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## CRITICAL SUCCESS FACTORS FOR IMPLEMENTING LEAN PRACTICES IN IT SUPPORT SERVICES

**Abstract:** Many studies have been done to identify the critical success factors (CSFs) in for successful lean implementation in the manufacturing firms. But, till date, no systematic study has been done to identify the CSFs from the perspective of lean implementation in IT support service sector. This paper aims to address this area. A detailed literature review was undertaken to identify CSFs for lean implementation in manufacturing and services context and to consider their applicability to the IT support services sector. This paper is based on a conceptual discussion of CSFs as applied to the IT support services sector. The authors proposed a set of CSFs which is believed to be suitable for IT support service enterprises. The relevance of CSFs will need to be tested and qualitative research is needed to inform further work. The proposed CSFs are aimed at being useful to IT support services sector as a guideline, so as to ensure a positive outcome of the lean implementation process in IT support services sector.

**Keywords:** Critical success factors, lean production, IT, services

### 1. INTRODUCTION

In today's competitive environment, IT service providers are facing many challenges. The customers expect their IT support service providers to provide better and more disciplined provisioning of IT services to ensure smooth operation (Johnson *et al.*, 2007).

Many IT support service providers have adopted one of the popular process improvement frameworks or standards like ISO, CMMI or ITIL. However, even after adopting one of these standards and frameworks, many IT service providers find it almost impossible to achieve effective end-to-end service delivery requirement.

Many of these organizations find it difficult to match the process improvement goals with customer expectations and to predict and measure the capability in schedule, effort, and quality (Murugappan and Keeni, 2003). Some of the IT service organizations have started exploring other concepts which would give them a firm basis to sustain process improvement and can be blended with their existing process improvement framework.

Lean is an evolving concept and many researchers have studied the principles and practices of lean from their research perspectives. Although lean concepts originated in a manufacturing environment, its principles have universal applicability

(Sousa and Voss, 2001). Lean has moved to sectors other than manufacturing, for example, with applications of lean at hospitals, within administrations and in in-service organizations (Piercy and Rich, 2009; Abdi *et al.*, 2006; Atkinson, 2004; Swank, 2003). In recent years, some organizations have sought to apply lean manufacturing principles to software development related operations (Middleton, 2001; Poppendieck and Poppendieck, 2003; Schutta, 2005). Staats *et al.* (2010) examined the applicability of lean to knowledge work by investigating the implementation of a lean production system in an Indian software services firm.

Toyota's sustained success is credited due to their persistent and pervasive application of the lean principles to their manufacturing and management systems (Hino, 2006; Liker, 2004). Besides Toyota, many other instances of successful lean implementation studies can be found in the literature-some of these studies are empirically evaluated (Krafcik, 1988; Womack *et al.*, 1990; Womack and Jones, 1994; Womack and Jones, 1996; Spear and Bowen, 1999) and others are anecdotal (Ahls, 2001; Alavi, 2003).

However, the literature also contains instances of unsuccessful lean implementation-some of these studies are empirically evaluated (Womack and Jones, 1994; Bamber and Dale, 2000; Emiliani, 2001) and others are anecdotal (Parks, 2002; Stamm, 2004). Lean implementation is not just about application of a set of tools but it is about application of systematic methods and principles of lean (Spear and Bowen, 1999). These contrast results indicate that lean implementation a complex process where the critical success factors (CSFs) in the implementation of lean must be recognized.

It is important to develop an understanding of the factors that are critical to the successful implementation of lean principles and practices. The identification of critical success factors (CSFs) will also

encourage consideration in developing an appropriate implementation plan (Mann and Kehoe, 1995).

As with lean implementation in manufacturing enterprises, there are certain key factors which will determine the ultimate success of lean implementation in IT support service environment.

This paper therefore seeks to identify the factors which are critical for the successful implementation of lean principles in IT support services.

At first, the paper compares and reviews the existing CSFs proposed by various researchers. Then an analysis is conducted to identify their possible weaknesses and deficiencies, which could be further improved. By combining these factors, the authors then propose a set of CSFs for lean implementation, which is believed to be more suitable for IT support service organizations.

## 2. CRITICAL SUCCESS FACTORS

In the Information Systems (IS) literature, the concept of success factors is well established for numerous contexts, for example, requirements analysis (Rockart, 1979), IS planning (Bullen and Rockart, 1981), and project management (Schultz *et al.*, 1987).

Rockart (1979) has defined the CSFs as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization". Critical success factors are crucial to the success of a program, and if the objectives associated with these factors are not achieved, the application program will also lead to failure (Rockart, 1979). According to Boynton and Zmud (1984), the CSFs are "those few things that must go well to ensure success". The CSFs are the actions and processes that can be controlled by the management to achieve the organization's goals (Brotherton and Shaw, 1996).

Any improvement initiative means high expenditure, investment (Ranjan and Bhatnagar, 2008) and high risk (Umble *et al.*, 2003) for an organization. So it is important to identify the factors that can determine the success of the implementation and avoid the risk of failure. If these CSFs are not emphasized, not only there could be a significant difference in the success gained, but also losses in terms of effort, time and money (Coronado and Antony, 2002). The critical success factors are essential parts that must be addressed by management or the manager to ensure that 'things must go right' for a project or activity to achieve management objectives and business growth. In the context of Six Sigma project implementation, CSFs represent the essential ingredients without which the implementation stands little chance of success.

### 3. IDENTIFYING CRITICAL SUCCESS FACTORS FOR LEAN IMPLEMENTATION

A number of researchers have considered the role of the CSFs in lean implementation.

Achanga *et al.* (2006) identified four factors that are critical for the implementation of Lean Manufacturing within SMEs. The factors are: Leadership and Management, Financial Capability, Skills and Expertise and Organizational Culture.

Sua' rez-Barraza and Ramis-Pujol (2010) identified various enablers and inhibitors during the implementation of lean-kaizen in a Mexican Public service organization. The enablers and inhibitors are as follows.

Enablers:

- Commitment to and wish for improvement
- Clear resolve to improve
- Focus on the simple and practical
- Active leadership

- The service is outcome /customer/stakeholder-oriented
- Holistic and transversal thinking
- Establishing a system for measuring service process performance
- Effective implementation of best HRM practices

Inhibitors:

- A "classical bureaucratic mode" organizational structure, creating "small fiefdoms."
- The influence of trade unions with little interest in change and/or improvement.
- Resistance to change by employees who enjoy their own quota of power (influenced by the trade union) and their own way of doing things in the HRO sections (a legacy of the approach of this kind of area).
- A lack of sound professional training in Lean-Kaizen techniques and tools.
- A lack of credibility of certain middle management, with these efforts viewed as imposed by a management group in power or as a passing fad.
- Excess regulation can block thinking about improvement and quality of services.
- Resistance to generating measurement actions as a result of a deficient or non-existent measurement "culture" in terms of service processes performance.
- The lack of a strong link between Lean-Kaizen efforts and the HRM best practices required to consolidate them.

According to Scherrer-Rathje *et al.* (2009), lean implementation success depends on: the evidence of management commitment to, and involvement in, the lean effort; employee autonomy to make decisions regarding business process changes; information transparency of lean goals; and evidence of initial performance improvements and long-term sustainability of lean efforts. The six lessons for lean implementation success are:

- Lean will not succeed without visible management commitment

- Develop formal mechanisms to encourage and enable autonomy
- Openly disclose mid-to long-term lean goals
- Ensure mechanisms are in place for the long-term sustainability of lean
- Communicate lean wins from the outset
- Continual evaluation during the lean effort is critical

Cheng *et al.* (2011) identified the resistance types as: Resistance to power loss, new routines, equity change and status quo bias.

An analysis of research literature by Skrudupaite and Jucevicius (2011) revealed the following key factors of success in the management of SPS implementation process: business plan and vision; top-management support (including funding); project management (including project champion and teamwork and composition); change management, organizational culture; effective communication, education and training, knowledge transfer, knowledge management (including skills and expertise); organizational structure; monitoring and evaluation of performance: performance measurements.

Kumar *et al.* (2009) identified the importance of the following critical success factors within SMEs implementing lean or Six Sigma: Management involvement and commitment; Communication; Link quality improvement to employee; Culture change; Education and training; Link quality improvement to customer; Project selection; Link quality improvement to business; Link quality improvement to supplier; Project management skill; Organization infrastructure; Vision and plan; IT and innovation.

Crute *et al.* (2003) considered five factors significant for lean implementation: Change strategy targeted and holistic; Effects of company culture; Product focus; Senior management commitment; Timing for performance improvements.

According to Czabke *et al.* (2008), three factors are great importance for the

successful Lean implementation. These factors are: Communicating the vision of the new initiative at every organizational level; Necessary change in the organizational culture; Consequently following the new practices and principles.

Kettinger and Grover (1995) as cited in (Motwani, 2003) points out that any significant process change requires the following success factors: Strategic initiative of top managers acting as leaders in defining and communicating the vision of change; Willingness to learn; Culture readiness; Balanced network relationships; Knowledge sharing; Prescribed process management and change management practices.

Mefford (2009) identified the following four essential components for successful implementation of lean: Belief in the new program that it will work; Commitment for implementing it from managers; Involvement of the whole organization – employees, resources; Patience and long term view for the results.

According to Pedersen and Huniche (2011), the following factors are important for lean implementation: Goals and values; Complexity and importance; Balance of power; and resources and capabilities.

According to Sim and Rogers (2009), the lean implementation problem lies primarily with an aging and high seniority hourly workforce and a lack of committed leadership at this research site.

Grove *et al.* (2010) identified the challenges faced during a lean implementation in a health service environment. These were: high process variability; a lack of understanding of lean; poor communication and leadership; target focused; problems defining waste; and difficulty in determining the customers and the value from customer's perspective.

The barriers to lean implementation could be overcome with upfront planning, transformational leadership, excellent communication, identification and sharing of best practice and, above all, a shared vision.

Henderson and Evans (2000) listed

seven components of successful Six Sigma implementation as upper management support, organizational infrastructure (OI), training, tools, link to human resource-based actions, measurement system, and information technology infrastructure.

Antony and Fregusson (2004) pointed out ten critical success factors for software industries from a pilot study, these are leadership engagement and uncompromising commitment of top management, supporting OI, cultural change, Six Sigma training, linking Six Sigma to business strategy, accountability, customer involvement, understanding of Six Sigma methodology, project management, project prioritization, and selection. The findings from the same study also show that the most critical success factors are leadership engagement and uncompromising commitment of top management, cultural change, linking Six Sigma to business strategy, and customer involvement.

Bhasin (2011), found the following barriers to lean implementation: Need to convince shareholders/owners; Insufficient external funding; Insufficient internal funding; Insufficient understanding of the potential benefits; Cost of investment; Cultural issues; Insufficient management time; Insufficient skills to implement lean; Employee attitude/resistance to change; Insufficient supervisory skills to implement lean.

In this paper, we have compared and reviewed the existing CSFs proposed by various researchers in the literature. Based on the review, we have found that some of the CSFs are consistently identified and which have relevance to the implementation of lean principles. Such CSFs could therefore also be relevant to measuring the degree of success of lean implementation in IT support services.

We have proposed a set of CSFs for lean implementation, which is believed to be more relevant to the IT support services sector. Each of the proposed CSFs is discussed below.

#### 4. PROPOSED CSFS FOR LEAN IMPLEMENTATION IN IT SERVICES SECTOR

The literature reviews reveals that different sets of CSFs have been put forward by different researchers. However, these CSFs can possibly be grouped into a number of generic factors. These are common in lean implementation in different organizations and therefore, these CSFs are also believed to be applicable to IT services sector.

However, one should also consider the needs and situations of IT support services sector when developing CSFs for them. There are some distinctive issues that require considerable attention in the IT support services sector. In order to address these issues and to compensate for the drawbacks of previous studies, new factors should be introduced. By integrating the common factors and introducing some new ones, the authors have proposed a more comprehensive model of CSFs for implementing lean in IT support services sector.

The proposed CSFs are:

- *Management leadership*
- *Management support*
- *Top management commitment*
- *Organizational Culture*
- *Communication*
- *Training and Skill Building*
- *Financial Capability*
- *Measurement Framework*

This proposition is the result of a systematic effort that identifies the factors in a holistic, integrative and comprehensive manner. Having proposed the CSFs for lean implementation in IT support services, the next section will discuss each of them in detail.

#### 5. DISCUSSION

The majority of the CSFs identified is general in nature and accordingly can be

used by any IT support services organization, regardless of its size, or type of IT support services.

These are presented below:

### 5.1 Management leadership

Top management leadership has been identified as the most crucial and important success factor in lean implementation (Achanga *et al.*, 2006; Sua´rez-Barraza and Ramis-Pujol, 2010; Scherrer-Rathje *et al.*, 2009; Kumar *et al.*, 2009; Crute *et al.*, 2003; Mefford, 2009). The following are crucial traits of management leadership.

- Demonstrate active leadership style (Sua´rez-Barraza and Ramis-Pujol, 2010) by acting as role models to exemplify the desired behaviour for lean implementation
- Take initiative in defining and communicating the vision of change (Kettinger and Grover, 1995; Czabke *et al.*, 2008)
- Set goals and define values (Pedersen and Huniche, 2011)
- Change of the mindset by accepting that a lot of learning has to be done at all levels, including themselves (Kettinger and Grover, 1995)
- Communicate the vision of the new initiative at every organizational level (Grove *et al.*, 2010)
- Communicate the importance of lean to the employees
- Steer the change initiatives
- Should have the ability to operate in diverse environments.

Good leadership fosters effective skills and knowledge enhancement amongst its workforce (Achanga *et al.*, 2006). It is vital that leaders model their behaviour and actions through deeds, not just words. By doing so, they can further influence other employees to imitate them and increase the propensity of employees to participate in lean implementation. In essence, leaders establish the necessary conditions for effective lean implementation.

### 5.2 Management support

Top management support is another crucial and important success factor in lean implementation (Achanga *et al.*, 2006; Sua´rez-Barraza and Ramis-Pujol, 2010; Scherrer-Rathje *et al.*, 2009; Kumar *et al.*, 2009; Crute *et al.*, 2003; Mefford, 2009). Management support is required to:

- Establish a system for measuring service process performance (Sua´rez-Barraza and Ramis-Pujol, 2010)
- Ensure and support proper planning for implementation of lean initiative prior to its implementation (Hayes, 2000).
- Provide adequate resources and funding (Bhasin, 2011; Pedersen and Huniche, 2011)
- Ensure mechanisms are in place for the long-term sustainability of lean (Scherrer-Rathje *et al.*, 2009)
- Develop formal mechanisms to encourage and enable autonomy (Scherrer-Rathje *et al.*, 2009)
- Establish and use prescribed process management and change management practices (Kettinger and Grover, 1995)
- Consequently following the new practices and principles (Czabke *et al.*, 2008)
- Bring in necessary change in the organizational culture (Czabke *et al.*, 2008)
- Establish mechanism for waste identification and removal (Grove *et al.*, 2010).

Top management leadership and support is vital in ensuring organization-wide awareness and understanding of IT support service issues and commitment to the implementation of the lean principles.

### 5.3 Top management commitment

Management involvement and commitment are the most essential prerequisites in aiding any of the desired productivity improvement initiatives (Antony and Banuelas, 2001; Coronado and

Antony, 2002; Eckes, 2000; Henderson and Evans, 2000).

- Demonstrate visible management commitment (Scherrer-Rathje *et al.*, 2009)
- Provide adequate top management time (Bhasin, 2011)
- Should have patience and take long term view for the results (Mefford, 2009)
- Should show clear resolve to improve (Sua´rez-Barraza and Ramis-Pujol, 2010)
- Openly disclose mid- to long-term lean goals (Scherrer-Rathje *et al.*, 2009)
- Communicate lean wins from the outset (Scherrer-Rathje *et al.*, 2009)
- Continual evaluation during the lean effort is critical (Scherrer-Rathje *et al.*, 2009)
- Should give greater efforts in encouraging all employees for change by introducing the importance of Lean concept (Atkinson, 2004; Boyer and Sovilla, 2003, cited in Worley and Doolen, 2006).
- Give support to low level employees and convey consistent information about lean (Crute *et al.*, 2003).
- Communicate consistent information about lean (Crute *et al.*, 2003)
- Get buy-in and commitment from managers and employees (Bicheno, 2004; Chalice, 2007; Graban, 2009; Tapping and Shuker, 2005; Zidel, 2007; Radnor *et al.*, 2006)

To succeed in Lean implementation, a committed management is necessary to give support to the organizations. Organizations should be aware that lean cannot be implemented overnight. There is a need to work continuously to reduce waste and increase commitments by looking at opportunities and limitations. An example is Toyota that implemented Lean in 1950s and still continues to reduce waste.

## 5.4 Organizational Culture

Organisational culture is another imperative factor for successful lean implementation (Achanga *et al.*, 2006; Sua´rez-Barraza and Ramis-Pujol, 2010; Skrudupaite and Jucevicius, 2011; Kumar *et al.*, 2009; Crute *et al.*, 2003; Czabke *et al.*, 2008; Kettinger and Grover, 1995; Antony and Fregusson, 2004; Bhasin, 2011).

Organization culture defines the core beliefs, values, norms and social customs that govern the way individuals act and behave in an organization. Goh (2002) asserted that a collaborative culture is an important condition for knowledge transfer to happen between individuals and groups.

- Bring in necessary changes to the organization culture (Kumar *et al.*, 2009, Czabke *et al.*, 2008)
  - Change from “classical bureaucratic mode” organizational structure, creating “small fiefdoms.” (Sua´rez-Barraza and Ramis-Pujol, 2010)
- Create a culture that promotes knowledge sharing and creation (Kettinger and Grover, 1995)
  - Establish a collaborative culture for effective knowledge transfer between individuals and groups (Goh, 2002)
- Ensure organization culture is ready for lean initiative (Kettinger and Grover, 1995)
- Address cultural issues (Bhasin, 2011)
  - Resistance to generating measurement actions as a result of a deficient or non-existent measurement “culture” in terms of service processes performance (Sua´rez-Barraza and Ramis-Pujol, 2010)
- Ensure balance of power between different functions/departments

The creation of a supportive organizational culture is an essential platform for the implementation of lean manufacturing. High-performing companies are those with a culture of sustainable and

proactive improvement. The investigation has clearly indicated that it is highly desirable to have some degree of communication skills, long-term focus and strategic team while intending to implement any new initiative (Achanga *et al.*, 2006).

Power relationships also affect the implementation of the lean projects (Pedersen and Huniche, 2011). If organization members who resist lean hold formal and informal power in the organization, it will become very difficult to generate the desired improvements and culture change (Womack and Jones, 2003).

### 5.5 Communication

Effective communication plays an essential role for Continuous improvement (CI) initiatives' maintenance and effectiveness. Communication is an important factor in successful lean implementation (Kumar *et al.*, 2009). Every new initiative needs to have a clear relationship to the company's mission and goals (Sim and Rogers, 2009). The following are important elements of communication.

- Communicate lean wins from the outset (Scherrer-Rathje *et al.*, 2009)
- Communicating the vision of the new initiative at every organizational level (Czabke *et al.*, 2008)
- Establish mechanism for capturing feedback from employees to top management for process improvement (Cotte *et al.*, 2008).
- Establish communication between all value streams (Atkinson, 2004; Worley and Doolen, 2006)
- Establish clear communication between customers and suppliers (Spear and Bowen, 1999)
- Establish communication between employees, as well as within the management and employees

### 5.6 Training and Skill Building

Training and education is very crucial

for lean implementation success (Kumar *et al.*, 2009). It is because some of the lean tools and techniques in the application process require employee skills and expertise. Moreover, low level employee skills would not harness the desire for technology development (Arhanga *et al.*, 2006).

- Provide training on lean tools and techniques (Sua´rez-Barraza and Ramis-Pujol, 2010)
- Provide training to the workforce for lean implementation (Bhasin, 2011)
- Provide training to build supervisory skills for lean implementation (Bhasin, 2011)
- Provide training to develop problem solving capability

### 5.7 Financial Capability

Financial capacity is a crucial factor which determines the success of a new process improvement initiative. Finance covers the avenues through which other useful provisions like consultancy and training can be made. Adequate finance is must for the adoption and subsequent implementation of successful lean manufacturing. Finance is required for training and skill building. Productivity improvement initiative like lean would require financial resources to hire consultants, as well as to aid the actual implementation of such ideas (Achanga *et al.*, 2006).

- Provide adequate resources and funding (Bhasin, 2011; Pedersen and Huniche, 2011).

### 5.8 Measurement Framework

Measurement acts like a data collection system that gives useful information about a particular situation or activity. An initiative like lean will suffer the risk of becoming just another management fad, if it is left unmeasured.

Measurement enables organizations to

track the progress of lean implementation and to determine its benefits and effectiveness. Essentially, it provides a basis for organizations to evaluate, compare, control and improve upon the performance. Measurement is also needed to demonstrate the value and worthiness of a lean initiative to management and stakeholders. Without such evidence, support and confidence from top management to sustain it will diminish.

- Establish measurement system, and information technology infrastructure (Henderson and Evans, 2000)
- Establish a system for measuring service process performance (Sua´rez-Barraza and Ramis-Pujol, 2010)
  - Monitor and evaluate performance (Worley and Doolen, 2006).

## 6. CONCLUSIONS

Successful lean implementation is governed and facilitated by certain crucial factors. A thorough understanding of these crucial factors will benefit the organizations who would like to implement lean principles. Considerable care must be taken in the development of CSFs for lean implementation in IT support services sector. In case an organization adopts factors that are not suitable, it may impede the achievement of the desired performance.

To date, CSFs for implementing lean

principles in the IT support services sector have not been systematically examined and investigated. Most of the existing studies have derived their set of CSFs from manufacturing perspective. Thus, they have not really been designed to meet the needs of IT support services sector.

This study has proposed a set of CSFs which is believed to be more appropriate for IT support services sector. It has improved on initial studies by integrating insights and ideas drawn from lean implementation in manufacturing and other service sectors. It has also considered CSFs for other process improvement initiatives in IT sector.

Our study is probably the first to provide an integrative perspective of CSFs for implementing lean principles in the IT support services sector. The set of CSFs proposed is in itself important because it can act as a list of items for IT support services organizations to address and deal with when accomplishing lean implementation. This would help to ensure that essential issues and factors are covered when they are planning implementation of lean principles.

Essentially, this study can be employed as a base for further empirical research. In the future, the authors intend to conduct a survey by involving the group of academics, consultants and practitioners to further investigate and validate the CSFs. The findings and results of this survey will be the subject of discussion in a future paper.

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