and actors and processes. It also includes what actions needs to be taken for enhancing performance of the organization through product innovation. Further, the understanding also uses DMAIC model for analyzing how the other factors needs to be facilitated. Moreover, interpretive structural modeling (ISM) was used to analyze the correlations between the factors and their influence over product innovation including intelligence generation and dissemination. Also the understanding elaborates the implementation issues using SAAS model software for implementing knowledge management systems within the organization. Empirical analysis uses the reliability factor for analyzing the reliability of the questionnaire designed.

A case understand of problem in question has been conducted using Situations-Actors-Processes (SAP) framework (Sushil, 2001) (Figure 2). The inputs from SAP-based analysis and field have been used to perform a strategic gap analysis. The issues identified through strategic gap analysis have been analyzed through process management and knowledge management paradigm (Figure 3). The linkages and interrelationships between the key customer satisfaction enablers have been worked out through Interpretive Structured Modeling (ISM) (Figure 4).

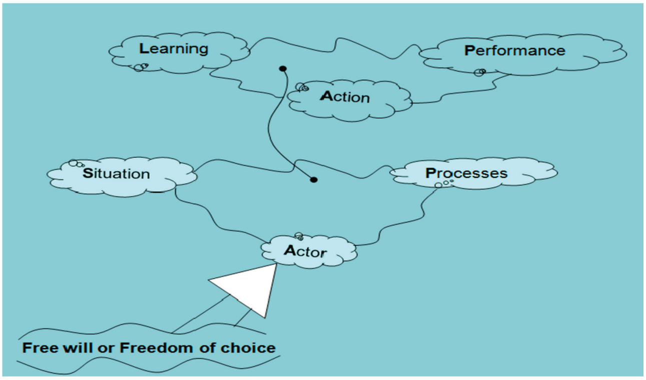
DMAIC (Define, Measure, Analyze, Improve, Control) analysis has been used to analyze the problem of delay in environment commissioning which was one of the findings of the SAP based analysis (Figure 5). The learning issues from analysis have been synthesized for recommending actions and expected benefits for ensuring sustainability using Learning-Actions-Performances (LAP) framework (Sushil, 2001) and Knowledge Management Model was done.

6. Case description

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

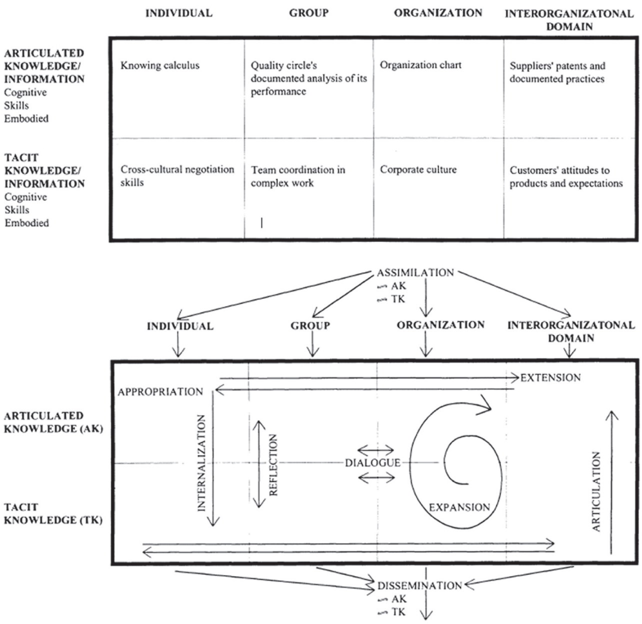
(1) *On Premise* – Traditional deployment which was being offered to all the customers before cloud. In this model, customer procures and owns the product licenses from the organization. The applications suites for which the licenses are procured are deployed on the platform and infrastructure maintained 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.

(2) *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



Source(s): (Sushil, 2001)

Figure 2.
SAP-LAP framework



Source(s): (Hedlund, 1994)

Figure 3.
Knowledge management framework

such an offering the product license, infrastructure and platform management and application management are appropriately priced and bundled as one service to the potential customer. These are also known as integrated converged services (Andreasen and Hein, 1985). This being a hosted environment, the organization owns the infrastructure, security and 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

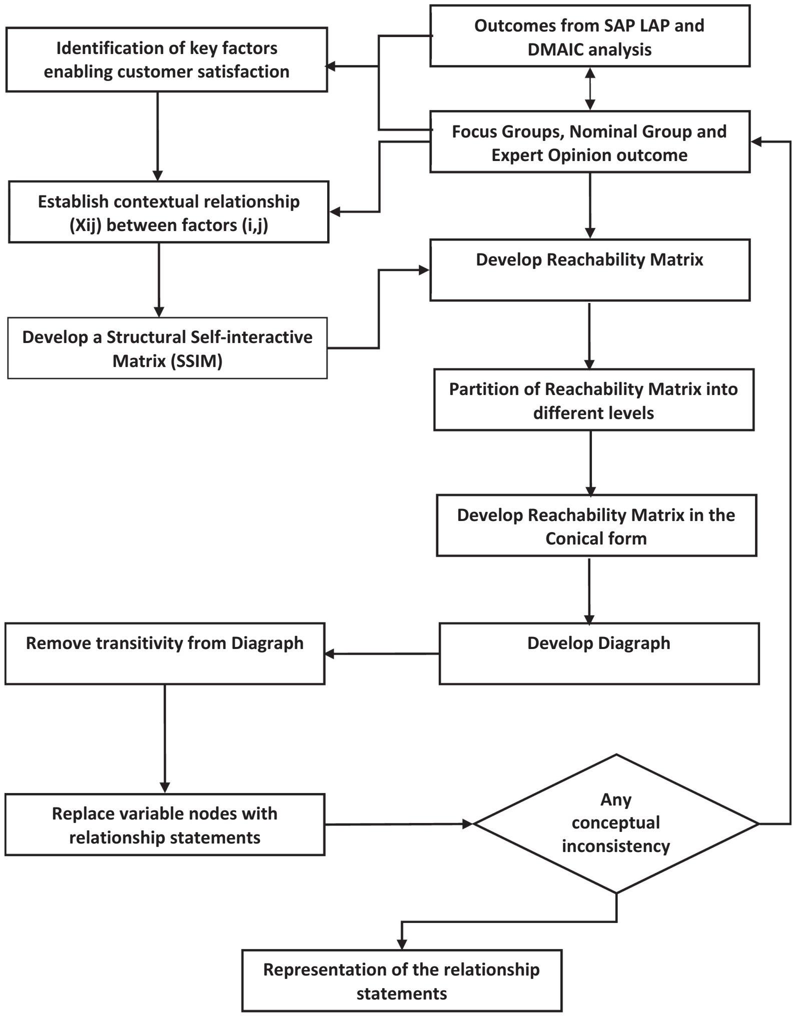


Figure 4.
ISM process methodology

Source(s): (Sohani, 2012 and Self Knowledge)

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 for enabling knowledge management for facilitating co creation with customers. Below diagram depicts the deployment models discussed above with their respective key characteristics, elements and differentials. Based on this research the conceptual model is being given below (see Figure 6):

Source(s): (www.sapartners.com, 2016)

Figure 5.
DMAIC process

6.1 Cloud service for facilitating commissioning process of knowledge management systems or product innovations

The following sub-processes are involved in Cloud Service Commissioning Process, which facilitates knowledge being shared among the employees about customer needs.

(1) *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. The organizations would do well by allowing customers to share their feedback in detail.

(2) *Order Receipt and Verification* – The Cloud Environment Delivery team is notified of a new order booking of the newly developed product or service. 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

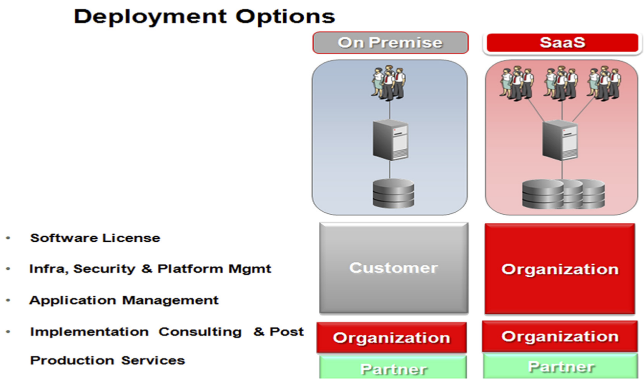


Figure 6.
Conceptual model of knowledge management systems deployment options for product innovations

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. It will also depend on the size of the organization and customer base.

(3) *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 for facilitating knowledge management systems. The number of environments entitlements for a customer varies on the basis of determined size and customer base. 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.

(4) *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 (see Figure 9).

(5) *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. Figure 10 below gives a summary of all the constituent teams and their respective functions.

All the above teams are shared pool of resources catering to multiple customers. Figure 7 shows that the knowledge management systems enabled by cloud architecture would help the employees share information and insights about customers' needs and wants.

6.2 Cloud service delivery constituents

As discussed earlier, the SaaS delivery model facilitating knowledge management systems for sustainable product innovation 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:

(1) *L1- Global Helpdesk* – Responsible for registration, prioritization 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

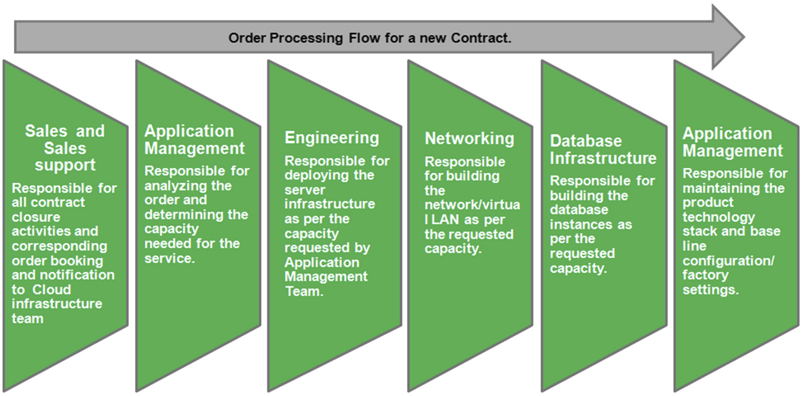


Figure 7.
Cloud service environment delivery team constituents and order processing flow

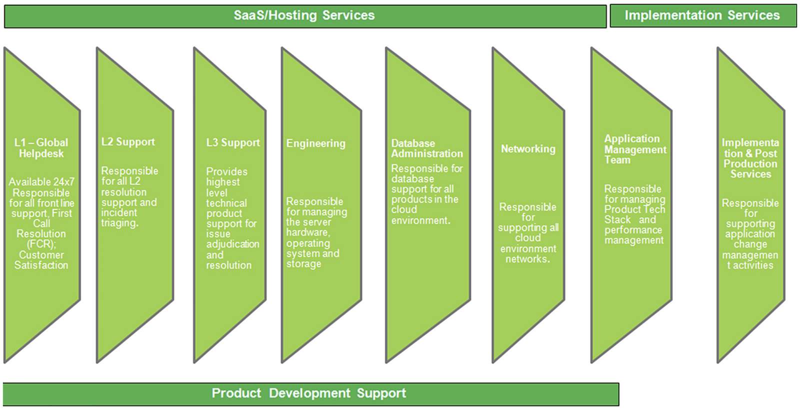


Figure 8.
Cloud service delivery team constituents for implementation

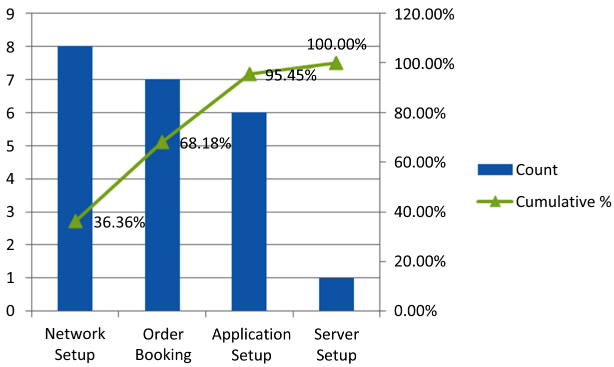


Figure 9.
Pareto analysis for cause of delays in commissioning

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.

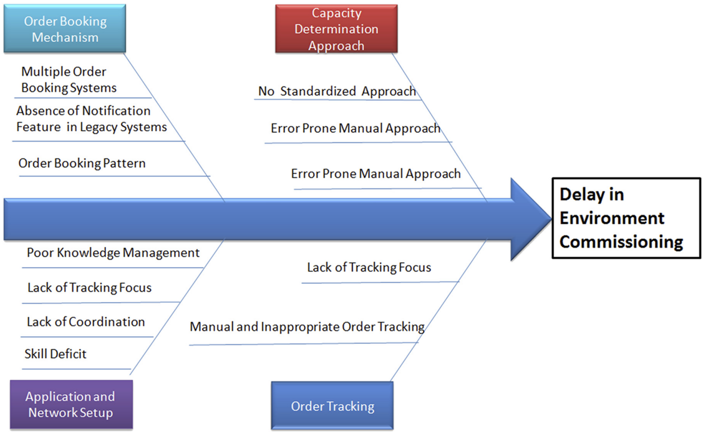


Figure 10.
Fish bone diagram depicting various causes for delay in knowledge sharing

(2) *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.

(3) *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 analyzing core product issues and help development create hot fixes/patches. L3 support too was preexistent and the ambit has now been extended to SaaS customers.

(4) *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.

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

(6) *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.

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

(8) *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. Figure 8 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.

7. SAP-LAP case analysis

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

7.1 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 (Caloghirou *et al.*, 2004; Eisenhardt and Martin, 2000). 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. These can be source of modification of products. There were escalations around lack of clarity on issues, inappropriate assignment of issues. The following items summarize the issues as reported by customers during the various phases of a project:

(1) *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.

(2) *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 was not able to bill the customer. Finance department and the senior management also pushed for exploring opportunities in reducing the overall commissioning time.

(3) *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.

(4) *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.

(5) *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.

(6) *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.

7.2 Actors and processes

There were several actors and processes which are interacting to create the above situations. Actors involved in different phases are depicted in Table 1 (see Tables 2–4).

8. DMAIC analysis for cloud service knowledge management for products innovation 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.

8.1 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. The need of the hour would be to define the customers' needs and wants in terms of features and design parameters for delivery in tangible form. Key findings were as follows:

(1) *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.

S. No	Actors	Deployment	Phase: Implementation and 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 1.
Participation of actors in different phases of knowledge sharing

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 2.
Actors and processes interaction

(2) *Customer Impact* – Delay in product implementation. Increased response time. Dissatisfied customer.

(3) *Business Impact* – Delay in revenue realization of $478,224.

(4) *Goal* – To reduce the commissioning time to 45 days. Current average is ~65 days.

(5) *Process* – The cloud service commissioning process has been described in section 4.2(e).

8.2 Measuring the influence of KM on product innovation

Out of eighty four commissioning studies done over past twelve months, twenty two were found to have exceeded the threshold of 45 calendar days. Table 5 below shows the time taken in days to perform individual commissioning steps by respective teams for the delayed

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	✓					✓

commissioning. The last column shows the additional days lost after the lapse forty five calendar days period post closure of contract.

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. Table 6 below depicts the scale of delay in revenue loss thereby resulting in late realizations.

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

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 (see Figure 9).

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.

8.3 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 (see Figure 10).

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 did not have this feature. Hence the Application Management team had to monitor the order booking system manually. The manual intervention induced delays.

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

Table 4.
Critical to quality and critical to process chart for implementing KM

Table 5.
Time consumed for performing key commissioning steps

Customer	Order information		Commissioning			Analysis	
	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

(continued)

Customer	Order information		Commissioning			Analysis	
	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 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

Table 5.

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

Table 6. Performance of revenue realization delay due to delays in commissioning KM

(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 did not 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. Figure 14 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.

8.4 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.

(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. This workflow should culminate after the environment has been fully commissioned by the Infrastructure team. The new arrangement is pictorially depicted in Figure 11.

(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.

- Product specific order trends in past four-quarters.
- 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.

8.5 Control

The control phase is already in progress as this report is written. Breach of any threshold defined for a phase will trigger a notification/escalation to a pre-configured set of roles in the

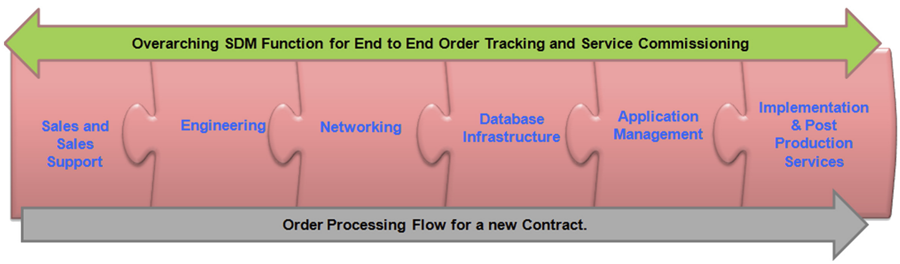


Figure 11.
Enhanced and modified integration framework of cloud team

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 (see Table 7).

8.5.1 Reliability analysis. Reliability is the extent to which a list of scale items would produce consistent results if data collection were repeated and is assessed by determining the proportion of systematic variation in a scale. The following Table 8 summarizes the Cronbach's coefficient alpha for the pilot understand of nine constructs with 32 statements (Agarwal, 2011).

Thus, the factor analysis confirms the validity of these constructs. So, these items have been included in the final questionnaire for survey understand. The components matrix is the output of the factor analysis process that lists the loadings of each of the scale items on each of the nine components. Valid components having scale item loadings of 0.5 and above and scale items with the highest loading on that component.

It was attempted to analyze the situation and understand the underlying factors contributing to the situation. A careful analysis of the situation for all the three customers led to the following findings:-

(1) *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

Constructs	Measurement variables for investigation in the understand	Author(s)
Intelligence generation	(a) Process of intelligence generation	Nonaka and Toyama (2002); Ramachandran *et al.* (2006)
	(b) Design of new products, services or systems	
	(c) Capability to generate intelligence and utilize it	Eisenhardt and Martin (2000)
	(d) Capability to engage employees in innovative activities	
Intelligence dissemination	(a) Interaction among employees	Francis and Sandberg (2000); Nonaka and Takeuchi (1998)
	(b) Availability of appropriate infrastructure and processes	
	(c) Familiarity with colleagues	
	(d) Identifying and designing intelligence dissemination processes	

Table 7. Showing constructs, measurement of variables and authors

Table 8. Overall and individual constructs reliability analysis for the pilot understand

Cronbach's alpha	*N* of items
0.905	39

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. This scenario is depicted in Figure 16 (see Figure 12).

(2) *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 (see Table 9).

(3) *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

Figure 12.
Validated model ok KM by integrating customer insights

Table 9.
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

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.

9. LAP synthesis

Previous section depicts the analysis of the situation, identified gaps and its implications at the various stages of the project.

(1) *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.

10. Customer satisfaction enablers' analysis through interpretive structural modeling (ISM)

10.1 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 understand 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 (see Table 10).

10.2 Development of structural self-interaction matrix (SSIM)

A understand 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

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	Standardization 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

Table 10. Key customer satisfaction enabling factors

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.

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 (Table 11)

(1) V: Variable i will influence j;

(2) A: Variable j will influence Variable i;

(3) X: Variables i and j will help influence each other; and

(4) O: Variables i and j are unrelated.

10.3 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 (see Table 12). The substitution of 1 and 0s were done according to the following rules-:

(1) 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.

(2) 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.

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*

Table 11.
Structural self-interaction 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

Table 12.
Initial reachability matrix

(3) 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.

(4) 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.

10.4 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. The factors identified during a iteration are color coded with different colors so as to enable identification (Table 13).

10.5 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 14).

10.6 Formation of ISM diagraph and model

The structural model was developed with the help of final reachability matrix (Table 15). 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 Figure 8. This final digraph is converted into the ISM-based model for devising the optimal strategy for enhancing customer satisfaction (see Figures 13 and 15).

10.7 MICMAC analysis and ISM conclusion

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:

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

Table 13. Partitioned reachability matrix with finalized levels

Table 14.
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

Table 15.
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	

(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.

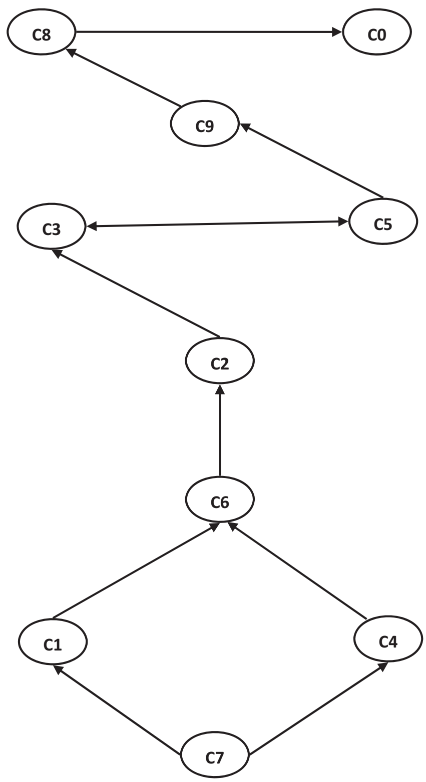


Figure 13. Final diagraph after removing transitivity facilitating KM for sustainable product innovation

(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 Figure 16 above. The categorization of the factors and subsequent analysis is presented next:

(1) *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.

(2) *Dependent Enablers* – Following factors fall into dependent cluster:

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

These 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.

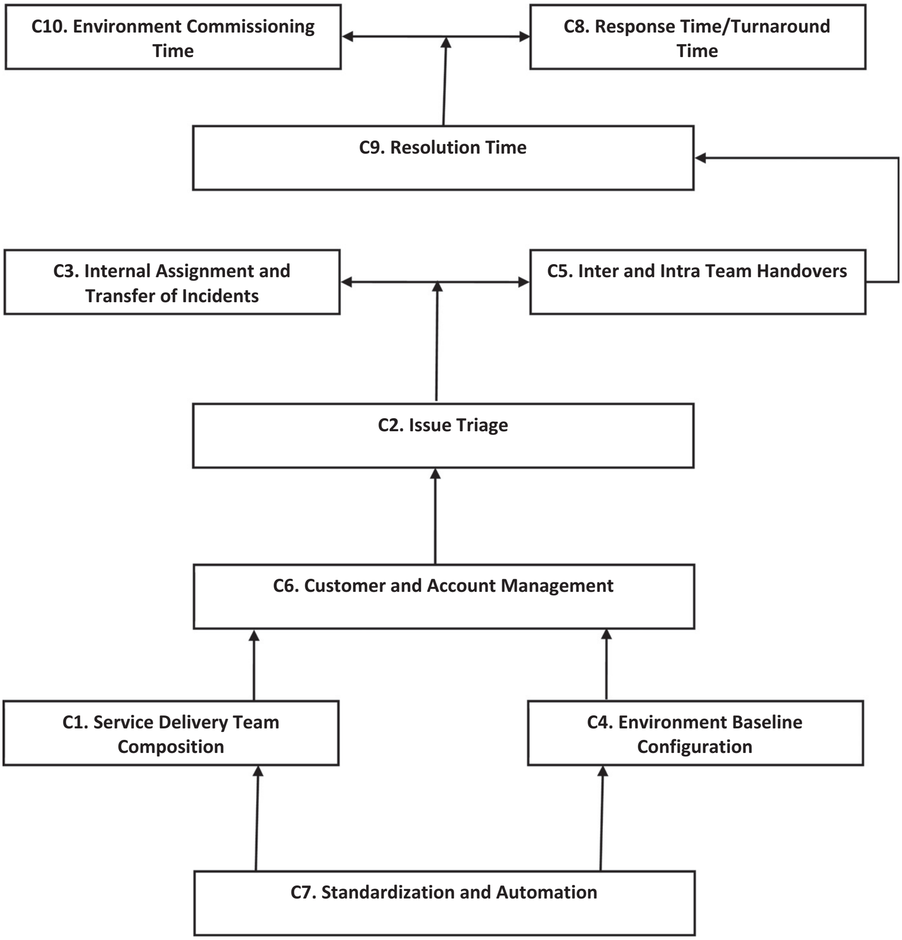


Figure 14.
Interpretive structural model of factors enabling customer satisfaction

(3) *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.

(4) *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.

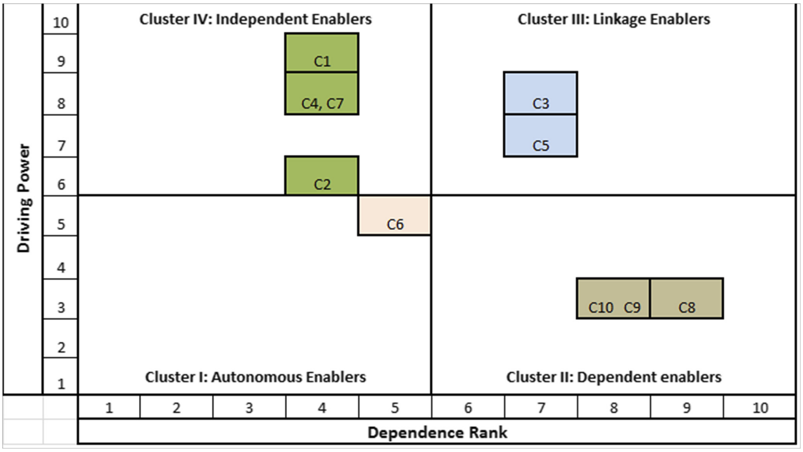


Figure 15. Clustering of factors for enhancing customer satisfaction – MICMAC analysis

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 16. Knowledge transformation matrix for cloud teams

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 (Lyles and Salk, 1996).

11. Conclusion

In order to remove inconsistencies in issue resolution and problem solving approach and provide an integrated service to the customer, as depicted in Figure 7 in LAP synthesis, various Knowledge Management options have been explored. Table 15 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:-

(1) *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.

(2) *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.

(3) *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.

(4) *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.

Figure 16 shows the knowledge transformation matrix which depicts the recommended knowledge transformation strategies between various teams.

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:

(1) *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.

(2) *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.

(3) *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.

(4) *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.

The understand findings suggest that knowledge management including intelligence generation helps the techno entrepreneurs to gather information from the market about customer's needs and wants thereby influencing the adoption pattern of the customers. On the other hand the findings also suggest that intelligence dissemination helps in diffusion of the intelligence gathered from the market. This in turn helps the product development team to understand the needs of the customers. Therefore, they are able to develop product innovations and modifications as per the customers' needs and wants. So the diffusion of knowledge is very critical for making the techno entrepreneurship sustainable by developing customer focused products and services in technopreneurship. Through the step-wise Structural equation modeling analysis, it emerged that Intelligence Generation is acting as a driver of Innovativeness (Danneels and Kleinschmidt, 2001). It is evident from the framework that

Intelligence Generation has higher order of impact on the Innovativeness in terms of Good Communication and Periodical Review. Thus, it can be concluded that Intelligence Generation can be utilized as a major determinant to improve the financial outcomes in terms of Innovativeness, which has been practically experienced in questionnaire survey in four major technopreneurs from automobile industries.

Intelligence Dissemination directly affects the financial outcomes. Intelligence Dissemination has emerged as a major predictor of adoption and diffusion of technology Innovativeness. Periodical reports Circulation influences Innovativeness directly. These links were observed in macro analysis (step-wise structural equation modeling analysis) of questionnaire survey. Thus, it can be concluded that Intelligence Dissemination can be utilized as a major determinant of product innovation to improve the financial outcomes.

These specific issues related to product innovation and help the organization for entrepreneurial revitalization (Nwokah *et al.*, 2009). These specific issues also help us to address the issue of organization's lack of vitality which is one of the key aspects of the technoentrepreneur's sustainability. Thus, the variables and their inter-relationships help to revitalize the ongoing process of entrepreneurship within the organization in terms of ongoing processes, which have been highlighted in this understand. The understand leads to the conclusion that the technopreneurs intending to practice of product innovation needs to focus on Intelligence Dissemination, Intelligence Generation for enhancing product-process innovation.

The predictors of adoption and diffusion of technology innovations include intelligence dissemination, intelligence generation and dependability. This shows that for innovations to succeed, it is important to have proper processes for intelligence generation and dissemination. This understanding suggests that innovations require work discretion to succeed.

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 (Song *et al.*, 2005). 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.

12. 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.

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.

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