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## Leadership characteristics for Lean Six Sigma

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In this paper, we explore the relation between Leadership and Lean Six Sigma deployment in organisations: as leadership has been identified as a critical success factor for Lean Six Sigma deployment in organisations, this paper sets out to determine the characteristics of leadership that are more conducive to a successful implementation. Qualitative analysis of semi-structured interviews provided insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments, allowing the identification of 10 leadership characteristics more conducive to success in Lean Six Sigma deployments: visible, communicative, inspirational, consistent, targeted, leading by example, flexible, perceive Lean Six Sigma as a philosophy, clearly define roles and responsibilities, and able to build. A leadership dependency model, connecting leadership to company size and industry sector, was also developed: the more people centred and service centred the sector, and the smaller the company, the greater the need for strong leadership to successfully implement Lean Six Sigma in participating organisations.

**Keywords:** Lean; Six Sigma; Leadership

### 1. Introduction

This article presents the qualitative findings that form part of a mixed-method study exploring the concept of organisational leadership in the context of Lean Six Sigma deployments across a variety of business organisations, focusing in particular on possible relationships between leadership approaches during the implementation and sustaining phases of Lean Six Sigma, and levels of success in the deployments.

Although leadership is often mentioned as an important factor for the deployment of continuous improvement programmes (Hahn, Hill, Hoerl, & Zinkgraf, 1999; Achanga, Shehab, Roy, & Nelder, 2006; Pande, 2007; Laureani & Antony, 2012), the specific traits needed to lead a continuous improvement programme have not been defined: this study attempts to go further than previous studies, determining what exactly are the leadership traits and characteristics more conducive to a successful deployment of Lean Six Sigma in organisations.

Following participation in the online survey that formed the quantitative element of the research, not covered in this article, 21 survey respondents accepted to participate in the one-to-one telephone interviews that formed the qualitative dimension of the study, and the subject of this paper, studying the relationship between leadership approaches during the implementation and sustaining phases of Lean Six Sigma programmes and success levels in deployments across a variety of organisational settings.

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Qualitative analysis of these recorded discussions yielded five general themes, and further analyses, involving cross-comparisons between the qualitative and quantitative data sets, yielded rich results that, combined, provide insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments, and also patterns or trends in this relationship according to the profiles of participating organisations.

Lean Six Sigma implementation is fraught with problems (Gijo & Rao, 2005; Grima, Marco-Almagro, Santiago, & Tort-Martorell, 2014) and there are many examples of both successful and unsuccessful deployment in organisations: there is increasing concern about implementation failures (Chakravorty, 2009), and various critical success factors (CSFs) (Rungasamy, Antony, & Ghosh, 2002) have been identified and discussed in the literature.

Previous studies have identified the CSFs for Lean Six Sigma deployment (Hahn et al., 1999; Antony & Banuelas, 2002; Coronado & Antony, 2002; Kwak & Anbari, 2006; Antony, Antony, Kumar, & Byung, 2007; Hilton, Balla, & Sohal, 2008; Moosa & Sajid, 2010; Laureani & Antony, 2012); this study focuses specifically on leadership, determining what it takes to lead a Lean Six Sigma programme, outlining the characteristics leaders must have to facilitate Lean Six Sigma deployment. This would be of particular interest to organisations about to embark on the Lean Six Sigma journey, helping them to assess whether they have the right leadership in place.

## 2. Literature review

### 2.1. *Lean Six Sigma*

Lean Six Sigma is a business improvement methodology that aims to maximise shareholder value by improving quality, speed, customer satisfaction, and costs: it achieves this by merging tools and principles from both Lean and Six Sigma. It has been widely adopted in manufacturing and service industries, and its success in some well-known organisations (e.g. GE and Motorola) has created a copycat phenomenon, with many organisations around the world wishing to replicate its success.

Lean and Six Sigma have followed independent paths since the 1980s, when the terms were first hard-coded and defined: the first applications of Lean were recorded in the Michigan plants of Ford in 1913, and were then developed to mastery in Japan (within the Toyota production system), while Six Sigma saw the light in the USA (at the Motorola Research Centre). Lean is a process improvement methodology used to deliver products and services better, faster, and at lower cost. Womack and Jones (1996) defined it as:

a way to specify value, line up value-creating actions in the best sequence, conduct those activities without interruption whenever someone requests them, and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more and more with less and less – less human effort, less human equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want.

Six Sigma is a data-driven process improvement methodology used to achieve stable and predictable process results by reducing process variations and defects. Snee (1999, p. 100) defined it as: 'a business strategy that seeks to identify and eliminate causes of errors or defects or failures in business processes by focusing on outputs that are critical to customers'. Despite different origins, Lean and Six Sigma share some commonalities, such as an emphasis on a culture of continuous improvement, customer satisfaction, comprehensive employee involvement, and search for root causes.

While both Lean and Six Sigma have been used for many years, they were not integrated until the late 1990s and early 2000s (George, 2002, 2003), and today Lean Six Sigma is recognised as ‘a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottom line results’ (Snee, 2010, p. 9). Lean Six Sigma uses tools from both toolboxes in order to get the best from the two methodologies, increasing speed while also increasing accuracy.

## 2.2. Leadership

Leadership definitions abound in the literature, with the 10 most common leadership styles defined as follows:

*5-Level*: the Level 5 leader sits on top of a hierarchy of capabilities and builds enduring company greatness through a paradoxical combination of personal humility plus professional will (Collins, 2001).

*Affiliative*: a leadership style where the leader promotes harmony among his or her followers and helps to solve any conflict. This type of leader will also build teams, making sure that their followers feel connected to each other. Typically, the followers will receive much praise from this style of leader; however, poor performance tends to go unchecked (Goleman, Boyatzis, & McKee, 2002).

*Bureaucratic*: a style of leadership that emphasises procedures and historical methods regardless of their usefulness in changing environments. Bureaucratic leaders attempt to solve problems by adding layers of control, and their power comes from controlling the flow of information (Weber, 1905).

*Participative*: also known as Democratic style, the leader involves subordinates in goal-setting, problem-solving, team-building, etc., but retains the final decision-making authority (Lewin, Lippitt, & White, 1939).

*Servant*: stresses the importance of the role a leader plays as the steward of the resources of a business or other organisations, and teaches leaders to serve others while still achieving the goals set forth by the business (Greenleaf, 1977).

*Six Sigma Leader*: advocates higher standard of leadership effectiveness through the foundational principles of Six Sigma, and is a model anyone can aspire to regardless of whether the company uses Six Sigma or not (Pande, 2007).

*Transactional*: based on the setting of clear objectives and goals for the followers as well as the use of either punishments or rewards in order to encourage compliance with these goals (Burns, 1978).

*Transcendent*: grounded in servant leadership, transcendent offers a pathway to increased trust necessary for global sustainability, offering a more inclusive and consensual decision-making process for the economic, social, and environmental sectors, moving beyond a singular focus on the bottom line of profits to a multiple focus on the triple bottom lines of profits, people, and planet (Gardiner, 2006).

*Transformational*: style of leadership in which the leader identifies the needed change, creates a vision to guide the change through inspiration, and executes the change with the commitment of the members of the group (Bass, 1990).

*Visionary*: leaders articulate where a group is going, but not how it will get there – setting people free to innovate, experiment, and take calculated risks (Goleman et al., 2002).

The importance of leadership has often been emphasised by writers in the continuous improvement field (Waldman, 1993; Dean & Bowen, 1994; Deming, 1994), and research

has showed that effective leaders have distinctive traits that are a prerequisite for individuals who want to become effective leaders (Kirkpatrick & Locke, 1991).

Lean Six Sigma has been extremely successful in some organisations, where it is no longer only a cost-reduction initiative, but has also been embedded into the organisation's way of doing things: more well-known examples are probably Toyota for Lean (Liker, 2003) and GE for Six Sigma (Eckes, 2000).

However, many other organisations have been and are struggling to turn Lean Six Sigma into a success, due to different failure factors (Albliwi, Antony, Halim Lim, & van der Wiele, 2014); and given that leadership has been identified as a CSF (Hahn et al., 1999; Pande, Neuman, & Cavanagh, 2000; Achanga et al., 2006), we now turn to investigate specifically which leadership traits and characteristics are more conducive to a successful implementation of Lean Six Sigma in organisations.

### 3. Methodology

This study is based on 21 one-to-one telephone interviews with Lean Six Sigma practitioners; the recorded telephone conversations were transcribed and their content was qualitatively analysed.

The methodology adopted by this study is in the realm of qualitative research, based on a phenomenological position; it does not commence with a prior hypothesis to be tested and proved but with an inductive approach to data analysis, where research outcomes are not broad generalisations but contextual findings: 'words are the way that most people come to understand their situations; we create our world with words; we explain ourselves with words; we defend and hide ourselves with words' (Maykut & Morehouse, 1994, p. 18).

#### 3.1. *Constant comparative method*

While qualitative research is not given to mathematical abstractions, it is, nonetheless, systematic in its approach to data collection and analysis: in analysing data generated in this format, responses are not grouped according to predefined categories; rather, salient categories of meaning and relationships between categories are derived from the data itself through a process of inductive reasoning.

Constant comparative methods have been used in this study; this involves breaking down the data into discrete 'incidents' (Glaser & Strauss, 1967) or 'units' (Lincoln & Guba, 1985) and coding them into categories.

Categories arising from this method generally take two forms: those that are derived from the participants' customs and language, and those that the researcher identifies as significant to the project's focus of inquiry; the goal of the former 'is to reconstruct the categories used by subjects to conceptualise their own experiences and world view', while the goal of the latter is to assist the researcher in developing theoretical insights into the social processes operative in the site under study; thus, 'the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories' (Lincoln & Guba, 1985, pp. 334–341). As Taylor and Bogdan (1984) summarise:

in the constant comparative method the researcher simultaneously codes and analyses data in order to develop concepts; by continually comparing specific incidents in the data, the researcher refines these concepts, identifies their properties, explores their relationships to one another, and integrates them into a coherent explanatory model. (p. 126)

The coding was conducted using the qualitative data analysis software NVivo 10 with the help of consultancy QDATraining Limited in the running of queries and reports from NVivo.

The stages and processes of qualitative analysis from Braun and Clarke (2006) were adopted, as described in Table 1.

#### 4. Interviews analysis

The quantitative element of the study was centred around a questionnaire distributed electronically to 600 Lean Six Sigma professionals, from various industries and countries; the list of companies was obtained from the database of the Department of Design, Manufacturing, and Engineering Management of Strathclyde University, plus a network of the professional contacts of the research team. The response rate was 20.5%, with 123 responses received; the questionnaire was targeted to those organisations, irrespective of the industry sector, that have already implemented either Lean or Six Sigma, or Lean Six Sigma.

Of the 123 respondents to the survey, 21 agreed to a follow-up interview; semi-structured interviews were conducted over the phone and the questions asked are illustrated in Appendix. The recorded telephone conversations were transcribed and their content was qualitatively analysed, through coding using NVivo software. Further analyses, involving cross-comparisons across the quantitative and qualitative data sets, yielded rich results that provide insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments.

From data analysis following the interviews, five themes emerged on leadership for Lean Six Sigma:

- communication,
- employee motivation,
- leadership style,
- programme(s) deployed, and
- training.

During analysis of participants' responses coded to these five top-level topics or themes, a number of themes and sub-themes emerged and matrices were used to cross-reference the five major themes against discrete variables, such as size, location and sector of company, and perception of success for the Lean Six Sigma deployment.

The next paragraphs explore each of the five emerging themes.

##### 4.1. Communication

In analysing participants' comments during telephone discussions on the broad theme of communication, the category 'practices for engaging the workforce, achieving buy-in' emerged as the dominant theme under this topic, with four subcategories or themes identified as follows:

- communication systems and structures;
- widespread basic training, awareness-raising;
- events, conferences, lunch, and learn; and
- create conditions for employee mobility.

Table 1. Analytical hierarchy to data analysis (adapted from Braun & Clarke, 2006).

Analytical process	Practical application in NVivo	Strategic objective	Iterative process throughout analysis	
(1) Familiarising yourself with the data	Transcribing data (if necessary), reading and rereading the data, noting down initial ideas Import data into the NVivo data management tool	Data Management ( <i>Open and hierarchal coding through NINVO</i> )	Assigning data to refined concepts to portray meaning	
(2) Generating initial codes:	Phase 2 – Open Coding- Coding interesting features of the data in a systematic fashion across the entire data set, collecting data relevant to each code		Refining and distilling more abstract concepts	
(3) Searching for themes:	Phase 3 – Categorisation of Codes – Collating codes into potential themes, gathering all data relevant to each potential theme		Assigning data to themes/concepts to portray meaning	
(4) Reviewing themes:	Phase 4 – Coding on – Checking if the themes work in relation to the coded extracts (level 1) and the entire data set (level 2), generating a thematic ‘map’ of the analysis		Assigning meaning	
(5) Defining and naming themes:	Phase 5 – Data Reduction – Ongoing analysis to refine the specifics of each theme, and the overall story [storylines] the analysis tells, generating clear definitions and names for each theme		Generating themes and concepts	
(6) Producing the report	Phase 6 – Generating Analytical Memos – Phase 7 – Testing and –Validating and Phase 8 Synthesising Analytical Memos. The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis		Explanatory Accounts ( <i>Extrapolating deeper meaning, drafting summary statements and analytical memos through NVIVO</i> )	

Table 2. Matrix of coding pattern between communication and success of LSS.

Communications × Success	Extremely successful	Successful	Not Significant	Negative
Practices for engaging workforce, achieving buy-in	12	30	19	2
Communication systems + Structures	7	15	9	1
Create conditions for employee mobility	0	2	4	0
Events, conferences, lunch, and learn	1	4	2	0
Widespread basic training, awareness-raising	5	10	5	1

When it came to the use of practices for engaging the workforce, there were twice as many mentions of communication, and its importance, coming from those participants who perceived success or extreme success emanating from deploying Lean Six Sigma across all codes in this theme; this suggested a significantly more proactive approach to communications from participants who successfully deployed the programme (Table 2).

#### 4.1.1. *Communication systems and structures*

Establishing and utilising effective communication systems and structures emerged as the most talked about suggestion for good practice in engaging the workforce and achieving buy-in to improvement measures. Participants' comments suggested a need for both verbal and visual communication systems as mutually re-enforcing mechanisms for communicating the message.

The following comment points to the idea of senior management constantly reiterating the importance of improvement initiatives:

There is no substitute for visible leadership by the CEO. And what I mean by that is even if the senior executive cannot meet with individual employees regularly, they should be talking about the initiative virtually every time they give a speech or address employees or write a letter to the shareholders in the annual report. They should be communicating about this personally on a regular basis. (Participant 14)

While participants have strongly emphasised the vitally important role communication plays in engaging the workforce and achieving buy-in to improvement processes, Participant 21 cautioned against communicating too much, too soon, to too many, suggesting instead a more 'those-to-be-affected' basis for communicating the message. This 'those-to-be-affected' basis is not intentioned as an exclusionary approach, but rather as a caution against unduly raising widespread employee expectations that will not be immediately met, potentially leading to employee apathy in the longer term.

#### 4.1.2. *Widespread basic training, awareness-raising*

The idea of widespread basic training emerged as a theme in relation to practices for engaging the workforce and achieving buy-in to improvement initiatives. Participants talked about either having conducted or having plans to conduct basic training in Lean for existing employees:

Everybody in the company has received basic introductory training to Lean, one-day training to the whole company, and at this stage about ninety-eight per cent of the company I think have done that. (Participant 11)

#### 4.1.3. *Events, conferences, lunch, and learn*

Aside from acting as a means of giving recognition, some participants talked about events and conferences as a platform for showcasing success stories, and thereby raising awareness and generating enthusiasm for improvements across the wider employee base:

I think when somebody sees the before and after in a well-run, well-executed, Six Sigma black belt, green belt premier event, they immediately buy into that. I mean most of the time, the persons buy into that and they want to, people want to do a type of event to any problem that they see, basically, because they get into that engagement so far, so strong. (Participant 1)

#### 4.1.4. *Create conditions for employee mobility*

Finally, creating conditions for employee mobility and career development opportunities were also cited as potential means of engaging the workforce and achieving buy-in to improvement processes, as exemplified in the following comment:

I think when you're in the role it's important that you're in the role full-time, but I do agree as well that there's a lot of benefit in putting somebody into that role maybe for six months or for a year and then translating them back out again into an operational quality role. Moving people through that cycle is a very good career development opportunity, it also keeps them fresh, it keeps them current and it allows you a mechanism to develop other people in the future. So very good if it's built into career development for supervisor, management development, technical roles; and it doesn't have to be purely operational, that could be, you know, HR people, finance, they'd all benefit from something like that. (Participant 9)

### 4.2. *Employee motivation*

In analysing participants' comments during telephone discussions on the theme of employee motivation, the category 'reward systems' emerged as the dominant theme under this topic, with two subcategories or themes, identified as Non-Financial Rewards and Financial Rewards.

Interestingly, participants who deemed Lean Six Sigma to be successful in their organisation mostly spoke about non-financial rewards, while those who felt the deployment was not particularly successful talked of both financial and non-financial rewards.

### 4.3. *Leadership style*

In analysing participants' comments during telephone discussions on the theme of leadership style, a category entitled 'differing approaches according to ...' emerged as a catch-all working title for housing participants' articulated experiences and perspectives on the relationship between leadership approaches and success levels of deployment. Seven subcategories or themes were identified:

- hierarchical roles, responsibilities, and relations;
- leadership perceptions of Lean Six Sigma;
- stage of programme;
- programme option;
- organisation size and culture;
- resources available; and
- external forces.

Table 3. Matrix of coding pattern between leadership style and company size.

Leadership style × Company size	<250	250–500	501–1000	>1000
Differing Approaches according to contextual factors	35	6	33	2
External forces	0	0	1	0
Hierarchical roles, responsibilities, relations	13	1	21	2
Leadership perceptions of Lean Six Sigma	14	1	4	0
Organisation size and culture	3	0	0	0
Programme option	2	1	3	0
Resources available	2	1	0	0
Stage of programme	6	2	4	0

Themes and issues relating to leadership style were significantly more talked about by participants from small organisations, defined as having fewer than 1000 employees, than by participants who hailed from larger organisations (Table 3). Also, there was a clear pattern, with participants from retail and consumer service organisations talking significantly more about leadership style and related contextual factors, than participants from any other sector (Table 4).

#### 4.3.1. Hierarchical roles, responsibilities, and relations

Many of the participants pointed to the importance of these three Rs in the context of good leadership practice, meaning that clearly defined and understood roles and responsibilities at senior, middle, and junior management levels, and harmonious symbiotic relationships between these levels, form the linchpin of successful approaches in rolling out and sustaining Lean Six Sigma improvement programmes, and this premise is succinctly and best exemplified in the following comment made by Participant 10:

I think the top leadership sets the strategic priority and cascades their vision for Lean and Six Sigma throughout the organisation. It's the next level, the director, leader, and manager level, that translates that strategy into more operational and tactical goals for their department and their staff, so that everything is aligned, that they are supporting in the day-to-day, month-to-month activities of the department, teaching you to improve utilising your standardised methodology, supporting things at their level, both championing to their staff and referring things to the top, so that everything continues to be aligned and progressing in a common direction.

#### 4.3.2. Leadership perceptions of Lean Six Sigma

In analysing participant discussions on the theme of leadership style, how leadership perceives Lean Six Sigma emerged as another contextual factor impacting on deployments. Participant 16 drew a distinction between leadership perceptions of Lean Six Sigma merely as a toolkit for fixing problems, or, primarily as a philosophy, a way of thinking to be, over time, engrained into the workplace culture:

For me, it comes down to how the leaders of an organisation view Lean Six Sigma. If they view it as a collection of tools, methodologies and processes to solve a problem, when it becomes difficult those leaders will look for something else, they don't have faith in it. If you want a successful Lean Six Sigma implementation, it's vital that the leadership team believe that it is more than just a toolkit to solve problems, that they believe it's more than just a collection of methodologies and processes and ways of working, that actually there's a whole ethos, a whole mindset that they are potentially embarking on.

Overall, participants suggested that leadership fully understanding the principles and practices of Lean Six Sigma and leading by example is central to creating the ideal

Table 4. Matrix of coding pattern between leadership style and company sector.

Leadership style × Sector	Health Care	Pharmaceuticals & Biotechnology	Internet & Online	Retail & Consumer Services	Management	Government & Trade	Industrial Goods & Services	Financial Services	Electronics & Semiconductors
Differing approaches according to contextual factors	5	8	13	20	9	6	4	4	7
External forces	0	0	0	0	0	0	0	0	1
Hierarchical roles, responsibilities, relations	4	2	8	9	2	4	2	4	2
Leadership perceptions of Lean Six Sigma	1	2	2	8	4	0	1	0	1
Organisation size and culture	0	0	0	0	3	0	0	0	0
Programme option	0	1	1	2	0	2	0	0	0
Resources available	0	1	0	0	0	0	0	0	2
Stage of programme	0	2	2	6	0	0	1	0	1

conditions for success in deployments, and this suggestion is encapsulated in the following extract:

I mean first they have to believe in it themselves. I think they have to really be champions for Lean Six Sigma and I think they have to, to bring them forward, they have to basically live by those rules, not doing things ad hoc, spur of the moment making decisions. I think they have to really, where possible, try and actually tap the right channels that they're actually doing it that way, that their senior team are adopting this mindset. So I think it's a case of them casting the right shadow, them actually doing, making sure that their teams are fully trained in the disciplines and the tools and so on, so if they're doing it right within their teams, then that will actually grow into other parts of the organisation, but really making sure that they do it right themselves and then obviously then be able to share what they've actually done and follow it all the way through. I think that's the key to success there. (Participant 5)

#### 4.3.3. *Stage of programme*

In analysing participant discussions on the theme of leadership style, the idea that roll-out and sustainment phases require different forms of leadership emerged as another contextual factor impacting on deployments, and this is best articulated by Participant 3:

At the start of the programme I guess leaders are trying to generate some buy-in and some enthusiasm and, you know, provide a bit of a vision for the future, how things can be if people get involved in the programme and deliver some of the success. I think that's probably easier than when it comes later on to when you have to sustain it, because organisations these days are often already laden with regards to the resources that they have available to begin to work on some of these areas and because individuals probably already have quite a lot on their plate, it can be quite difficult to identify the time and the resources to sustain some of the improvements that are going on. So for the leadership that's required later on in the programme it's about not just falling back into firefighting mode and just dealing with the immediate needs of the organisation on a day-to-day basis but setting more of a longer-term view or vision for the organisation, and so that is a bit different from just generating enthusiasm at the start. You know, any programme will go through a cycle that normally you would start a programme with the high type of leadership that's required, and thereafter it's working through the lows and how to help people and support people and making sure that the whole thing just doesn't fall apart because immediate priorities can get in the way of longer-term views. So I do think that a little bit different leadership is required from the start and sustaining the programme.

#### 4.3.4. *Programme option*

The programme option emerged as another contextual factor considered by participants, and this factor is closely related to leadership perceptions and understanding of Lean Six Sigma principles and practices. Participant 2 suggested that differing approaches are required from senior leadership according to whether the organisation opts for Lean or for Six Sigma deployments. With the former option, senior management can delegate to line management, whereas with the latter, a much more responsible and comprehensive approach is required of them:

I think they're slightly different. If you look at more traditional Lean, traditional Lean is much more a frontline-focused approach with daily huddles and local . . . easy to improve things for elimination of waste, etc. Six Sigma always has as part of its roll-out deployment some form of strategic alignment, some form of ensuring that the projects being worked on are related to some important task for the company. So for Six-Sigma-related deployments, the senior executives are encouraged, strongly encouraged, to come up with a few high-level deployable priorities that are real clear with metrics and goals and compelling stories. And so much more

active involvement in, if you were going to separate Six Sigma from Lean, much more active involvement in Six Sigma. And then Lean, they tend to deploy, tell somebody go do Lean, and it's viewed as much more of a frontline activity. (Participant 2)

#### 4.3.5. *Organisation size and culture*

Organisation size and culture emerged as another contextual factor:

What we've found in organisations which are open and receptive to change, who want to embrace the true meaning of Lean Six Sigma, actually starting it up and having a hundred per cent employee engagement is vital for success. If there is a history of negativity, a history of problems, a history of 'we've been there, we've done it before', much better to start right at the bottom, do a little revolution somewhere out of the way, very quietly, under the radar, and then build momentum from there. So I see it very much as two different approaches. Now, those two approaches can work well in tandem in very large organisations where actually there's often a disconnect, you work for an enormous organisation and you might feel at times that there's a real disconnect between the top of the organisation and the bottom, and in those kinds of environments it can work very well to start a revolution right at the bottom and right at the top simultaneously. (Participant 16)

#### 4.3.6. *Resources available*

The level of resources available emerged as another contextual factor impacting on deployments, with participants stressing the importance of choosing projects for which adequate resources can be provided, in order to meet the twofold aim of both achieving success and generating exemplar projects, which can be showcased as a mechanism for keeping momentum in employee enthusiasm and commitment to improvement initiatives:

Now, when it comes to launching projects, they have to look at how much resources they've got, in other words the Six Sigma group, the Lean practitioners and the Six Sigma practitioners, how many resources do we have, and they have to take a vested interest in making sure that the right projects get launched. So in other words, it's all about prioritisation now, so leadership has to take an active role in making sure that the projects with the highest impact and the least amount of risk get launched, because you only have a finite number of resources and you have an infinite number of projects, leadership has to take an active role in making sure that the highest-impact, lowest-risk projects get launched and assigned the resources. (Participant 19)

#### 4.3.7. *External forces*

Participant 7 talked about the impact of external forces on deployment decisions, describing external factors, such as changing customer demands and economic environments, that forced change upon his organisation, but, however, with positive longer term outcomes:

Change is always difficult for people. So when you try and introduce anything, some employees think 'oh, it's just a new initiative, I've just got to wait long enough and we'll forget about it'. So a lot of people throughout the organisation have been reluctant to change but, you know, over the course of the last twelve, thirteen, maybe fourteen years, we've had various, you could almost say crises, that forced you to change. One of them was this initial one where a customer suddenly came to us and they wanted a lot of product very quickly and that's when I first learned about Lean, about how in principle we could respond to that kind of demand. And other times when, you know, we've had depressions and recessions and all sorts and you just have to reorganise and we found that going the Lean way has really helped every time. We've done some recent Lean improvements in our order entry, automating as much as possible order entry from regular customers, and everybody now is really positive about that.

Table 5. Matrix of coding pattern between programme(s) deployed and company size.

The programme(s) deployed × Company size	<250	250–500	501–1000	>1000
The programme(s) deployed	23	7	41	4
Language and terminology	4	3	5	1
Metrics for evaluating success of programme	5	1	8	2
Success factors in deployments	15	3	30	1
Addressing employee concerns	0	0	4	2
Building trust	0	0	4	1
Culture of acknowledging problems	3	1	2	0
Inclusive bonus structure	1	0	1	0
Leadership commitment	10	2	18	1

#### 4.4. The programmes deployed

On the theme of programmes deployed (Lean, Six Sigma, and Lean Six Sigma), three categories emerged under this topic: success factors in deployments, metrics for evaluating the success of the programme, and language/terminology used.

Issues relating to the programme(s) deployed, especially leadership commitment, were significantly more talked about by participants from smaller organisations, defined as having less than 1000 employees (Table 5), and by participants operating in retail and consumer services, Internet and online services, and healthcare (Table 6).

This is consistent with the findings of the previous section: just as participants from smaller and service-led companies talked more about leadership style than did participants from any other sector, so too, participants from these sector types and company size talked more about leadership commitment as a CSF in Lean Six Sigma deployments.

Coding patterns consistently support the outcome that participants from smaller, service-driven companies placed greater emphasis on leadership commitment in successfully deploying Lean Six Sigma in their respective organisations, as illustrated in Figure 1.

##### 4.4.1. Leadership commitment

In analysing participant comments on success factors in deployments, leadership commitment emerged as the most heavily coded category; that is, strong, supportive, and committed leadership was deemed by participants to be *the* most critical factor in ensuring success in deployments, supporting findings from the exploratory factor analysis of the survey responses, in which leadership was identified as a significant CSF.

Some participants offered concrete examples of how leaders might demonstrate commitment; for instance, when they are seen to be actively involved and participating in development programmes:

There is one critical issue which I have felt in my experience of some organisations, where the top management is directly getting involved in the processes of Lean Six Sigma activities the things were more successful, things were much faster, and people were more serious; whereas in the organisations where the top management involvement is not as much of an issue, there the people were not that much serious, things were taking more time and eventually the progress was not good. I'd say wherever there is the leadership involvement and participation of the top management and wherever the top management is really committed to work with the initiative, there is success.

(Participant 8)

Collectively, participants offered examples of leadership commitment that encompassed a wide range of activities and actions. Such measures included provision of all resources

Table 6. Matrix of coding pattern between programme(s) deployed and company sector.

The programme(s) deployed × Sector	Internet & Online	Retail & Consumer Services	Health Care	Industrial Goods & Services	Pharmaceuticals & Biotechnology	Management	Electronics & Semiconductors	Government & Trade	Financial Services
Language and terminology	2	3	3	0	2	0	1	1	1
Metrics for evaluating success of programme	0	3	4	1	2	1	1	0	4
Success factors in deployments	9	10	9	3	4	2	7	3	2
Addressing employee concerns	1	0	0	1	0	0	1	0	3
Building trust	1	0	2	0	0	0	1	0	1
Culture of acknowledging problems	0	2	2	0	1	0	1	0	0
Inclusive bonus structure	0	1	0	0	0	0	1	0	0
Leadership commitment	7	7	5	3	2	2	2	2	1

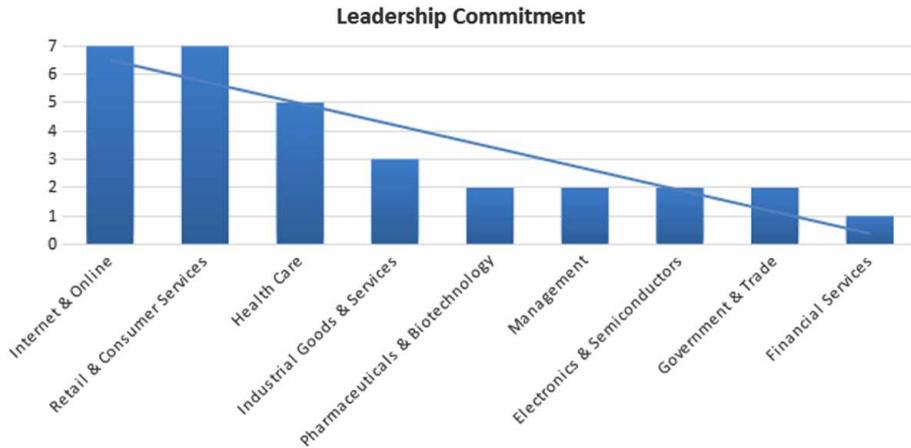


Figure 1. Leadership commitment by company sector.

necessary for success; for example, sufficient staffing levels, appropriate training, appropriate allocation of time, provision of peer support in the form of events and conferences as a platform for sharing of good practice, and nomination to projects on completion of training. All such elements of dedicated leadership are incorporated in the following concrete examples offered by Participant 1:

I'm going to give you three very concrete examples. The first one is ... there is a saying that 'where you put your money and your time, is where your heart is', and I mean, they put a lot of investment into training. I mean there is a lot of money put in place to train all the people coming into the programme, that's for one. The second example is every year, there is kind of a gathering where all the Lean Six Sigma black belts from all over the organisation, and this is a worldwide company, so you have Lean black belt Six Sigmas coming from Asia, from Latin America, from Europe, from within the States. to get together and share experiences and look for those highly profiled successful project implementations, and basically it's a three-full-days summit where everybody has kind of lessons learned. So that's a good second example where you need to put money and time because you have the fee of these companies coming to spend one, two, maybe three days with everybody, and I think that shows where is your heart, by dedicating that time and money, because you're bringing all people all over the world to this unique week, and it's amazing how enriched people are, so that's a good second example. The third example is you come in to the programme and spend two, three, maybe four years doing implementation and then go out and, usually you do either a lateral move or you will get promoted to a new position, and in order to do that you need to have the support of the senior leadership. And I think that's when you see that they believe in that, that once an individual has passed through this training or Six Sigma assimilation, they force that individual to go and pretty much apply those concepts now in a day-to-day operation Sigma programme for what area you are in. They trusted you so you can put in place those concepts, so that's pretty much how you can see that the senior leadership is engaged and they're putting their money and their heart on what they're saying.

#### 4.5. Training approaches

Participants' views on the idea of widespread basic training as a mechanism for engaging the workforce in improvement initiatives have already been discussed in the previous section; however, apart from the concept of widespread training, analysis of participants' comments during telephone discussions on this topic yielded three main themes: selection of candidates for training, the format of training, and the evaluation of training's effectiveness.

## 5. Leadership characteristics for Lean Six Sigma

From this qualitative analysis, some characteristics emerge that are needed for effective leadership for Lean Six Sigma. The importance for leadership to be *visible* has been highlighted (Kausman & Lane, 2008): Lean Six Sigma is a transformational journey for an organisation, radically changing the way things are done; it is necessary for the leader to be visibly at the forefront of this journey, personally leading the charge and being identified with it. It is not only the top executive leaders: ensuring top-performing people in all business units and geographies are engaged in the programme is key to achieving visibility.

Establishing and utilising effective *communication* systems and structures emerged as the most talked about suggestion for good practice in engaging the workforce and achieving buy-in to improvement measures. Participants' comments suggested a need for both verbal and visual communication systems as mutually re-enforcing mechanisms for communicating the message.

Participants from customer-service-led companies talked significantly more about leadership style and related contextual factors than did participants from any other sector (Table 4), highlighting the need for leadership to be *inspirational*: the start of a Lean Six Sigma journey can be worrisome for employees, who may be wondering whether they will have a job at the end of it; hence, it is necessary for leaders to inspire employees and engage with them at a personal level, making it clear what the benefits will be for them.

The importance of the *three Rs* (Roles, Responsibilities, and Relations) in the context of good leadership practice cannot be overstated: clearly defined and understood roles and responsibilities at senior, middle, and junior management levels, and harmonious symbiotic relationships between these levels, form the linchpin of successful approaches in rolling out and sustaining Lean Six Sigma improvement programmes.

In other words, leadership at all levels needs to be *consistent*, constantly reinforcing the main message: no matter how successful a Lean Six Sigma programme appears to be, inevitably there will be operational issues, budget constraints, and urgent issues that will divert the organisation's attention from the programme. At these stages, it is critical for leadership to show unresolved commitment to the programme (Jones, Parast, & Adams, 2010), with a strong and determined resolve to keep the programme going and not having it fade in favour of other priorities of the moment: attending the opening of all Six Sigma trainings, and mentioning the programme in corporate messages and reports are examples of how to keep it in the forefront of the minds of all employees and stakeholders.

As with any change management programme, Lean Six Sigma is going to face resistance; not all employees, managers and non-managers, are going to be onboard from the start. It is important that leaders recognise this, individuate the areas of greatest resistance, and get personally involved to overcome them. Leadership needs to be *targeted* to the areas of critical resistance, with leaders spending more time in the areas (either functional or geographical) where more resistance is expected.

The perception leadership has of Lean Six Sigma is also an important contextual factor impacting deployments: it is important for leadership to perceive Lean Six Sigma not just as a toolkit for fixing problems, but as a *philosophy*, a way of thinking, to be over time engrained into the workplace culture. To achieve this, leadership needs to engage with Lean Six Sigma, and understand the key principles and the potential applications for Lean Six Sigma in alignment with wider organisational strategies and goals, all while

*leading by example*, particularly in ensuring a transparent and data-driven decision-making process.

Leadership's role and hence its characteristics need to adapt to the stage the Lean Six Sigma programme is at, as requirements for leaders to launch a programme are different from those to maintain and sustain it after a few years; as programmes mature and expand, so too should leadership's perception of Lean Six Sigma develop, especially in terms of gaining an increased understanding of potential applications for Lean Six Sigma in alignment with wider organisational strategies and goals. Leadership needs to be *flexible*, moving from the particular to the larger view, and the reverse, as needed.

Finally, the ability to build trust with the people you work with is another essential leadership characteristic; the capacity of building employees' confidence in the approach and competence of leadership itself, with what can be termed as the *three Cs* model of trust-building for leadership:

- Connection: make sure to understand your employees' needs before trying to be understood;
- Competence: make sure to display the right technical skills and understanding of the Lean Six Sigma toolkit;
- Character: be open to change, always be learning, be an example of 'open-mindedness' to the employees.

## 6. Conclusion

With leadership considered a CSF for the deployment of continuous improvement programmes (Hahn et al., 1999; Pande, 2007; Laureani & Antony, 2012) and many different leadership styles identified in the literature (see Section 2 for a summary), this study identified which leadership traits and characteristics are more conducive to a successful deployment of Lean Six Sigma in organisations.

The findings were presented in five parts corresponding to the five key themes that emerged in the analytical process, namely, communication, employee motivation, leadership style, the programme deployed, and training.

Exploration of these themes provided rich insights into participants' experiences and views concerning the relationship between leadership and success levels in Lean Six Sigma deployments. The more important leadership attributes were summarised in the last section: although some are described in the leadership literature as belonging to one or more different leadership styles, there is no existing style of leadership that comprehends all of the above characteristics (Lakshman, 2006; Nwabueze, 2011). The need for a new leadership paradigm is one of this paper's contributions to research and industry practice.

Two key correlations are also worth noting: themes and issues relating to leadership style were significantly more talked about by interviewees from small organisations, defined as having fewer than 1000 employees, than by participants who hailed from larger organisations (Table 3); and participants from customer-service-led companies talked significantly more about leadership style and related contextual factors than did participants from any other sector (Table 4).

Figure 2 illustrates a leadership dependency model developed to summarise the findings from the analysis, which cross-referenced the inductively coded content in all five

	Leadership	Processes	
>1000 Employees <1000	High Dependency	Low Dependency	>1000 Employees <1000
	Equidependence	Equidependence	
	Low Dependency	High Dependency	
	Services	Sector	

Figure 2. Leadership dependency model.

themes against the five variables participants provided information on during their separate survey questionnaires prior to their in-depth interviews. The model is based on the following three assumptions:

- (1) Successful deployment of Lean Six Sigma requires leadership and business processes;
- (2) That these two inputs are not mutually exclusive;
- (3) That being high in one method of deployment means less or equal dependency on the other, meaning participants were rarely high or low in both.

So, a services company with less than 1000 employees would be placed in the grid suggesting a higher dependency on leadership skills and a commensurate lower dependency on business process, while the opposite would be the case for a manufacturer with greater than 1000 employees, who would depend more on having the right processes in place to optimise roll-out.

In conclusion, the contribution to practice from this research came from the identification of the traits and characteristics of leadership which were more conducive to a successful Lean Six Sigma deployment. This would help organisations about to embark on this journey to understand whether they have the right type of leadership in place.

For organisations to be successful, there must be continual adaptation and improvement of products and services in order to stay ahead of the competition while meeting all stakeholders' needs. This requires effective leadership throughout the organisation: knowing what the more suitable characteristics of leadership are for successful Lean Six Sigma deployment allows an organisation to establish whether they have the right kind of leader in place, and so avoid some of the pitfalls described in the literature.

Future research on this topic should delve deeper into the differences between senior leadership and middle management, exploring whether the attributes for leadership vary across the levels of seniority, and the impact of organisational culture.

#### **Disclosure statement**

No potential conflict of interest was reported by the authors.

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## APPENDIX – Semi-structured Interview Questions

### *Introductory protocol*

*To facilitate our note-taking, we would like to audiotape our conversations today. For your information, only researchers on the project will be privy to the tapes, which will be eventually destroyed after they are transcribed. All information will be held confidentially; your participation is voluntary and you may stop at any time if you feel uncomfortable. Thank you for agreeing to participate.*

*We have planned this interview to last no longer than one hour. During this time, we have several questions that we would like to cover.*

### *Introduction*

You have been selected to speak with us today because you have been identified as someone who has a great deal to share about the deployment of Lean Six Sigma (LSS) in your organisation, you have already filled a preliminary online survey on Critical Success Factors (CSFs) for LSS deployment and indicated your willingness to be interviewed. Our research project as a whole focuses on the impact of leadership on LSS deployment, the impact different leadership styles and traits have on the success of Lean Six Sigma in an organisation. Our study does not aim to evaluate your company success or your personal techniques or experiences; rather, we are trying to develop best-in class practices for leadership which helps those organisations who are embarking on Lean or Six Sigma or LSS.

### *Interviewee background: first reconfirm the answers on the online survey. Is there anything that needs to be changed?*

How long has LSS been implemented in your organisation?

Did your organisation implement first Lean, then Six Sigma, or the other way around, or did it go straight into Lean Six Sigma?

In the survey, you mentioned LSS is being applied to Business Units X, Y, Z (*this depends on what the person answered to the survey*): what do you think made those business units start using LSS, while others did not?

In which particular business function has the company started to apply Lean or Six Sigma? Why?

In what parts of the business are your company not utilising LSS and why do they not employ LSS in that business function?

How is the success (or lack of success) of the LSS programme being measured? Which metrics are being tracked?

If non-financial metrics are used, which ones? For example, employee satisfaction, customer satisfaction, etc.

If the measure is financial, do you track the financial impact of LSS projects as hard savings on the bottom line?

In the survey, you assessed your organisation's LSS programme as being successful/unsuccessful (*this depends on the person's survey response*): what exactly prompted you to answer that way?

### **Leadership style**

In the survey, you mentioned leadership as CSF number X (*this depends on the person's survey response*): what was your interpretation of leadership in that regard?

What prompted you to assign that ranking to leadership?

How would you describe the leadership style of the senior management team in your organisation?

Did the leaders of the business units that implemented LSS display a different leadership style from the others?

How does leadership style influence innovation in your firm?

How does leadership style influence operational excellence in your firm?

Do you think the LSS programme in your organisation would have reached the same results with a different leadership? If YES, why? If NO, why?

If you were the leader of your organisation, what would you have done differently?

Which leadership style is more conducive to a successful LSS deployment? For example, transactional, transformational, etc.

### **Management commitment**

Would you consider the top management in your organisation as being supportive of LSS? In what ways have they been (or not been) supportive, and how did they demonstrate their commitment?

In your experience, what percentage of top management were not believers in the LSS programme at the beginning? Was there any difference in the mindset of such people after the execution of LSS projects and the results LSS has brought to the organisation? Has the overall attitude of the top management towards LSS changed during the implementation? If YES, in what way has it changed?

Would you consider middle management in your organisation as being supportive of LSS? In what way have they have been (or not been) supportive and how did they demonstrate the commitment?

Would you consider middle management in your organisation as being supportive of LSS? Has its attitude toward LSS changed during the implementation? If YES, in what way has it changed?

### ***Communication/awareness***

How did the top management communicate the need for LSS to employees at the outset of the journey? Was that communication a success? If yes, how did you measure the success? If not, why not? How do you know it was not successful?

How is the ongoing status of the LSS programme being communicated to employees?

How is the status of the LSS programme being communicated to customers and/or suppliers?

Is the communication continuous or only on ad hoc occasions?

How would you communicate the success of LSS projects in the business? Do you host any annual conferences to increase the awareness of the initiative across the company? If yes, how does that look? Has it been a successful event?

### ***Employees' motivation/teamwork***

How do you feel LSS is perceived by employees in your firm?

How do you engage employees with this initiative? How do you get employees onboard for this programme? How do you win their hearts and minds?

How does your company motivate its employees along the LSS journey?

Do you have intrinsic types of motivational instruments (e.g. career advancement, education)? If so, what is their impact on the LSS implementation?

Do you have extrinsic types of motivational instruments (e.g. bonuses, cash awards)? If so, what is their impact on the LSS implementation?

What is the role of a leader in motivating their employees for the sustainability of a LSS initiative? How can they make sure that the employees are motivated to deliver the projects and engage well with the rest of the company?

### ***Training***

Is LSS something most employees are involved with or is it restricted to a cohort of specialists?

What percentage of employees is involved in LSS?

How do you select the people for the training? Do you use any criteria for selecting people such as YBs? GBs? BBs? If so, can you share the criteria?

What are the roles and responsibilities of GBs, YBs, BBs, MBBs and LSS deployment champions?

What percentage of their time do yellow/green belts spend in their role?

Is the black belt role full-time? If so, how long before they are expected to move to a new role?

What percentage of MBBs take up the leadership role during their employment period?

What level of training is provided to employees at different levels?

What types of training are provided to employees and how would you certify them as YBs, GBs, BBs and MBBs?

How do you measure the effectiveness of training? How do you measure the success of training? What are the key leading indicators of successful training?

Do you think the training offering in your firm is having an impact on the level of engagement and/or awareness of LSS among the employees?

What is the annual investment on training for the LSS? At the beginning, how much did you have invested for the training? What was the ratio of investment against the benefits? Can you share its current ROI?

Can you elaborate on the training offerings: do they take place in classrooms, online, or a combination of both?