IMPACT OF LEAN SIX SIGMA IMPLEMENTATION SUCCESS FACTOR ON GROWTH-RATE OF E-SERVICE BASED ORGANISATION

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ABSTRACT

Most of previous researches on Lean Six Sigma focused on application and implementation but never paid much attention on growth rate of organisation. This article concentrates on the factors and elements of Lean Six Sigma project that influence growth rate of e-business organisations. This article is an attempt to bridge this gap. On basis of survey & data collection, analysis of a service based organisation has done in Indian scenario. A questionnaire survey has taken to identify critical success factors of Lean Six Sigma and case is studied from one of Asia’s largest service provider company i.e. Tata Consultancy Services. Data is analysed on the basis of four parameters. They are monetary saving, time taken to earn revenue, information quality and training of people. Methodology has both qualitative and quantitative perspectives. A comparative overview of degree of implementation of Lean Six Sigma and effect on growth rate is also discussed. Findings show that “growth rate” is a strong function of critical success factors of Lean Six Sigma implementation in e-service based organisation. Impact of investment, trainers, communication, precise and accurate information may serve new opportunities for future researchers to measure growth rate. Quantified results are provided for better understanding.

Keywords: Lean management, Six Sigma, LSS, growth rate, information quality, e-business, service industry

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1. INTRODUCTION
In present era, competition amongst industries allow service provider to stretch accuracy and precision up to gratifying level to become a sustainable organisation. Earlier manufacturing companies took advantage of Lean philosophy and Six Sigma tools. Unpredictable growth rate of e-service organisation have observed in last two decades. To understand the growth rate dependency and characteristic, first we have to understand underlying theory of critical success factor of lean six sigma implementation and their relation and integrity. Electronic business (e-business) alludes to the utilization of the Web, Internet, intranets, extranets or some blend thereof to conduct business e.g. store network administration, electronic request preparing and client relationship administration. In this way e-business can help organizations to work all the more successfully and proficiently. A service is an activity that a man accomplishes for another person. Services business represent a general term that depicts work that backings a business but does not produce a tangible product. Information technology (IT) is an essential business service that backings numerous different business services e.g. acquisition, delivering, broadcast communications, well-being treatment, budgetary, mail conveyance and professional services.

According to Cherrafi et al., (2016a), the matrix of Lean, Six Sigma and Sustainability presents ability to produce a framework for persistent improvisation, effectiveness and efficient, particularly in organizations that already followed these procedures. In this phase, the author look to identify through the perception of specialists: How factors of Lean Six Sigma (LSS) are proficient to impact the growth rate of sustainable service organisation?

The implementation is an iterative process since the probability of success depends upon some key inputs termed as Critical Success Factors (CSF). Evidently each CSF has an effect of the last yield. CSF are liable for success or failure of LSS projects and since are also responsible for growth rate of e-service based organisations. As per Linderman et al., (2002) Continued success and promotion within the organization required their confirmation and provision of Six Sigma. Top management must know that effective arrangement of Six Sigma requires not just specialized comprehension, yet in addition behavioural understanding.

2. LITERATURE REVIEW
Six Sigma has executed in the mid-1980s in Motorola and LSS strategy has developed about 1990s. Both have progressed toward becoming strategies giving right outcomes and wind up noticeably common from manufacturing to sales, architecture to service in all business regions after some time. A number of research paper and literature has reviewed by author to understand the laying theory of impact of success factors of LSS projects and implementation that affect the growth rate of E-business and service based organization. As per Atmaca et al., (2011) LSS was initiated by BAE Systems Controls in 1997 in India.

According to Haksever et al. (2013) service is described as tangible and intangible quantity and they are served and consumed about at same time. To categorise different type of services, Schemer (1986) advised service process matrix. Service is categorised in service factory, professional service, service shop and mass service. It clarifies that e-business falls under professional service which requires high degree labour intensity and high degree of customer interaction.

Six Sigma is a restrained, information driven approach and scientific methodology for eliminating defects (heading towards six-standard deviations between the mean and the closest specification limit) in any procedure from production to consumption and from goods to service. in 1980s, Motorola CEO Bob Galvin with a team of engineers initiated first and took advantages in minimizing defects. Though this scientific approach was well propagated by Jack Welch, CEO of General Electric (Shah et al., 2008). Six Sigma is not used to count
number of defects in a process rather it is used to count which of the process can late to defect. It uses data, data analysis technique and then it devises methods. It is applied for both product and services. A Six Sigma is rigorous, focused, Highly Effective implementation, proven principle and technique which aims at virtually error free business performances i.e. 3.4 defects per million opportunities (DPMO). Wilful learning requires control of moves made by organisational individuals. Data as per Pandey et al., (2000), General Electric Company (GEC, 1999) spent over $500 million to initiate Six Sigma projects and earned $2000 million for in fiscal year 1999 (Thawani, 2004). Many describe Six Sigma programs as the most recent administration prevailing fashion of improvement tool and technique (Watson, 2006).

Lean philosophy: According to Kurdve et al., (2014) and inman et al., (1999), Taiichi Ohno and associates architected the Lean philosophy at Toyota Production System to stay in scenario of competition of resources and capital, which were consequences of Second World War. The Toyota production system is additionally credited with being the origination of just-in-time (JIT) production strategies, an embedded component of Lean philosophy, and hence the Toyota production system remains a model of brilliance for advocate of Lean philosophy. Lean philosophy assumed that defects are produced due to irrelevant process or unnecessary activity. Whereas Six Sigma emphasizes on incapability of the process. The idea of Lean ended up plainly prominent through Womack and Jones (1990) book 'The Machine That Changed the World'.

The conventional US manufacturing framework depended on the "batch and queue" design. Lean philosophy focuses small batch sizes and, at last, flow of single-piece i.e. single transfer batch size. The term pull is mentioned to suggest that nothing is made until the point that it is required by the downstream customer, and the use of a make-to-order (MTO) approach at whatever point conceivable. Lean theory stresses on total system efficiency. Lean standards concentrate on streamlining the stream of generation material all through the whole venture. Lean practices bolster this by decreasing variability in production system. Practice of LSS implementation demonstrates that the achievement or disappointment depends on choosing the right project of four to six months and convey quantifiable business gain (Breyfogle et al., 2001; Kwak and Anbari, 2006). Lean trade can be apply to any industry from horticulture to aviation and any procedure from monotonous assembling to modified assembly. Earlier researchers have tried to coordinate lean philosophies & six sigma keeping in mind the end goal, to create a unique model of implementation i.e. Lean Six Sigma (Sheridan, 2000). It is found that organizations implemented either Lean philosophy or Six Sigma alone may achieve a state of consistent losses. Balanced system growth (Scott, 1987) is driven by both information and inspiration. Without learning, growth happens through accidental or verifiable realizing. According to (Fischman, 2010; Antony et al., 2012; Hsieh et al., 2012), It is reasonable to make statement that management hypothesis with respect to operating frameworks is as yet developing. While both Six Sigma and Lean philosophy speak to the best in class, every framework offers need to specific aspects of hierarchical performance. By Kornfeld and Kara, (2013); Lertwattanapongchaid and William Swierczek, (2014); Meza and Jeong, (2013) the LSS system keeps on advancing as far as the use of LSS in different sectors of an organisation, beyond production situation itself, the development of the tools and technique utilized. In Bhat et al., 2009 six sigma implementation and barrier is discussed.

Lean Six Sigma and sustainability: the coordination between Lean and Sustainability was the most considered, since the attention on elimination of defect is normal between the two methodologies and increases the capability of its integration (Cherrafi et al., 2016b; Garza-Reyes, 2015a). The integration of Lean, Six Sigma and Sustainability came to emerge in recent years as a creative field of study for methodical approach of the LSS technique and the
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requirement for a more realistic model for overseeing and controlling support ability in associations (Freitas et al., 2017). As per Cherrafi et al. (2016a) the organisation who use Lean Six Sigma as a management system has a high potential to be the sustainable. As per Bebbington et al., (2007), There is a broadly perceived requirement for people, associations and social orders to discover models, measurements and tools for design the extent to which, and the dimensions in which, present actions are sustainable. In Sheridan (2000), it was one of the primary cases was done in the BAE Systems Controls which was an Indian aircraft engine control firm. In the practiced initiated in 1997, Lean Manufacturing standards are utilized with Six Sigma devices.

In McIlroy and Silverstein (2002), Northrop Management Grumman had utilized Lean Management before starting Six Sigma program. They consolidated Lean Management, Kaizen and the issue settling procedure created by General Electric. In Boyne and Walker (2002), the greater part of the applications on LSS work have made in the private sector, particularly in the assembling and manufacturing and in huge organizations. It is advanced that numerous specialists on Lean and Six Sigma have suggested that tools and techniques used in these area could be applied in service sector, i.e. call centers, software development, innovation programs and education institution.

In Sharma (2003), consolidated Lean strategies with Six Sigma technique amid the change he made in a battery processing plant. He figured out how to diminish the stock cost from $20 to $2 million by understanding with the Lean procedures the issues he had recognized amid the investigation stage under DMAIC (Pull system, poka yoke, standard working reports, SMED). In Pojasek (2003), the author was dealing with Lean Management, Six Sigma and the system approach as a comparative review. Lean Management ought to be favored for the enterprises where visual advance and quick transformation are satisfied and the system approach ought to be favored for the enterprises where efficient basic leadership approach is embraced with participation of employee.

Furterer and Elshennawy (2005) made in investigation in the finance branch of a city, process change openings were characterized by shaping procedure flow map. At that point the change design was readied and the cost benefit analysis was assessed with arrangements. Wage payment arrangement process was diminished by 60%, buying and payment procedure by 40% and the way toward getting account by 90% towards the finish of the investigation. In Arnheiter and Maleyeff (2005), paper fundamentally characterize both of the system in detail and depict essential tools and technique utilized, by talking about the ideas of Lean Management also, Six Sigma independently. At that point, they investigated what Lean organization can pick up from Six Sigma and what the organizations applying Six Sigma can pick up from Lean Management. In Bendell (2005), author intends to manage enterprises by tending to qualities and weakness of Six Sigma, Lean and Lean Sigma and other certain strategies, (i.e., ISO 9001:2000). In Brett and Queen (2005), it is portrayed how to integrate Lean Manufacturing and Six Sigma approaches for Lean Six Sigma application. With the illustrations given on information management, it is spoken to how to prevail by dispersing the deficiencies of one with the other. In Bhat et al., 2009 six sigma implementation and barrier in manufacturing industry is discussed in Indian scenario.

In Antony et al. (2008), he completed an investigation on the most proficient method to receive Lean Six Sigma in SMEs. They gave data with respect to what should be accomplished for progress by assessing the outcomes in a territory picked as a pilot application area. Six Sigma links customer requirements and process improvements with financial results while simultaneously providing the desired speed, accuracy and agility in today’s e-age (Thawani, 2004).
Table 1 Sector wise *Lean Six Sigma* studies in Literature.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Author</th>
<th>Year</th>
<th>Methodology and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft sub-industry</td>
<td>Kandebo</td>
<td>1999</td>
<td>Implementation, Cause effect diagram, pareto analysis, TGSCM diagram, reducing errors</td>
</tr>
<tr>
<td>Aircraft sub-industry</td>
<td>Sheridan</td>
<td>2000</td>
<td>Implementation, value flow map, control chart, kaizen, reducing errors</td>
</tr>
<tr>
<td>Service sector</td>
<td>Bossert and Walker</td>
<td>2002</td>
<td>Applicability of Lean Six Sigma in service sector</td>
</tr>
<tr>
<td>Aircraft sub-industry</td>
<td>Mcllroy and Silverstein</td>
<td>2002</td>
<td>Implementation, kaizen, control chart, reducing errors, pareto analysis</td>
</tr>
<tr>
<td>White goods industry</td>
<td>Dubai Quality Group</td>
<td>2003</td>
<td>Implementation, line balancing, design of production line</td>
</tr>
<tr>
<td>General</td>
<td>Pojasek</td>
<td>2003</td>
<td>Comparison of Six Sigma, Lean Management and system approach</td>
</tr>
<tr>
<td>Battery industry</td>
<td>Sharma</td>
<td>2003</td>
<td>Implementation, Kanban, poka yoke, SMED, reducing costs</td>
</tr>
<tr>
<td>General</td>
<td>Arnheiter and Maleyeff</td>
<td>2005</td>
<td>Comparison of Six Sigma, Lean Management and Lean Six Sigma</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Brett and Queen</td>
<td>2005</td>
<td>Applicability of Lean Six Sigma methodology in IT</td>
</tr>
<tr>
<td>Public sector</td>
<td>Furterer and Elshennawy</td>
<td>2005</td>
<td>Implementation, 5S, value flow map, cost benefit analysis, improving finance process, statistical process control, cause effect diagram, pareto analysis, kanban</td>
</tr>
<tr>
<td>Pharmaceutical industry</td>
<td>Marti</td>
<td>2005</td>
<td>Implementation, kaizen, variance analysis, reducing clinic experiment costs</td>
</tr>
<tr>
<td>Insurance company</td>
<td>Bertels</td>
<td>2006</td>
<td>Implementation, reducing costs, customer feedback, kaizen, value flow map</td>
</tr>
<tr>
<td>General</td>
<td>Burton</td>
<td>2006</td>
<td>Comparison of Six Sigma, Lean Management and Kaizen</td>
</tr>
<tr>
<td>General</td>
<td>Carnell</td>
<td>2006</td>
<td>The issues to consider at Lean Six Sigma studies</td>
</tr>
<tr>
<td>Call centre</td>
<td>Chao et al</td>
<td>2006</td>
<td>Implementation, improving, service quality</td>
</tr>
<tr>
<td>Marketing sector</td>
<td>Hesselschwerdt</td>
<td>2006</td>
<td>Applicability of Lean Six Sigma in marketing sector</td>
</tr>
<tr>
<td>Casting industry</td>
<td>Kumar et al</td>
<td>2006</td>
<td>Implementation, reducing the defects on final products and during casting process</td>
</tr>
<tr>
<td>General</td>
<td>Myers</td>
<td>2006</td>
<td>Use of RFID technology for Lean Six Sigma</td>
</tr>
<tr>
<td>innovation in business</td>
<td>Antony</td>
<td>2007</td>
<td>Six Sigma expels innovation in business, underlying theory</td>
</tr>
<tr>
<td>Service sector</td>
<td>D’Angelo and Zarbo</td>
<td>2007</td>
<td>Six Sigma and improving quality</td>
</tr>
<tr>
<td>Service organisation</td>
<td>Antony et al</td>
<td>2007</td>
<td>Implementation, survey, questionnaire, sampling,</td>
</tr>
<tr>
<td>Manufacturing industry</td>
<td>Bhat et al</td>
<td>2009</td>
<td>survey study, implementation, barriers, enablers</td>
</tr>
<tr>
<td>General</td>
<td>Cherrafi et al</td>
<td>2016</td>
<td>Link among Lean, Six Sigma and sustainability</td>
</tr>
<tr>
<td>General</td>
<td>Marzagao et al</td>
<td>2016</td>
<td>Success factors, implementation, survey</td>
</tr>
</tbody>
</table>
3. RESEARCH METHODOLOGIES

To accomplish the objective, survey and case study played vital role. Data of survey provide a basis and case study verify that data in real practise. Since this has both survey and case study to understand theoretical and practical impact on growth rate of service based organisation. To analyse the impacts of factors of successful implementation of Lean Six Sigma in service based organization on growth rate, a survey is constructed by following parts.

3.1. Research Survey Design

A structured electronic questionnaire survey was organised. Survey questionnaire included two parts, partially close ended questions and Likert ratings. Cross sectional study has been done in which information from population was gathered at a single point of time. The respondent were asked to give their opinion about 25 statement in a scale of one to five indicated strongly dis-agree to strongly agree respectively.

3.2. Population for Survey

The population in this survey comprises of different associations either national or multinational conveying out business in India and the Lean Six Sigma master black belts, black belts, champions either Indian resident or outsiders who are working or worked with Lean Six Sigma in India. An aggregate of 204 polls were answered which were initially mailed or sent through proper channel with 49 being returned for email address inconsistencies and other barrier. Which leads to total 26% response, since resulting total sample size is 204.

3.3. Unit of Analysis

Lean Six Sigma experts working in selected organizations and Lean Six Sigma experts related to consultancy are the unit of analysis for this research in survey.1. Most of the questionnaire was sent to respondent through emails.2. Champions, Master Black Belts, Black Belts were interviewed individually to seek their cooperation’s in filling the questionnaires.3. Some questionnaires were distributed through friends and colleagues. The time given to respondents was two weeks to answer the questionnaire. The survey verifies 10 essential factors for successful implementation of Lean Six Sigma in service organisation. Now in this paper these factors will be ranked on basis of survey result associated with it to be effective. Factors are arranged priority wise in table 3 on basis of survey results.

Table 2 List of top ten success factors on the basis of respondent’s opinion

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Critical Success Factor</th>
<th>Ratings and frequency</th>
<th>Average (Rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 Strongly Disagree</td>
<td>2 Disagree</td>
</tr>
<tr>
<td>1</td>
<td>Top Management leadership, engagement and commitment</td>
<td>4</td>
<td>137</td>
</tr>
<tr>
<td>2</td>
<td>Company’s financial capability for Lean Six Sigma projects</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Organizational culture and teamwork</td>
<td>143</td>
<td>61</td>
</tr>
<tr>
<td>4</td>
<td>Project prioritization, selection, reviews and tracking</td>
<td>11</td>
<td>162</td>
</tr>
<tr>
<td></td>
<td>Well organised information and communication system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>Constructive Lean Six Sigma education &amp; training program</td>
<td>6</td>
<td>152</td>
</tr>
<tr>
<td>6</td>
<td>Well established customer management system</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>Availability of master Black Belts and black belts (including consultant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Strategic Planning System</td>
<td>14</td>
<td>148</td>
</tr>
<tr>
<td>9</td>
<td>Competitive bench marking system</td>
<td>31</td>
<td>149</td>
</tr>
</tbody>
</table>

**Figure 1** Survey evaluation of various critical success factor on Likert scale

**4. DATA COLLECTION AND ANALYSIS**

To understand impact of critical success factor of LSS implementation on growth rate, some data are collected from ‘isixsigma’ official website. The question arises that ‘is growth rate directly proportional to critical success factors of LSS implementation?’ To find the solution Analysis is done on basis of four parameter

- Monetary savings in billion US dollar per year
- Time taken for savings in years
- Information quality and communication system used during Six Sigma implementation (on Likert scale of 1 to 5 from worst to very effective)
- Training of people of LSS implementation team (on Likert scale of 1 to 5 from worst to very effective)
Impact of Lean Six Sigma Implementation Success Factor on Growth-Rate of e-service based Organisation

![Diagram showing research phases and impact of CSF on growth rate.]

**Figure 2** Research Phases on Lean Six Sigma and Impact of CSF of LSS on Growth rate

![Bar chart showing data collection and analysis.]

**Figure 3** Structural Presentation of Data Collected of Company used Six Sigma Approach in Four Independent Parameter.

**Table 3** critical success factor arranged priority wise with importance and impact on growth rate of organisation.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Critical Success Factors</th>
<th>Importance</th>
<th>Impact on growth rate within Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Availability of Master Black Belts and black belts (including consultant).</td>
<td>Master black belt have a profound knowledge of the Six Sigma philosophy at both strategic and operational levels.</td>
<td>Right guidance increases growth rate drastically from LSS initiation to completion.</td>
</tr>
<tr>
<td>2</td>
<td>Well organised information and communication system</td>
<td>To immediately enhance execution and worker needs to get their performance feedback from their administrator.</td>
<td>Lack of communication causes adverse effect on growth rate.</td>
</tr>
<tr>
<td>3</td>
<td>Top Management leadership, engagement and commitment</td>
<td>Responsible for setting up a vision for Six Sigma implementation.</td>
<td>Provide confidence and increase moral result positive impact on growth rate.</td>
</tr>
</tbody>
</table>
3 Organizational culture and teamwork

The collaboration, correspondence and strengthening advanced by the organisational culture are additionally anticipated that would encourage the execution of tools and technique in Six Sigma.

Difficult to achieve if people are not willing to work. Team spirit plays a vital role to increase the moral to anticipate better growth rate.

4 Constructive Lean Six Sigma education & training program

To enhance the abilities and diminish the odds of a disappointment in a wide range of Six Sigma projects.

Skill and quality of work improved since increases growth rate.

5 Strategic Planning System

It translates ready to action plan with related performance measurement.


6 Project prioritization, selection, reviews and tracking

It must present an opportunity to fulfil a client require and in the meantime restore a monetary advantage to the organization.

Right Projects include ease of operation and assure growth of organisation.

7 Company’s financial capability for Lean Six Sigma projects and implementation

This investment is huge in form of training, culture change, process change, information technology etc. Normally Lean Six Sigma is not best fitted for small scale organization. Adequate financial capability is expected.

Lack of money makes resource constraints which leads to failure of LSS successful implementation. It shows adverse effect on growth rate.

8 Well established customer management system

To receive customer feedback and to resolve customer concern.

Enforce implementation and communication results better Growth.

9 Competitive benchmarking system

Fit for gathering business sector and competitor’s information. The procedure of benchmarking data collection should be assessed to be guarantee its potency.

Right information at right time impels organisations growth rate.

5. CASE STUDY OF TATA CONSULTANCY SERVICES (TCS)

Tata Consultancy Services Limited (TCS) is a subsidiary company of Tata Sons and IT services brands worldwide generally supports services in various field like supply chain management, logistics & stores, business consultant, hospitality, retail chain management and various government sectors in 46 countries. Six Sigma activity began in TCS in Global Engineering Development Center (GEDC) at Chennai in 1998. At that time TCS was a sustainable service based organization and generating These projects include Cycle Time Reduction, Input Quality, Quality Compliance, Error Reduction, Improvement of Schedule Compliance and Design Improvement. Reasons behind TCS adopted Six Sigma was

(a) To develop robust services and processes.
(b) To eliminate the waste in supply chain management.
(c) Improvisation of quality performance and delivery schedule.
(d) For better anticipation of customer needs and demand.

5.1. Six Sigma activity applied in TCS:

In logistic and store department of a Denso International India Pvt. Ltd which is a Japanese multinational manufacturing company. TCS was supporting SAP which is an enterprise software to manage business operations and customer relations software which was using by Denso. Frequent shut down and freezing of SAP software were a major problem and each time when retailer faced problem they consult with TCS and TCS asked vender due to technical error since the problem was in software itself. Software engineers at TCS define the
problem of frequent shut down and freezing of software and after analyzing problem they found solution by asking vender of SAP to create a batch file to fix this issue. After this, TCS trained its employee by documentation of such problems and related practice used to solve that problem. Now TCS employed a number of employee in reserve and trained for future endeavor and provide quality performance to its client. These way TCS approached for DMAIC process. Company realizes opportunity of Six Sigma and they implemented more than 10 successful implantation of Six Sigma project till now. Company’s revenue after initiation of Six Sigma at GDEC to now are (data are taken from annual report TCS own website.

![Figure 4](image_url)

Figure 4 Critical observation of increment of TCS revenue since 1998

Today TCS is well known service organization and comes in top IT companies worldwide. Since 1998 TCS applied Six Sigma in some of its departments in order to deliver quality performance to its customer. The annual report from 1998 onwards shows significant impact on company’s growth. From 1998 to 2000 company’s revenue got almost 2.25 times and in upcoming 4 years company’s revenue figured $2000 million dollar which is more the 4 times than earlier 1998 i.e. before Six Sigma implementation.

6. DISCUSSION

Although the era in which each above organization applied six sigma was not the same. One thing is for sure that every organization grew and made profit. Then it is very essential to understand how this factor affects the growth rate because time taken by each organization was different. In Motorola, Six Sigma was at developing stage. Since only top management was solely responsible for implementation. Huge investment results saving of manufacturing of $1.4 billion from 1987 to 1994. Effective communication systems were not established like these days. Motorola saved $16 billion over 15 years from 1987 to 2001. After a decade allied signal saved $0.5 billion over the year 1998 and G.E. showed $1.6 billion of investment and $4.4 billion of saving from 1996 to 1999. Similarly Honeywell and Ford saved $1.8 and $1 billion over two years from 1998-2000 and 2000-2002 respectively.
6.1. Discussion on critical success factors
Survey strongly indicate that the execution of implementation program should be done under guidance of master black belt. Since to hire such experts of six sigma the budget of project should be ample or sufficient. Also the cost of information quality and training of implementing team make constraint on budget because the budget is also very crucial factor. If organization spends more than what it earns it will be a business of loss. This is the Economic criteria. The budget of Motorola was less than GE because Motorola did an experiment but GE knew that implementation will definitely give a positive effect. The information quality and historical database was available for GE but Motorola lacks it. TCS took advantage of both of it. In 1999 the communication around the world turn in new dimension of completely digitization. At GDEC in TCS, they focused more on information, communication system, expert’s opinion and budget and lacks to do new thing unlike GE and Motorola. By outcome to budget ratio definitely GDEC did well. Author also observed that the organization which later implement six sigma grew faster than those who implemented earlier. The employee of TCS was mostly Indian at that time as an IT company TCS had ignited mindset people since the work culture was also favorable. All these factors indicate that the organization will definitely grow. As any organization like TCS fulfill the criteria and requirement of CSF it will grew faster than the previous because technology and communication and other dimension always opens a new and better way of thinking and opportunity. TCS planned the implementation strategically and achieve it as planned within time period. This also shows that although having all resources but without strategic planning it may fails.

6.2. Discussion on impact of CSF growth rate
GDEC took advantage of history and prior information to create database and train the implementing team. This saved time and cost to tackle problem earlier faced by GE and Motorola. TCS earned 450 M$ in financial year of 1999-2000. If it is compared with past data TCS took less time even GE took approx. two years including savings for achieving this target. TCS grew continuously for more than a decade as shown in fig. 3. It is validated that CSF influence drastically the growth rate. There is an analogy from production perspective, in production process we believe that if the process meet the design standard then finished product will be good. Likewise in successful LSS implementation if the Organisation fulfill the CSF criteria then definitely Organisation will grow. The extent to which CSF are focused and worked on it, the higher will be the growth rate.

7. CONCLUSION
As LSS implementations, are not always suitable for all organizations in all industries It is obvious that the extent to which Six Sigma implementation is done, is not same among any above mentioned organization (TCS, GE, Allied signal, Motorola) but the factors e.g. cost of implementation, training of implementing team, top management support, customer relationship management, organizational culture etc. which influence the implementation of Lean Six Sigma project are same. These factor in all company are definitely differ at their own category therefore all company has different growth rate. Some factor directly affect growth rate and some has inherent impact. Since the author conclude that all these critical success factors directly impact the growth rate of e-service based organization. Also growth rate is a strong function of CSF in service based organization. One thing author also noticed that monetary terms is not a unique scale to measure the growth rate but enhancement of skills, quality work, data driven approach, Impact of investment, trainers, utilization of
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technology can also be part of measuring parameter & study. This dimension provide a future scope for research in this field.

REFERENCES


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