

## **Abstract**

The term 'Lean Six Sigma' refers to the integration of 'Lean' and 'Six Sigma' business improvement methodologies, where 'Lean' is a process improvement methodology used to deliver products and services better, faster and at a lower cost, while 'Six Sigma' is a data-driven methodology used to achieve stable and predictable processes. The concept of 'Lean Six Sigma' as an integrated strategy is still in development: since its inception in 2000, a number of academics have developed an integrated approach, while others have focused on a framework for the successful integrations of Lean and Six Sigma. Despite becoming the most popular business strategy for deploying continuous improvement, many organizations are struggling to turn Lean Six Sigma into a success, citing lack of leadership, changing business focus, internal resistance and availability of resources as the main impeding factors. The focus of this research was to consolidate the existing knowledge on leadership and Lean Six Sigma, providing a starting point for researchers and practitioners seeking to implement Lean Six Sigma in organizations and offering suggestions for future research.

This systematic literature review aims to synthesize, organize and structure the stock of knowledge relating to Lean Six Sigma and leadership. The research is based on a systematic literature review of 179 papers that were published on leadership, Lean and Six Sigma in well-known academic databases in the past 20 years. The key findings of the review show that: (1) Leadership is a requirement for successful Lean Six Sigma deployment in organizations, and critical to sustaining improvement; and (2) Lean Six Sigma is an effective leadership development tool. Leadership is a critical factor for Lean Six Sigma success and there is the need to develop a new model of leadership that encompasses the leadership traits needed for Lean Six Sigma.

**Keywords:** Lean, Six Sigma, Lean Six Sigma, leadership, systematic literature review

# 1 Introduction

This systematic literary review aims to synthesize, organize and structure the stock of knowledge relating to Lean Six Sigma and leadership. The review focuses primarily, but not exclusively, on theoretical developments and empirical studies in the practice of Lean Six Sigma.

The term 'Lean Six Sigma' started to be used in 2000 as a way to describe the integration of Lean and Six Sigma philosophies (Sheridan, 2000). Lean Six Sigma is a business improvement methodology that aims to maximize shareholders' value by improving quality, speed, customer satisfaction and costs: it achieves this by merging tools and principles from both Lean and Six Sigma (Albliwi, Antony, & Lim, 2015; Lee & Wei, 2009; Chen & Lyu, 2009; Chakravorty & Shah, 2012; Vinodh, Kumar, & Vimal, 2012).

Lean and Six Sigma have followed independent paths since the 1980s, when the terms were first hard-coded and defined: Lean originated in Japan (within the Toyota production system), and Six Sigma first saw the light in the USA (within the Motorola Research Centre). Lean is a process improvement methodology used to deliver products and services better, faster and at a 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, reducing process variation and defects. Snee (1999) 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’.

While Lean is all about speed and efficiency, Six Sigma is concerned with precision and accuracy: Lean ensures resources are working on the right activities while Six Sigma ensures things are done right the first time. The term ‘Lean Six Sigma’ was first introduced in the literature in 2000 (Timans, Antony, Ahaus, & Solingen, 2012), and has increased in interest and popularity, both in small- and medium-sized manufacturing businesses (Kumar, Antony, Singh, Tiwari, & Perry, 2006) and in large organizations, such as **Motorola, General Electric and Honeywell** (Laureani & Antony, 2012; Timans et al., 2012). Snee (2010) defined Lean Six Sigma as ‘a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottom-line results’, arguing that it was unproductive to debate whether Lean or Six Sigma was more applicable to solve specific issues, while focusing instead on how to combine them best to address the problem at hand. The benefits of Lean Six Sigma in the industrial world (in both manufacturing and services sectors) have been highlighted extensively in the literature (Zhang, Irfan, Khattak, Zhu, & Hassan, 2012) and include (Antony, 2005a, 2005b): ensuring services/products conform to what the customer needs (‘voice of the customer’), removing non-value adding steps (waste) in critical business processes, reducing the cost of poor quality, reducing the incidence of defective products/transactions, shortening the cycle time and delivering the correct product/service at the right time in the right place.

The concept of Lean Six Sigma as an integrated strategy is still in development in the literature. Since its inception in 2000, a number of academics have developed an integrated approach (Thomas, Rowlands, Byard, & Rowland-Jones, 2008; Snee & Hoerl, 2007; Pepper & Spedding, 2010), while others have focused on a framework for the successful integration of Lean and Six Sigma (Alsmadi & Kahn, 2010; Bendell, 2006; Salah, Rahim, & Carretero, 2010; Hardeman & Goethals, 2011). While Pepper (2007) individuated the need for a closer integration of Lean and Six Sigma in order to drive a unified methodology forward, Snee (2010) focuses on how Lean Six Sigma is a holistic improvement methodology addressing the flow of information and materials through processes, as well as the enhancement of value-adding process steps to create the product for the customer (Timans et al., 2012): in his view, this will naturally lead to making improvement a business process similar to any other important business process.

Overall, there is a noticeable increase in the popularity of Lean Six Sigma in the industrial world, particularly in larger organizations in western countries (USA, UK, Netherlands) and some small- and medium-sized manufacturing enterprises (SMEs) in developing countries such as India (Albliwi et al., 2015), although the theoretical foundations are still developing (Pepper & Spedding, 2010).

Lean and Six Sigma have become the most popular business strategies for deploying continuous improvement in manufacturing, service and public service organisations (Albliwi et al., 2015). Continuous improvement is the main aim for any organization to help them to achieve quality and operational excellence and to enhance performance (Thomas, Barton, & Okafor, 2009; Assarlind, Gremyr, & Backman, 2012).

However, despite its success in some organizations, others are struggling to turn Lean Six Sigma into a success, citing a lack of leadership, changing business focus, internal resistance

and availability of resources as the main impeding factors (Timans et al., 2012), with Snee (2010) pointing out how Lean Six Sigma is an effective leadership development tool: ‘leaders enable an organization to move from one paradigm to another; from one way of working to another way of working. Lean Six Sigma provides the concepts, methods and tools for changing processes’. Given this scenario, we believe an updated systematic literature review on leadership and Lean Six Sigma is needed. As research in this field is still in development, with fragmented and diverse studies, it would benefit significantly from a study aimed at understanding and reorganizing the available knowledge around leadership and Lean Six Sigma. This review also makes an important methodological contribution by applying elements of systematic reviews originating from the so-called ‘hard sciences’ to the leadership and Lean Six Sigma studies field, where there is little systematic research and concepts are often poorly operationalized, often meaning a failure to provide enough help to organizations in their efforts to deploy Lean Six Sigma.

The focus of this research was to consolidate the existing knowledge on leadership and Lean Six Sigma, providing a starting point for researchers and practitioners seeking to implement Lean Six Sigma in organizations and offering suggestions for future research. Several new leadership styles have been proposed in the past decade (Anderson & Sun, 2015), but they haven’t been yet properly defined: there is a need to develop a new model of leadership that encompasses the leadership traits needed for Lean Six Sigma. This will also have managerial implications, helping organizations that are about to embark on a Lean Six Sigma journey to ensure they have the right leadership in

The paper is structured as follows: the next section describes the methodological approach used to conduct the systematic literature review; then we analyse the data collected. Finally, we provide a critical discussion of the results, with suggestions for future research.

## 2 Methodology

The approach used to conduct the review is the one of systematic review. Systematic reviews in management research are relatively new (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Tranfield, Denyer, & Smart, 2003): they have been used in a range of health, social care and education fields in order to synthesize research in an orderly and transparent way (Tranfield, Denyer, & Smart, 2002). A systematic review is a structured process used to investigate the background literature, which aims to avoid potential pitfalls arising from a purely narrative analysis (Pittaway, Robertson, Munir, Denyer, & Neely, 2004), while providing an audit of the decisions and conclusions of the reviewers, increasing transparency and enabling the replication of the research considered (Thorpe, Holt, MacPherson, & Pittaway, 2005).

The adopted systematic review procedures outlined by Tranfield et al. (2003) comprise three stages of review process:

1. Review planning, in which we define what is in the scope of the review, the review protocol (including explicit description of various steps in review process), the key data collection method, the search strategy for the identification of relevant studies, and the inclusion and exclusion criteria. These explicitly aim to limit systematic error and bias (Petticrew & Roberts, 2006).
2. Review execution includes the collection and organization of data, data processing and classification, and data synthesis. Data collection is carried out with a predefined selection algorithm using predefined search strings.
3. Reporting, where the results are synthesized and their consequences examined.

In the review planning we decided to focus the scope of our systematic review on the Lean and Six Sigma methodologies for quality and continuous improvement, and leadership effects.

In the review execution phase, the search strategy aimed to eliminate bias and be as widespread as possible, by using a database search and cross-referencing between papers.

The review focused on double-blind peer-reviewed journal articles, which can be considered as valuable knowledge (Podsakoff, MacKenzie, Bachrach, & Podsakoff, 2005), and influential journals tend to shape theoretical and empirical work (Furrer, Thomas, & Goussevskaia, 2008); however, we also included relevant text books, conference proceedings and academic dissertations.

The following keywords, in the fields of 'title' and/or 'abstract' in English, were searched:

- Leadership and/or Lean
- Leadership and/or Six Sigma
- Leadership and continuous improvement

These keywords correspond to the main fields of studies in which we have investigated a relationship. References at the end of each paper were used to dive deeper into the literature; further searches in key journals were used to supplement the initial search to identify articles that might have been missed in the initial search. Reminder alerts were also set on the systems so as to be immediately informed of a new relevant article being published: this allowed the systematic review to be very up to date with the literature in the Lean Six Sigma field. Thus we tried to 'retrieve everything of relevance, while leaving behind the irrelevant' (Petticrew & Roberts, 2006, p. 81).

The list of peer-reviewed journal articles were obtained from ABI/INFORM Complete, Omnifile Full-Test, ASSIA (Applied Social Sciences Index and Abstracts), Informa – Taylor & Francis, JSTOR, ScienceDirect, Springer, Wiley, Athena, Shibboleth, Google Scholar, EBSCO, Primo Central and Emerald Insights, as they cover the entire management and quality-related fields. We began our search by identifying publications with ‘Leadership Lean Six Sigma’ as keywords, as these words reflect our scope of review, with searches limited to the English language.

The initial search returned 610 papers: we then excluded those papers from journals focusing on areas other than management or quality, books, dissertations and conference proceedings. Further searches in key journals were used to supplement the initial search to identify articles that might have been missed in the initial search. In order not to miss any relevant articles that are within our inclusion and exclusion criteria, we cross-checked with earlier reviews and included those papers that are within our criteria. We also carried out manual searches of numerous reference lists from the selected papers to identify additional relevant papers that fall under our selection criteria. We ended up with 285 papers with these inclusion and exclusion criteria.

We then filtered these papers for articles linked to leadership, Lean, Six Sigma, Lean Six Sigma, continuous improvement, and quality, and we excluded the following: papers dealing with Six Sigma models for implementation; papers dealing with statistical domains; and papers dealing exclusively with the tools and techniques of Six Sigma and industrial case studies demonstrating Six Sigma improvement projects. By going through each abstract, we finally identified relevant articles to match our inclusion criteria and the scope of our study and this systematic and rigorous selection identified 179 publications (full list in the appendix). Figure 1 shows our selection procedure.

## INSERT FIGURE 1

**Figure 1 Systematic review selection and review procedure adapted from Arumugam et al. (2014)**

Since the objective of our systematic literature review is to review and synthesize the literature, rather than to consolidate the findings empirically, we limit our methodology to descriptive and qualitative analysis. Therefore we carried out interpretative synthesis (Dixon-Woods et al., 2006) and qualitative analysis (Bronson & Davis, 2012).

### **3 Results and analysis**

This systematic literature review is based on a sample of 179 papers (full list in the appendix) composed as follows: 146 conceptual papers, 14 empirical studies, 12 literature reviews and seven exploratory studies. In this section, we present data collected with the aim of providing an updated picture of the status of current literature on leadership and Lean Six Sigma. Since the main objective of our review was to bring out a broad theoretical understanding of the relationship between leadership and Lean Six Sigma, we classified the selected papers on the basis of their research focus, the research methods, year of publication, geography and application sector (manufacturing, service or public sector).

#### **3.1 Publication distribution**

##### *Year of publication*

The distribution of papers over time show academic interest for the subject increased over time, reaching the most output in the second half of the last decade (Figure 2).

## INSERT FIGURE 2

**Figure 2 Number of relevant articles by time period**

Publications on leadership and Lean Six Sigma grew over time, as Lean Six Sigma itself moved from a niche to a mainstream management technique, peaking around 2009–2010.

### *Journals*

Most of the papers were published in the following five journals: *Quality Progress*, *International Journal of Quality & Reliability Management*, *International Journal of Six Sigma and Competitive Advantage*, *Harvard Business Review* and *Total Quality Management & Business Excellence*. Papers were also found in journals dedicated to a variety of fields (e.g. healthcare, engineering, operation management), signalling the dissemination of the topic in contexts and disciplines different from the original manufacturing or quality setting. In total, 97 journals were used for this study and Table 1 lists the journals with two or more articles.

INSERT TABLE 1

**Table 1 Journals with two or more papers in our literature review**

## **3.2 Research context**

This sub-section analyses the data collected around the sector and country of the research. For each paper it was determined whether there was a dominant industrial sector or country on which the research was based. The majority of papers were not affiliated to a specific industrial sector, but examined the subject at a more theoretical, conceptual level. However, it was noticeable that Lean Six Sigma has grown in publications related to healthcare: a clear sign of how it has ventured outside the more traditional manufacturing sector to tackle problems elsewhere. Considering the countries where research took place, the USA was the

country with by far the most papers (approximately 20%), while the rest of papers were spread equally across the UK, continental Europe and India.

The vast majority of papers were conceptual in nature, describing some aspect of the Lean Six Sigma methodology and its possible applications. This is not a surprise, as often industry practitioners are unable to publish their results due to a company's non-disclosure rules or concerns about confidentiality and competitiveness; hence, inevitably, a literary review is always more biased towards theoretical publications.

The next part of the systematic literature review process is the synthesis (Dixon-Woods et al., 2006): it involves an in-depth qualitative analysis of each research study selected for review, inclusive of all aspects of the research process, related findings and interpretations made from the primary research (Bronson & Davis, 2012).

## **4 Discussion**

### **4.1 Leadership theories**

The importance of leadership has often been emphasized in the area of quality management. Despite such consideration, little has been espoused regarding the theoretical mechanisms by which leadership and Lean Six Sigma are related: this paper provides a focus on such issues with the hope of stimulating more systematic research efforts. Emphasis is placed on the mutual influence of leadership and organizational culture on the deployment of Lean Six Sigma.

The definition of 'leadership' abounds in the literature. In 1991, 54 leadership experts from 38 countries agreed on a common definition of leadership as 'influencing, motivating, and enabling others to contribute toward the effectiveness and success of the organizations of which they are members' (House, Javidan, & Dorfman, 2001). Most of the literature on

leadership can be organized into the following five leadership theories (Kanungo, 1998; Yukl, 2006):

1. *Behavioural perspective* identifies two clusters of leaders' behaviour: people-oriented and task-oriented.
2. *Contingency perspective* says effective leaders adapt their styles to the situation.
3. *Competency perspective* tries to identify the characteristics of effective leaders.
4. *Transformational perspective* says that leaders create and communicate a vision.
5. *Implicit leadership perspective* says the importance of leadership is inflated.

It is important to note that, no matter which theory one wants to follow, all agrees that leaders exist everywhere in the organization, not just on the executive board (McShane & Von Glinow, 2008).

#### *Behavioural perspective*

Originally only four leadership styles were identified (Lewin, Lippitt, & White, 1939):

1. Dictator
2. Autocratic
3. Participative
4. Laissez-faire

In the 1940s and 1950s many studies were carried out to determine which leadership behaviours made leaders more effective; the results clustered the various behaviours around two poles, the task-oriented and the people-oriented (Northouse, 2004; Yukl, 2006).

These two extremes are clearly generalizations useful in theory, but rarely in practice is a leader either completely task-oriented or completely people-oriented. This dichotomy also assumes that high levels of both extremes are best in all situations, while in reality the best leaders' behaviour may depend on the situation (Kerr et al., 1974), as stated by the contingency theorists of leadership.

### *Contingency perspective*

Among the contingency theories, the 'path-goal' theory (based on the expectancy theory of motivation (Isaac, Zerbe, & Pitt, 2001) is the one that has stood the test of time. It has the merit of having introduced the concept of servant leadership – that is, the belief that leaders serve followers by understanding their needs and facilitating their work performance (Spears & Lawrence, 2002). The path-goal leadership theory advocates four leadership styles:

1. *Directive*: the leader dictates goals and standards.
2. *Supportive*: the leader is approachable and friendly, supporting followers.
3. *Participative*: followers are involved in setting goals and standards.
4. *Achievement oriented*: the leader sets challenging goals and strives for continuous improvement.

Other contingency theories include:

- situational leadership theory, developed by Hersey and Blanchard (1988), which suggests that leaders adapt their styles based on the 'readiness' of their followers;
- Fiedler's contingency model (Fiedler, 1967), where leadership effectiveness depends on whether the person's natural leadership style is appropriately matched to the situation; and

- leadership substitute theory (Schriesheim, 1997), which identifies conditions that limit a leader's effectiveness and advocates that leaders help followers to lead themselves.

### *Competency perspective*

The idea of identifying personality traits more conducive to effective leadership is a cornerstone of the competency theory. Ilies, Gerhardt and Le (2004) individuated the following personality traits as important to be an effective leader:

1. Emotional intelligence
2. Integrity
3. Drive
4. Leadership motivation
5. Self-confidence
6. Intelligence
7. Knowledge of the business

### *Transformational perspective*

Burns (1978) defines transformational leaders as agents of change, creating, communicating and modelling a vision for the team or organization, inspiring followers to that vision.

Opposite to this is transactional leadership, helping organizations to achieve their current objective more efficiently (Goodwin, Wofford, & Whittington, 2001). For a while, charismatic leadership was used as a synonym of transformational leadership, but ultimately

it came to be considered as a separate leadership perspective, using referent power over followers to establish itself (Barbuto, 1997).

#### *Implicit leadership perspective*

The four types of leadership theories reviewed so far (competency, behavioural, contingency and transformational) all have in common the underlying assumption that a leader can make a difference in an organization. On the contrary, the last type of leadership theory, the implicit one, considers the importance of leadership as inflated, seeing its origin in the human need for control (Meindl, 1990).

#### *Level 5 and Six Sigma leadership*

Recently two new theories of leadership have been introduced: Level 5 leadership (Collins, 2001b) and Six Sigma leadership (Pande, 2007). Level 5 leaders display compelling humility, putting the organization's interests ahead of their own, a strong powerful commitment, and the capacity to bring out the best in others: they are a mix of personal humility and iron will. Six Sigma leadership is based on the idea that leadership is a learnable combination of skills that combine balance and flexibility to drive performance; data drive decisions and a constant customer focus are among the most important characteristics of the Six Sigma leader.

## **4.2 Leadership traits and styles**

Table 2 summarizes the leadership traits from the literature review for the ten different styles of leadership (Tannenbaum & Schmitt, 1958; Hofstede, 1977; Schriesheim, 1982; Stodgill, 1989; Bass, 1990; Kouzes & Posner, 1987), defined as follows.

INSERT TABLE 2

**Table 2 Leadership traits by leadership style**

### *Level 5*

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, 2001a). Level 5 leaders routinely credit others, external factors and good luck for their company's success, but when results are poor, they blame themselves. They also act quietly, calmly and determinedly, relying on inspired standards, not charisma, to motivate. Utterly intolerant of mediocrity, they are stoic in their resolve to do whatever it takes to produce great results. They also select great successors for themselves, wanting their organization to be even more successful in the future (Collins, 2001b).

### *Affiliative*

This is a leadership style where the leader promotes harmony among his or her followers and helps to resolve any conflict. This type of leader will also build teams that make sure that their followers feel connected to each other. Affiliative leaders value people and their feelings, put less emphasis on accomplishing tasks and goals and more on the emotional needs of employees. They keep people happy, emphasise harmony and build team resonance. Typically the followers will receive much praise from this style of leader; however, poor performance tends to go unchecked (Goleman, Boyatzis, & McKee, 2002).

### *Bureaucratic*

This is a style of leadership that emphasizes 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). A bureaucratic leader is subject to a system of behavioural rules and technical rules. Behavioural rules define the scope of a manager's behaviour and constraint his conduct, while technical rules control how work is to be performed and how decisions are

made (Meier, 1989). Weber (1905) described the six main characteristics of bureaucratic leadership in this way:

1. A strict hierarchy that is formalized by the leadership and strictly adhered to.
2. The organization is controlled by immutable rules, regulations or laws.
3. The organization is structured along the lines of specialities. People with like talents are grouped together.
4. The organization has one of two missions:
  - ‘Up-focus,’ meaning it focuses on the board of directors or stockholders;
  - ‘In-focus,’ which means the organization serves a product-oriented goal such as increasing profits market share.
5. Bureaucratic leadership is impersonal. It is about performance, not the worker.
6. Employment is based on the most technically proficient.

### *Participative*

Also known as the democratic style, the participative leader involves subordinates in goal setting, problem solving, team building and so on, but retains the final decision-making authority (Lewin et al., 1939). The idea that participative leadership is likely to enhance the performance of subordinates was suggested by Barnard (1938) decades ago, and has been expanded and developed subsequently by many researchers (Huang, Iun, Liu, & Gong, 2010). Two theoretical models underline the effects of participative leadership behaviour on subordinates’ work performance: the motivational model and the exchange-based model. The first suggests that increasing the degree in which subordinates participate in decision making

may increase performance through enhanced motivation (Sashkin, 1976). The exchange-based model, based on social exchange theory (Blau, 1964), suggests that when employees are treated well by their superiors, they are more likely to reciprocate by showing high levels of work performance (Blau, 1964).

### *Servant*

This style stresses the importance of the role a leader plays as the steward of the resources of a business or other organization, and teaches leaders to serve others while still achieving the goals set by the business (Greenleaf, 1977). Servant leaders begin with the natural feeling of serving first, to ensure that others' 'highest priority needs are served first' (Greenleaf, 1970, p. 4). Various studies (Barbuto & Wheeler, 2006; Dennis & Bocarnea, 2005; Liden, Wayne, Zhao, & Henderson, 2008; Russell & Stone, 2002; Sendjaya, Sarros, & Santora, 2008; Van Dierendonck & Nuijten, 2011) have developed measures for servant leadership, which have elicited 43 overlapping dimensions. Anderson & Sun (2015) synthesized these in the following 12 conceptually distinct dimensions.

1. *Altruistic calling* is a leader's deep-rooted desire and spiritual purpose to make a positive difference in others' lives through service (Barbuto & Wheeler, 2006).
2. *Persuasive mapping* describes the extent to which leaders uses sound reasoning and mental frameworks to map issues and conceptualize greater possibilities for the future (Barbuto & Wheeler, 2006; Liden et al., 2008).
3. *Courage* is the ability to see things differently and take risks with new ways to deal with old problems (Van Dierendonck & Nuijten, 2011).

4. *Agapao love* is moral (Dennis & Bocarnea, 2005) and unconditional, and considers the whole person rather than treating them as a means to an end (Russell & Stone, 2002).
5. *Emotional healing* can help in the spiritual recovery from hardship and trauma when individuals' dreams, aspirations, hopes and relationships are broken (Barbuto & Wheeler, 2006).
6. *Forgiveness* is the ability to let go of perceived wrong doings and not carry past grudges into other situations (Van Dierendonck & Nuijten, 2011).
7. *Humility* is the understanding of one's own strengths and weaknesses, putting one's strengths in proper perspective (Dennis & Bocarnea, 2005).
8. A *covenantal relationship* is developed by accepting individuals as they are, engaging with them as equal partners, and displaying open-ended communication and trust (Sendjaya et al., 2008).
9. *Behaving ethically* means holding oneself to high moral standards and always acting with moral integrity (Liden et al., 2008; Sendjaya et al., 2008).
10. *Authenticity* is being true to oneself, accurately reflecting both public and private selves (Van Dierendonck & Nuijten, 2011).
11. *Creating value for the community* is the extent to which leaders prepare an organization to make a positive contribution to society (Barbuto & Wheeler, 2006; Liden et al., 2008).
12. *Accountability* is holding followers accountable to deliver on what they can control (Van Dierendonck & Nuijten, 2011).

### *Six Sigma*

This style advocates a 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). The combination of stability (balance) and responsiveness (flexibility) makes a Six Sigma leader: rather than focusing on traits like charisma, the core of Six Sigma leadership is about practical skills and principles that can be applied to create and sustain success in organizations (Pande, 2007).

### *Transactional*

This is based on the setting of clear objectives and goals for followers, as well as the use of either punishments or rewards in order to encourage compliance with these goals (Burns, 1978). Bass' (1985) model of leadership conceptualized transactional leadership as consisting of three dimensions: contingent reward and two forms of management by exception (MBE), active and passive. Goodwin et al. (2001) found that contingent reward is made of two factors: explicit psychological contract and implicit psychological contract. The latter is more closely associated with transformational leadership behaviours (Goodwin et al., 2001). A further analysis by Podsakoff, Bommer, Podsakoff and MacKenzie (2006) further distinguished between contingent reward, contingent punishment, non-contingent reward and non-contingent punishment.

### *Transcendent*

Grounded in servant leadership, the transcendent style 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). Crossan, Vera and Nanjad (2008) defined transcendent

leadership as a form of strategic leadership that spans the levels of self, others and organization; it captures the quality of going above and beyond the narrow definition of a leader.

### *Transformational*

This style of leadership – in which the leader identifies necessary change – creates a vision to guide the change through inspiration, and executes the change with the commitment of the members of the group. Brass (1985) built on Burns' (1978) description of 'transforming leadership' and developed a model of transformational leadership that encompasses four dimensions:

1. *Charisma* represents 'the degree to which the leader behaves in admirable ways that cause followers to identify with the leader'.
2. *Inspirational motivation* is 'the degree to which the leader articulates a vision that is appealing and inspiring to followers'.
3. *Intellectual stimulation* is 'the degree to which the leader challenges assumptions, takes risks, and solicits followers' ideas'.
4. *Individualized consideration* is 'the degree to which the leader attends to each follower's needs, acts as a mentor or coach'.

(Judge & Piccolo, 2004, p. 755)

### *Visionary*

The visionary style – also referred to as charismatic – means that 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). House (1977) and House & Podsakoff (1994)

argue that charismatic leaders exude passion and self-confidence, engage in self-sacrificial behaviour, promote a collective identity, model desirable behaviour, establish high expectations for followers and express confidence that followers can achieve them.

### **4.3 Overview of relationship between Leadership and Lean Six Sigma**

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 struggle to turn Lean Six Sigma into a success because of different failure factors (Albliwi, Antony, Halim Lim, & van der Wiele, 2014), and the question is whether different styles and traits of leadership can have an impact on whether the deployment of Lean Six Sigma results in organisational success. As Deming said (1994), quality is determined by top management and cannot be delegated, and the quality of the output of a company cannot be better than the quality at the top (Hilton & Sohal, 2012; Suresh, Antony, Kumar, & Douglas, 2012). Existing theory suggests that in order to implement a quality improvement process successfully, an organisation needs to have transformational leaders at the top (Waldman, 1993) to create the culture and objectives which must be adopted by transactional leaders in the middle management ranks (Waldman et al., 1998).

Research shows an inextricable link between leadership and commitment (Aboelmaged, 2011; Martinez-Jurado & Moyano-Fuentes, 2012; Waldman et al., 1998) at the basis of the success of a quality improvement programme: unwavering commitment to quality programmes from top management is fundamental for embedding those into the organisation's culture, allowing it to overcome the initial scepticism of employees (Bhasin 2012a, 2012b; Juran, 1989).

Leadership has been recognised as a mechanism for embedding cultural values and norms into an organisation (Schein, 1983); at the same time, the idea of culture affecting the type of leadership in an organisation has been advanced (Bass, 1985), suggesting the existence of a reciprocal relationship between leadership and culture in organisations (Waldman, 1993). Overall, Lean Six Sigma deployment needs to proceed hand in hand with cultural change in order to avoid falling into the same traps into which TQM fell in previous generations of quality improvement programmes (Albliwi et al., 2014; Bushe, 1988).

Leadership and organisational culture look at conditions within the organisation, but Forker (1991) noted how societal-level differences exist in the way quality and continuous improvement are defined in the USA, Japan, and what was the USSR at the time his article was written: these societal-level differences have an impact on the organisational culture. Putting all this together, similarly to the TQM model introduced by Waldman (1993), we suggest the model displayed in Figure 3 for illustrating the links between leadership, culture, and Lean Six Sigma.

**Figure 3 Model of Leadership, Culture and Lean Six Sigma, adapted from Waldman (1993)**

This model illustrates the key relationships so far identified in the literature.

1. the reciprocal impact of leadership and culture within the organisation;
2. the societal-level factors outside the organisation that have an impact on the organisational culture;
3. how (1) and (2) above impact on the Lean Six Sigma behaviours of employees affected by both the leadership and the culture prevalent in the organisation;
4. all the above combine to generate the Lean Six Sigma outputs.

## **5 Key emerging themes**

The review showed that effective leaders have distinctive traits, such as drive, leadership motivation, honesty and integrity, self-confidence, cognitive ability and knowledge of the business (Kirkpatrick & Locke, 1991) that makes them stand out of the crowd. Since 2000, several new leadership styles have also been proposed (Anderson & Sun, 2015): ideological leadership, pragmatic leadership, authentic leadership, ethical leadership, spiritual leadership, distributed leadership, and integrative public leadership. However, they haven't been yet properly defined, with large areas of overlap among themselves and with more traditional styles previously studied in the literature. Anderson and Sun (2015) issue a call to leadership researchers to collectively develop a new model of leadership that encompasses what is unique about these various new styles being proposed. Defining what leadership traits are more conducive to a successful Lean Six Sigma deployment is critical for organizations that are about to embark on such a journey, so they can ensure the right leaders are in place.

This systematic literature review also highlighted the need to extend research on leadership and Lean Six Sigma to different cultures: since Kull, Yan, Lio and Walker (2014) showed that several dimensions of national culture can influence the effectiveness of a Lean implementation, the impact of geo-cultural issues on Lean Six Sigma can be an interesting research stream, particularly as so far most of studies have focused on the US and/or the UK.

There are also opportunities for further research in healthcare. It has been an important area of study in the past few years, and many case studies have demonstrated how Lean Six Sigma can improve the quality of care for patients, but there is scope for a more generalizable approach to patient care.

Finally, a need for more research in the effect of social constructs has also been highlighted: the effects of working environment, employee well-being, unionized workforce and social sustainability on the types of leadership required for a successful Lean Six Sigma deployment would be an interesting research stream.

## **6 Conclusion and agenda for future research**

Lean and Six Sigma have become the most popular business strategies for deploying continuous improvement in manufacturing, service and public service organisations (Albliwi et al., 2015). Continuous improvement is the main aim for any organization to help them to achieve quality and operational excellence and to enhance performance (Thomas, Barton, & Okafor, 2009; Assarlind, Gremyr, & Backman, 2012).

However, despite its success in some organizations, others are struggling to turn Lean Six Sigma into a success, citing a lack of leadership, changing business focus, internal resistance and availability of resources as the main impeding factors (Timans et al., 2012), with Snee (2010) pointing out how Lean Six Sigma is an effective leadership development tool: ‘leaders enable an organization to move from one paradigm to another; from one way of working to another way of working. Lean Six Sigma provides the concepts, methods and tools for changing processes’. Leadership expert Kotter (1996, 2008) emphasizes how the continuous improvement journey needs to begin with a sense of urgency and Snee (2010) identified leadership as a much needed requirement for successful Lean Six Sigma deployment and critical to sustaining improvement.

The focus of this research was to consolidate the existing knowledge on leadership and Lean Six Sigma, providing a starting point for researchers and practitioners seeking to implement Lean Six Sigma in organizations and offering suggestions for future research. Limitations

inherent to the research design were the lack of differentiation between Leadership style required from Senior/Executive management and Middle management in organizations, and lack of differentiation among industry sectors, such as manufacturing and services: it is possible that a different style of Leadership may be required in different industry sectors and across organizations of very different size. However, it's clear that leadership is a critical factor for Lean Six Sigma success and its impact will be the subject of future research to determine what are the leadership traits more conducive to successful Lean Six Sigma. As we have seen, since 2000 several new leadership styles have also been proposed (Anderson & Sun, 2015), but they haven't been yet properly defined. There is a need to develop a new model of leadership that encompasses the leadership traits needed for Lean Six Sigma. This will also have managerial implications, helping organizations that are about to embark on a Lean Six Sigma journey to ensure they have the right leadership in place.

## References

- Aboelmaged, M.G. (2011), "Reconstructing Six Sigma barriers in manufacturing and service organizations: the effects of organizational parameters", *International Journal of Quality & Reliability Management*, Vol. 28 No. 5, pp. 519-541.
- Albliwi S., Antony J., Halim Lim, S.A. & van der Wiele, T. (2014),"Critical failure factors of Lean Six Sigma: a systematic literature review", *International Journal of Quality & Reliability Management*, Vol. 31, No. 9, pp. 1012 - 1030
- Albliwi, S.A., Antony, J., & Lim, S.A.H. (2015). A systematic review of Lean Six Sigma for the manufacturing industry. *Business Process Management Journal*, 21(3), 665–691.
- Alsmadi, M. & Khan, Z. (2010). Lean Sigma: The New wave of Business Excellence: Literature Review and Framework. Paper presented at Engineering Systems Management and its Applications (ICESMA), Second International Conference on IEEE, pp. 1–8.
- Anderson, M. H. & Sun, P. Y. T. (2015). Reviewing leadership styles: overlaps and the need for a new 'full-range' theory. *International Journal of Management Reviews*.  
doi:10.1111/ijmr.12082
- Antony, J. (2005a), "Assessing the status of six sigma in the UK service organizations", *Proceedings of the Second National Conference on Six Sigma*, Wroclaw, pp. 1-12.
- Antony, J. (2005b), "Six Sigma for service processes", *Business Process Management Journal*, Vol. 12, No. 2, pp. 234-248.
- Arumugam, V., Antony, J., & Linderman, K. (2014). A multilevel framework of Six Sigma: a systematic review of the literature, possible extensions, and future research. *Quality Management Journal*, 21(4), 36–61.

- Assarlind, M., Gremyr, I., & Backman, K. (2012) Multi-faceted views on a Lean Six Sigma application. *International Journal of Quality & Reliability Management*, 22(3), 21–30.
- Barbuto, J. E. (1997). Taking the charisma out of transformational leadership. *Journal of Social Behavior & Personality*, 12, 689–697.
- Barbuto, J. E. & Wheeler, D. W. (2006). Scale development and construct clarification of servant leadership. *Group and Organization Management*, 31(3), 300–326.
- Barnard, C. I. (1938). *The functions of the executive*. Cambridge, MA: Harvard University Press.
- Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York, NY: Free Press.
- Bass, B. M. (1990). From transactional to transformational leadership: learning to share the vision. *Organizational Dynamics*, 18(3), 19–31.
- Bendell, T. (2006). A review and comparison of Six Sigma and the Lean organisations. *The TQM Magazine*, 18(3), 255–262.
- Bhasin, S. (2012a), “An appropriate change strategy for lean success”, *Management Decision*, Vol. 50 No. 3, pp. 439-458.
- Bhasin, S. (2012b), “Prominent obstacles to lean”, *International Journal of Productivity and Performance Management*, Vol. 61 No. 4, pp. 403-425.
- Blau, P. M. (1964). *Exchange and power in social life*. New York, NY: Wiley.
- Bronson, D. E. & Davis, T.S. (2012). *Finding and evaluating evidence: systematic reviews and evidence-based practice*. New York, NY: Oxford University Press.
- Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.

- Bushe, G. R. (1988) “Cultural contradictions of statistical process control in American manufacturing organizations”, *Journal of Management*, Vol. 14, pp. 19–31
- Chakravorty, S. & Shah, A. (2012). Lean Six Sigma (LSS): an implementation experience. *European Journal of Industrial Engineering*, 6(1), 118–137.
- Chen, M. & Lyu, J. (2009). A Lean Six Sigma approach to touch panel quality improvement. *Production Planning & Control*, 20(5), 445–454.
- Collins, J. (2001a). *Good to great*. New York, NY: HarperCollins.
- Collins, J. (2001b). Level 5 leadership: the triumph of humility and fierce resolve. *Harvard Business Review*, 79(1), 66–76.
- Crossan, M., Vera, D., & Nanjad, L. (2008). Transcendent leadership: strategic leadership in dynamic environments. *The Leadership Quarterly*, 19(5), 569–581.
- Deming, W. E. (1994) “Leadership for quality”, *Executive Excellence*, Vol. 11, No. 6, pp. 3–5
- Dennis, R. S. & Bocarnea, M. (2005). Development of a servant leadership assessment instrument. *Leadership & Organization Development Journal*, 26(8), 600–615.
- Dixon-Woods, M., Bonas, S., Booth, A., Jones, D., Miller, D., & Sutton, A. (2006). How can systematic reviews incorporate qualitative research? A critical perspective. *Qualitative Research* 6(1), 27–44.
- Eckes, G. (2000) *The Six Sigma Revolution*, John Wiley and Sons, New York, NY
- Fiedler, F. E. (1967). *A theory of leadership effectiveness*. New York, NY: McGraw-Hill.
- Forker, L. B. (1991), “Quality: American, Japanese, and Soviet perspectives”, *The Executive*, Vol. 5, No. 4, pp. 63-74

- Furrer, O., Thomas, H., & Goussevskaia, A. (2008). The structure and evolution of the strategic management field: a content analysis of 26 years of strategic management research. *International Journal of Management Reviews*, 10(1), 1–23.
- Gardiner, J. J. (2006). Transactional, transformational, and transcendent leadership: metaphors mapping the evolution of the theory and practice of governance. *Leadership Review*, 6, 62–76.
- Goleman, D., Boyatzis, R., & McKee, A. (2002) *The new leaders: transforming the art of leadership*. Harvard Business Review Press.
- Goodwin, V. L., Wofford, J. C., & Whittington, J. L. (2001). A theoretical and empirical extension to the transformational leadership construct. *Journal of Organizational Behavior*, 22, 759–774.
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: systematic review and recommendations. *Millbank Quarterly*, 82, 581–620.
- Greenleaf, R. (1970). *The servant as a leader*. Indianapolis, IN: Greenleaf Center.
- Greenleaf, R. (1977). *Servant leadership: a journey into the nature of legitimate power greatness*. Paulist Press.
- Hardeman, J. & Goethals, P. L. (2011). A case study: applying Lean Six Sigma concept to design more efficient airfoil extrusion shimming process. *International Journal of Six Sigma and Competitive Advantage*, 6(3), 173–196.
- Hersey, P. & Blanchard, K. H. (1988). *Management of organizational behavior: utilizing human resources* (5th ed.). Englewood Cliffs, NJ: Prentice Hall.

- Hilton, R.J. and Sohal, A. (2012), “A conceptual model for the successful deployment of Lean Six Sigma”, *International Journal of Quality & Reliability Management*, Vol. 29 No. 1, pp. 54-70.
- Hofstede, G. (1977). *Culture and organizations: software of the mind*. New York, NY: McGraw-Hill.
- House, R. J. (1977). A 1976 theory of charismatic leadership. In J. G. Hunt & L. L. Larson (Eds.), *Leadership: the cutting edge* (pp. 189–207). Carbondale, IL: Southern Illinois University Press.
- House, R. J., Javidan, M., & Dorfman, P. (2001). Project Globe: an introduction. *Applied Psychology: An International Review*, 50, 489–505.
- House, R. J. & Podsakoff, P. (1994). Leadership effectiveness: past perspectives and future research. In *Organizational behavior: the state of the science* (pp. 45–82). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Huang, X., Iun, J., Liu, A., & Gong, Y. (2010) Does participative leadership enhance work performance by inducing empowerment or trust? The differential effects on managerial and non-managerial subordinates. *Journal of Organizational Behavior*, 31(1), 122–143.
- Ilies, R., Gerhardt, M. W., & Le, H. (2004). Individual differences in leadership emergence: integrating meta-analytic findings and behavioural genetics estimates. *International Journal of Selection and Assessment*, 12(3), 207–219.
- Isaac, R. G., Zerbe, W. J., & Pitt, D. C. (2001). Leadership and motivation: the effective application of expectancy theory. *Journal of Management Issues*, 13, 212–226.
- Judge, T. A. & Piccolo, R. F. (2004) Transformational and transactional leadership: a meta-analytic test of their relative validity. *Journal of Applied Psychology*, 89(5), 755–768.

- Juran, J. M. (1989) *Juran on leadership for quality: an executive handbook*, New York: Free Press
- Kanungo, R. N. (1998). Leadership in organizations: looking ahead to the 21st century. *Canadian Psychology*, 39, 71–82.
- Kerr, S. et al. (1974). Towards a contingency theory of leadership based upon the consideration and initiating structure literature. *Organizational Behavior and Human Performance*, 12, 62–82.
- Kirkpatrick, S. A. & Locke, E. A. (1991). Leadership: do traits matter? *The Executive*, 5(2), 48–60.
- Kotter, J. P. (1996). *Leading change*. Boston, MA: Harvard Business Press.
- Kotter, J. P. (2008). *A sense of urgency*. Boston, MA: Harvard Business Press.
- Kouzes, J. M. & Posner, B. Z. (1987). *The leadership challenge*. San Francisco, CA: Jossey-Bass.
- Kull, T. J., Yan, T., Lio, Z., & Walker, J. G. (2014). The moderation of lean manufacturing effectiveness by dimensions of national culture: testing practice-culture congruence hypotheses. *International Journal of Production Economics*, 153, 1–12.
- Kumar, M., Antony, J., Singh, R. K., Tiwari, M. K., & Perry, D. (2006). Implementing the Lean Six Sigma framework in an Indian SME: a case study. *Production Planning & Control*, 17(4), 407–423.
- Laureani, A. & Antony, J. (2012). Standards for Lean Six Sigma certification. *International Journal of Productivity and Performance Management*, 61(1), 110–120.
- Lee, L. & Wei, C. (2009). Reducing mold changing time by implementing Lean Six Sigma. *Quality & Reliability Engineering International*, 26(4), 387–395.

- Lewin, K., Lippitt, R., & White, R. K. (1939). Patterns of aggressive behavior in experimentally created social climates. *Journal of Social Psychology, 10*, 271–301.
- Liden, R. C., Wayne, S. J., Zhao, H., & Henderson, D. (2008). Servant leadership: development of a multidimensional measure and multi-level assessment. *Leadership Quarterly, 19*(2), 161–177.
- Liker, J., 2003, *The Toyota way*, 1st ed. New York, NY: McGraw-Hill
- Martinez-Jurado, P.J. and Moyano-Fuentes, J. (2012), “Key determinants of lean production adoption: evidence from the aerospace sector”, *Production Planning & Control: The Management of Operations*, Vol. 25 No. 4, pp. 332-345
- McShane, S. L. & Von Glinow, M. A. (2008). *Organizational behavior* (4th ed.) (p. 402s). New York, NY: McGraw-Hill.
- Meier, K. J. (1989). Bureaucratic leadership in public organizations. In *Leadership and politics: new perspectives in political science* (pp. 267–288). Lawrence, KS: University Press of Kansas.
- Meindl, J. R. (1990). On leadership: an alternative to the conventional wisdom. *Research in Organizational Behavior, 12*, 159–203.
- Northouse, P. G. (2004). *Leadership: theory and practice* (3rd ed.) (ch. 4). Thousand Oaks, CA: Sage.
- Pande, P. S. (2007). *The Six Sigma leader*. New York, NY: McGraw-Hill.
- Pepper, M. P. J. (2007) *A supply chain improvement methodology for the process industries* (unpublished doctoral dissertation). University of Wollongong, Australia.
- Pepper, M. P. J. & Spedding, T. A. (2010) The evolution of Lean Six Sigma. *International Journal of Quality & Reliability Management, 27*(2), 138–155.

- Petticrew, M. & Roberts, H. (2006). *Systematic reviews in the social sciences: a practical guide*. Malden, MA: Blackwell Publishing.
- Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence. *International Journal Management Reviews*, 5/6, 137–168.
- Podsakoff, P. M., MacKenzie, S. B., Bachrach, D., & Podsakoff, N. P. (2005). The influence of management journals in the 1980s and 1990s. *Strategic Management Journal*, 26(5), 473–488.
- Podsakoff, P. M., Bommer, W. H., Podsakoff, N. P., & MacKenzie, S. B. (2006). Relationship between leader reward and punishment behavior and subordinates attitudes, perceptions, and behaviors: a meta-analytic review of existing and new research. *Organizational Behavior and Human Decision Processes*, 99(2), 113–142.
- Russell, R. & Stone, G. A. (2002). A review of servant leadership attributes: developing a practical model. *Leadership & Organization Development Journal*, 23(3), 145–157.
- Salah, S., Rahim, A., & Carretero, J. (2010) The integration of Six Sigma and Lean Management. *International Journal of Lean Six Sigma*, 1(3), 249–274.
- Sashkin, M. (1976). Changing toward participative management approaches: a model and methods. *Academy of Management Review*, 1(3), 75–86.
- Schein, E. H. (1983) “The role of the founder in creating organizational culture”, *Organizational Dynamics*, Vol. 12, pp. 13–28
- Schriesheim, C. A. (1982). The great high consideration: high initiating structure leadership myth: evidence on its generalizability. *The Journal of Social Psychology*, 116, 221–228.

- Schriesheim, C. A. (1997). Substitutes for leadership theory: development and basic concepts. *Leadership Quarterly*, 8, 103–108.
- Sendjaya, S., Sarros, J. C., & Santora, J. C. (2008) Defining and measuring servant leadership behaviour in organizations. *Journal of Management Studies*, 45(2), 402–424.
- Sheridan, J. H. (2000). Lean Six Sigma synergy. *Industry Week*, 249(17), 81–82.
- Snee, R. D. (1999). Why should statisticians pay attention to Six Sigma? *Quality Progress*, 32(9), 100–103.
- Snee, R. D. (2010). Lean Six Sigma: getting better all the time. *International Journal of Lean Six Sigma*, 1(1), 9–29.
- Snee, R. D. & Hoerl, R. W. (2007). Integrating Lean and Six Sigma: a holistic approach. *ASQ Six Sigma Forum Magazine*, 6(3), 15–21.
- Spears, L. C. & Lawrence, M. (2002). *Focus on leadership: servant leadership*. New York, NY: John Wiley & Sons.
- Stodgill, R. M. (1989). *Stodgill's handbook of leadership: a survey of theory and research*. In B. M. Bass (Ed.). New York, NY: Free Press.
- Suresh, S., Antony, J., Kumar, M. and Douglas, A. (2012), “Six Sigma and leadership: some observations and agenda for future research”, *The TQM Journal*, Vol. 24 No. 3, pp. 231-247.
- Tannenbaum, A. S. & Schmitt, W. H. (1958). How to choose a leadership pattern. *Harvard Business Review*, 36, 95–101.
- Thomas, A., Barton, R., & Okafor, C. (2009). Applying Lean Six Sigma in a small engineering company: a model for change. *Journal of Manufacturing Technology Management*, 20(1), 113–129.

- Thomas, A. J., Rowlands, H., Byard, P., & Rowland-Jones, R. (2008) 'Lean Six Sigma: an integrated strategy for manufacturing sustainability. *International Journal of Six Sigma and Competitive Advantage*, 4(4), 333–354.
- Thorpe, R., Holt, R., MacPherson, A., & Pittaway, L. (2005). Using knowledge within small and medium-sized firms: a systematic review of the evidence. *International Journal of Management Reviews*, 7, 257–281.
- Timans, W., Antony, J., Ahaus, K., & Solingen, R. (2012). Implementation of Lean Six Sigma in small and medium-sized manufacturing enterprises in the Netherlands. *Journal of Operational Research Society*, 63(3), 339–353.
- Tranfield, D., Denyer, D., & Smart, P. (2002). *Undertaking research: developing an evidence-based approach for management research* (conference paper). Academy of Management, Denver, CO.
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14, 207–222.
- Van Dierendonck, D. & Nuijten, I. (2011). The servant leadership survey: development and validation of a multi-dimensional measure. *Journal of Business Psychology*, 26(3), 249–267.
- Vinodh, S., Kumar, S. V., & Vimal, K. E. K. (2012). Implementing Lean Six Sigma in an Indian rotary switches manufacturing organization. *Production Planning & Control*, 25(4), 1–15.
- Weber, M. (1905). *The Protestant ethic and the spirit of capitalism and other writings*. New York, NY: Penguin Group.

Waldman, D. A. (1993) “A theoretical consideration of leadership and total quality management”, *Leadership Quarterly*, Vol. 4, No. 1, pp. 65–79

Waldman, D. A. et al. (1998) “A qualitative analysis of leadership and quality improvement”, *Leadership Quarterly*, Vol. 9, No. 2, pp. 177–201

Womack, J. P. & Jones, D. T. (1996). *Lean thinking*. New York, NY: Simon & Schuster.

Yukl, G. A. (2006). *Leadership in organizations* (6th ed.) (ch. 3). Upper Saddle River, NJ: Pearson Education.

Zhang, Q., Irfan, M., Khattak, M., Zhu, X. & Hassan, M. (2012), “Lean Six Sigma: A Literature Review”, *Interdisciplinary Journal of Contemporary Research in Business*, Vol. 3, No. 10, pp. 599-605

## Appendix - article database reference listing

1. Aboelmaged, M. G. (2010) "Six Sigma quality: a structured review and implications for future research", *International Journal of Quality & Reliability Management*, Vol. 27, No. 3, pp. 268-317
2. Aboelmaged, M. G. (2011) "Reconstructing Six Sigma barriers in manufacturing and service organizations: the effects of organizational parameters", *International Journal of Quality & Reliability Management*, Vol. 28, No. 5, pp. 519-541
3. Aherne, J. (2007) "Think Lean", *Nursing Management*, Vol. 13, No. 10, pp. 13-15
4. Ahmed, P. K., Loh, A. Y. & Zairi, M. (1999) "Cultures for continuous improvement and learning", *Total Quality Management*, Vol. 10, No. 4/5, pp. 426-434
5. Aldwell, C. (2006) "A high quality of care: in health systems, achieving strategic results using lean Six Sigma demands strong leadership", *IEEE Engineering Management Review*, Vol. 34, No. 1, pp. 15
6. Alukal, G. (2006) "Keeping Lean alive", *Quality Progress*, Vol. 39, No. 10, pp. 67-69
7. Angelis, J., Conti, R., Cooper, C. & Gill, C. (2011) "Building a high-commitment lean culture", *Journal of Manufacturing Technology Management*, Vol. 22, No. 5, pp. 569-586
8. Anonymous (2007) "Why aren't we all lean?", *Management Services*, Vol. 51, No. 4, pp. 11-13
9. Anonymous, (2006) "Lean success improves line-transfer strategy", *Quality*, Vol. 45, No. 3, p. 52-53
10. Antony, J. & Banuelas, R. (2002) "Key ingredients for the effective implementation of Six Sigma program", *Measuring Business Excellence*, Vol. 6, No. 4, pp. 20-27
11. Antony, J. (2007) "Is Six Sigma a management fad or fact?", *Assembly Automation*, Vol. 27, No. 1, pp. 17-19
12. Antony, J. (2011) "Six Sigma vs Lean: Some perspectives from leading academics and practitioners", *International Journal of Productivity and Performance Management*, Vol. 60, No. 2, pp. 185-190
13. Antony, J. et. al. (2007) "Six Sigma in service organizations. Benefits, challenges and difficulties, common myths, empirical observations and success factors". *International Journal of Quality and Reliability Management*, Vol. 24, No. 3, pp. 294-311
14. Antony, J., Kumar, M. & Cho, B. R. (2007) "Six Sigma in services organizations – benefits, challenges and difficulties, empirical observations and success factors", *International Journal of Quality & Reliability Management*, Vol. 24, No. 3, pp. 294-311
15. Antony, S., Antony, J. (2014), "The leadership conundrum: the challenges of effective leadership in businesses using Lean Six Sigma", *Quality World*, Vol. 4, No. 1, pp. 40
16. Bäckström, I., Larsson, J. & Wiklund, H. (2009) "Are healthy and successful organizations working accordingly to quality management?", *International Journal of Workplace Health Management*, Vol. 2, No. 3, pp. 245-257
17. Berggren, C. (1993) "Lean production – the end of history?", *Work, Employment and Society*, Vol. 7, No. 2, pp. 163-188
18. Bernett, R. & Nentl, N. (2010) "Opinions and expectations about continuous improvement" *The Journal for Quality and Participation*, Vol. 32, No. 4, pp. 35-38
19. Bhalla, A. (2009) "The right mix: avoid these six common mistakes when melding Lean with Six Sigma, and your organization will reach its goals more easily", *Quality Progress*, Vol. 42, No. 5, pp. 32-37

20. Blakeslee, J. A. (1999) "Implementing the Six Sigma solution", *Quality Progress*, Vol. 32, No. 7, pp. 77-85
21. Boyle, T. A., Scherrer-Rathje, M. & Stuart, I. (2011) "Learning to be Lean: the influence of external information sources in lean improvements", *Journal of Manufacturing Technology Management*, Vol. 22, No. 5, pp. 587-603
22. Brady, J. E. & Allen, T. T. (2006) "Six Sigma literature: a review and agenda for future research", *Quality and Reliability Engineering International*, Vol. 22, No. 3, pp. 335-367
23. Braglia, M., Fantoni, G. & Frosolini, N. (2007) "The house of reliability", *International Journal of Quality & Reliability Management*, Vol. 24, No. 4, pp. 420-440
24. Braunscheidel, M. J. et al. (2011) "An institutional theory perspective on Six Sigma adoption", *International Journal of Operations & Production Management*, Vol. 31, No. 4, pp. 423-451
25. Breyfogle, F. W. (2009) "Next generation management: going beyond lean Six Sigma and the balance scorecard", *Industrial Engineer – Norcross*, Vol. 41, No. 12, pp. 24-29
26. Brown, C. B., Collins, T. R. & McCombs, E. L. (2006) "Transforming from batch to lean manufacturing: the performance issues", *Engineering Management Journal*, Vol. 18, No. 2, pp. 3-13
27. Carnell, M. (2009) "Smart Talk: use common language to communicate Six Sigma effectively", *Quality Progress*, Vol. 42, No. 4, pp. 66-67
28. Carnell, M. (2009) "Too Little, Too Late", *ASQ Six Sigma Forum Magazine*, Vol. 8, No. 3, pp. 31-33
29. Carter, A. (2012) "In Healthcare Quality, Improvement starts with Passionate Leadership", *Home Healthcare Nurse*, Vol. 30, No. 4, pp. 263-264
30. Carter, M.Z., Armenakis, A.A., Feild, H.S., Mossholder, K.W. (2013) "Transformational leadership, relationship quality, and employee performance during continuous incremental organizational change", *Journal of Organizational Behavior*, Vol. 34, No. 7, pp. 942-958
31. Casey, J. (2015) "Lean Leadership: Coaching to Connect the Dots", *Strategic Finance*, Vol. 96, No. 11, pp. 23
32. Casey, J. (2015) "Lean Leadership: Sustaining Long-Term Process Change", *Strategic Finance*, Vol. 96, No. 8, pp. 15
33. Chakravorty, S. S. (2009) "Six Sigma programs: an implementation model", *International Journal of Production Economics*, Vol. 119, No. 1, pp.
34. Chakravorty, S. S. (2009) "Six Sigma failures: An escalation model", *Operations Management Research*, Vol. 2, No. 1-4, pp. 44-55
35. Chau, K. Y., Liu, S. & Ip, W. H. (2009) "Enhancing enterprise information integration using Six Sigma", *Total Quality Management & Business Excellence*, Vol. 20, No. 5, pp. 537-546
36. Conti, T. (2010) "System thinking in quality management", *The TQM Journal*, Vol. 22, No. 4, pp. 352-368
37. Cooper, N. P. & Noonan, P. (2003) "Do teams and Six Sigma go together", *Quality Progress*, Vol. 36, No. 6, pp. 25-28
38. Coronado, R. B. & Antony, J. (2002) "Critical success factors for the successful implementation of six sigma projects in organizations", *The TQM Magazine*, Vol. 14, No. 2, pp. 92-99
39. Creasy, T. (2009) "Pyramid Power: Could a new method combining Lean Six Sigma with the theory of constraints become the next wonder of the quality world?", *Quality Progress*, Vol. 42, No. 6, pp. 40-45

40. Cronemyr, P., Eriksson, M., Jakolini, S. (2014) "Six Sigma diplomacy-the impact of Six Sigma on national patterns of corporate culture", *Total Quality Management & Business Excellence*, Vol. 25, No. 7-8, pp. 827-841
41. Dale, B. G. & Lightburn, K. (1992) "Continuous quality improvement: why some organizations lack commitment". *International Journal of Production Economics*, Vol. 27, No. 1, pp. 57-67
42. DeBusk, G. K. & DeBusk, C. (2010) "Characteristics of Successful Lean Six Sigma Organizations", *Cost Management*, Vol. 24, No. 1, pp. 5-10
43. Dibia, K., Nath Dhakal, H., Onuh, S. (2014) "Lean "Leadership People Process Outcome" (LPPO) implementation model", *Journal of Manufacturing Technology Management*, Vol. 25, No. 5, pp. 694-711
44. Dombrowski, U., Mielke, T. (2014) "Lean Leadership-15 Rules for a Sustainable Lean Implementation", *Procedia CIRP*, Vol. 17, pp. 565-570
45. Douglas, A. et al. (2009) "Enhancing the Six Sigma problem-solving methodology using the systems thinking methodologies", *International Journal of Six Sigma and Competitive Advantage*, Vol. 5, No. 2, pp. 144-155
46. Easton, G.S. (2015) "Team leader experience in improvement teams: A social network perspective", *Journal of Operations Management*, Vol. 37, pp. 13-30
47. Edgerman, R. L. & Bigio, D. I. (2004) "Six Sigma in Metaphor: heresy or holy writ?", *Quality Progress*, Vol. 37, No. 1, pp. 25-30
48. Emiliani, M. L. & Stec, D. J. (2004) "Using Value Stream Maps to improve leadership", *Leadership and Organization Development Journal*, Vol. 25, No. 8, pp. 622-645
49. Emiliani, M. L. & Stec, D. J. (2005) "Leaders lost in transformation", *Leadership and Organization Development Journal*, Vol. 26, No. 5, pp. 370-387
50. Emiliani, M. L. (1998) "Continuous Personal Improvement", *Journal of Workplace Learning*, Vol. 10, No. 1, pp. 29-38
51. Emiliani, M. L. (1998) "Lean Behaviors", *Management Decision*, Vol. 36, No. 9, pp. 615-631
52. Emiliani, M. L. (2003) "Linking leaders' beliefs to their behaviors and competencies", *Management Decision*, Vol. 41, No. 9, pp. 893-910
53. Emiliani, M. L. (2008) "Standardized work for executive leadership", *Leadership and Organization Development Journal*, Vol. 29, No. 1, pp. 24-46
54. Fairfield-Sonn, J. W. (1999) "Influence of context on process improvement teams: leadership from a distance" *Journal of Business and Economic Studies*, Vol. 5, No. 2, pp. 47-66
55. Fleming, J. H., Coffman, C. & Harter, J. K. (2005) "Manage your human sigma". *Harvard Business Review*, July-August 2005, pp. 107-114
56. Flinchbaugh, J. (2003) "Lean: not just a better toolbox", *Manufacturing Engineering*, Vol. 130, No. 2, p. 96
57. Flinchbaugh, J. (2007) "Lean is born from how we think", *Products Finishing*, Vol. 71, No. 9, pp. 34-38
58. Flinchbaugh, J. (2008) "Connecting lean and organisational learning", *Management Services*, Vol. 52, No. 3, pp. 33-39
59. Fraser, N. & Fraser, J. (2009) "Lean Six Sigma applied to supply chains within a services organisation – a practical solution", *International Journal of Knowledge and Learning*, Vol. 5, N. 1, pp. 62-80

60. Frater, M. (2005) "No Time, No Money? Get Lean", *Journal of Housing and Community Development*, Vol. 62, No. 6, pp. 6-12
61. Freiesleben, J. (2007) "Can Six Sigma claim to be a generic strategy? Reassessing the competitive implications of quality improvement". *International Journal of Six Sigma and Competitive Advantage*, Vol. 3, No. 3, pp. 248-265
62. Galli, B., Handley, H. (2014) "The right approach to Six Sigma leadership", *Industrial Management*, Vol. 56, No. 3, pp. 25-30
63. Gelei, A., Losonci, D. & Matyusz, Z. (2015) "Lean production and leadership attributes-the case of Hungarian production managers", *Journal of Manufacturing Technology Management*, Vol. 26, No. 4, pp. 477-500
64. Gijo, E.V. & Rao, T. S. (2005) "Six Sigma Implementation – hurdles and more hurdles". *Total Quality Management*, Vol. 16, No. 6, pp. 721-725
65. Gillam, S., Siriwardena, A.N. (2013) "Leadership and management for Quality", *Quality in Primary Care*, Vol. 21, No. 4, pp. 253-260
66. Goh, T. N. (2002) "A strategic assessment of Six Sigma", *Quality and Reliability Engineering International*, Vol. 18, No. 5, pp. 403-410
67. Goh, T. N. (2011) "Six Sigma in Industry: some observations after twenty-five years", *Quality and Reliability Engineering International*, Vol. 27, No.2, pp. 221-227
68. Goodridge, D., Westhorp, G., Rotter, T., Dobson, R., Bath, B. (2015) "Lean and leadership practices: development of an initial realist program theory", *BMC Health Services Research*, Vol. 15: 362
69. Green, R. A. (2001) "Seeking Six Sigma standardization", *Quality Digest*, August 2001, pp. 49-52
70. Guarraia, P. et al. (2009) "Six Sigma - at your service", *Business Strategy Review*, Vol. 20, No. 2, pp. 56-61
71. Gutierrez, L. J., Llorens-Montes, F. J. & Sanchez, O. F. (2009) "Six sigma: from a goal-theoretic perspective to shared-vision development", *International Journal of Operations & Production Management*, Vol. 29, No. 2, pp. 151-169
72. Halling, B., Renstrom, J. (2014) "Lean Leadership: a matter of dualism", *International Journal of Human Resources Development and Management*, Vol. 14, No. 4, pp. 242-253
73. Harry, M. & Crawford, D. (2005) "Six Sigma – The Next Generation", *Machine Design*, Vol. 77, No. 4, pp. 126-131
74. Harry, M. J. (1998) "Six Sigma: a breakthrough strategy for profitability", *Quality Progress*, Vol. 31, No. 5, pp. 60-65
75. He, Z. (2009) "Progress Report: A new scoring method lets you assess the maturity of your Six Sigma program and evaluate its strengths and weaknesses", *Quality Progress*, Vol. 42, No. 8, pp. 22-29
76. He, Z., Goh, T.N. (2015) "Enhancing the Future Impact of Six Sigma Management", *Quality technology & quantitative measurement*, Vol. 12, No. 1, pp. 83-92
77. Hilton, R.J., Sohal, A. (2012) "A conceptual model for the successful deployment of Lean Six Sigma", *International Journal of Quality & Reliability Management*, Vol. 29, No. 1, pp. 54-70
78. Hoerl, R. W. (2001) "Six Sigma Black Belts: what they need to know", *Journal of Quality Technology*, Vol. 33, No. 4, pp. 391-406
79. Howard, L., Forster, S.T. & Shannon, P. (2005) "Leadership, perceived team climate and process improvement in municipal government". *International Journal of Quality and Reliability*

80. Ingelsson, P., Martensson, A. (2014) "Measuring the impact and practices of Lean values", *The TQM Journal*, Vol. 26, No. 5, pp. 463-474
81. Ingle, S. & Roe, W. (2001) "Six Sigma Black Belt Implementation", *The TQM Magazine*, Vol. 13, No. 4, pp. 273-280
82. Irani, Z., Beskese, A. & Love, P. E. D. (2004) "Total Quality Management and corporate culture: constructs for organizational excellence", *Technovation*, Vol. 24, No. 8, pp. 643-650
83. Jain, S. (2005) "Lean Thinking-Indeed", *Siliconindia*, Vol. 9, No. 5, pp. 36-37
84. Jing, G. G. (2009) "A Lean Six Sigma breakthrough: overcome the obstacles of integrating Lean and Six Sigma by using a tier-based, mutually inclusive model", *Quality Progress*, Vol. 42, No. 5, pp. 24-31
85. Jobin, M.V. (2015) "Employee Involvement and Management Commitment in Lean Implementation", *Applied Mechanics and Materials*, Vol. 813-814, pp. 1150-1153
86. Johannsen, F. & Leist, S. (2009) "A Six Sigma approach for integrated solutions", *Managing Service Quality*, Vol. 19, No. 5, pp. 558-580
87. Johnston, A. B., Maguire, L. P. & McGinnity, T. M. (2009) "Downstream performance prediction for a manufacturing system using neural networks and six-sigma improvement techniques", *Robotics and Computer Integrated Manufacturing*, Vol. 25, No. 3, pp. 513-521
88. Kaye, M. & Anderson, R. (1999) "Continuous Improvement: the ten essential criteria", *International Journal of Quality & Reliability Management*, Vol. 16, No. 5, pp. 485-506
89. Kearns, D. T. (1990) "Leadership through Quality", *Academy of Management Executive*, Vol. 4, No. 2, pp. 86-89
90. Kelly, W. (2007) "Lean Six Sigma Deployment: 7 stumbling blocks to overcome". *ASQ Six Sigma Forum Magazine*, Vol. 6, No. 4, pp. 16-21
91. Klefsjö, B., Wiklund, H. & Edgeman, R. L. (2001) "Six Sigma seen as a methodology for total quality management", *Measuring Business Excellence*, Vol. 5, No. 1, pp. 31-35
92. Koltzenburg, T. (2004) "The latitudes of Lean", *American Printer*, Vol. 233, No. 5, pp. 64-66
93. Kuei, C. & Madu, C. N. (2003) "Customer-centric Six Sigma quality and reliability management", *International Journal of Quality & Reliability Management*, Vol. 20, No. 8/9, pp. 954-964
94. Kumar, M. et al. (2008) "Common myths of Six Sigma demystified", *International Journal of Quality & Reliability Management*, Vol. 25, No. 8, pp. 878-895
95. Kwak, Y.H. & Anbai, F.T. (2006) "Benefits, obstacles, and future of six sigma approach". *Technovation*, Vol. 26, pp. 708-715
96. Ladkin, D. (2008) "Leading beautifully: how mastery, congruence and purpose create the aesthetic of embodied leadership practice", *Leadership Quarterly*, Vol. 19, No. 1, pp. 31-41
97. Lane, G. (2008) "Lean made your way", *Industrial Engineering*, Vol. 40, No. 2, pp. 34-38
98. Latham, J.R. (2014) "Leadership for Quality and Innovation: Challenges, Theories, and a Framework for Future Research", *Quality Management Journal*, Vol. 21, No. 1, pp. 11-15
99. Laureani, A., Antony, J. (2012) "Critical success factors for the effective implementation of Lean Sigma", *International Journal of Lean Six Sigma*, Vol. 3, No. 4, pp. 274-283

100. Laureani, A., Antony, J. (2015) "Leadership characteristics for Lean Six Sigma", *Total Quality Management & Business Excellence*, 1-22
101. Lucey, J., Bateman, N. & Hines, P. (2005) "Why major lean transitions have not been sustained", *Management Services*, Vol. 49, No. 2, pp. 9-13
102. Lyth, D. M. & Mallak, L. A. (1998) "'We're not in Kansan anymore, Toto' or Quality Lessons from the land of OZ", *Quality Engineering*, Vol. 10, No. 3, pp. 579-588
103. Mader, D. P. (2008) "Lean Six Sigma's evolution", *Quality Progress*, Vol. 41, No. 1, pp. 40-48
104. Mann, D. (2009) "The missing link: Lean leadership", *Frontiers of Health Service Management*, Vol. 26, No. 1, pp. 15-26
105. McAdam, R. & Evans, A. (2004) "The organizational contextual factors affecting the implementation of Six Sigma in a high technology mass-manufacturing environment". *International Journal of Six Sigma and Competitive Advantage*, Vol. 1, No. 1, pp. 29-43
106. McAdam, R. et al. (2009) "Customer-orientated Six Sigma in call centre performance measurement", *International Journal of Quality & Reliability Management*, Vol. 26, No. 6, pp. 516-545
107. McFadden, K.L., Stcok, G.N., Gowen III, C.R. (2015) "Leadership, safety climate, and continuous improvement: Impact on process quality and patient safety", *Health Care Management Review*, Vol. 40, No. 1, pp. 24-34
108. McKellen, C. (2005) "Lean and Six Sigma", *Metalworking Production*, Vol. 149, No. 7, p. 16
109. McManus, K. (2008) "Did it really work", *Industrial Engineer*, Vol. 40, No. 7, p. 18
110. Meyerson, D. E. (2001) "Radical change, the quiet way", *Harvard Business Review*, October 2001
111. Milivojevich, A. (2006) "Emotional Intelligence and Six Sigma", *Quality Progress*, Vol. 39, No. 8, pp. 45-49
112. Moe, Jeffrey L. (1995) "What does "employee involvement" mean?". *Quality Progress*, Vol. 28, No. 7, pp. 67-72
113. Montgomery, D. C. & Woodall, W. H. (2008) "An overview of Six Sigma", *International Statistical Review*, Vol. 76, No. 3, pp. 329-346
114. Morrow, E., Robert, G., Maben, J. (2014) "Exploring the nature and impact of leadership on the local implementation of The Productive Ward Releasing Time to Care™", *Journal of health organization and management*, Vol. 28, No. 2, pp. 154-176
115. Mullenhour, P. (2006) "Process improvement through the generations", *Manufacturing Engineering*, Vol. 136, No. 6, p. 112
116. Murphy, S. A. (2009) "Leveraging Lean Six Sigma to Culture, Nurture, and Sustain Assessment and Change in the Academic Library Environment", *College and Research Libraries*, Vol. 70, No. 3, pp. 215-226
117. Natarajan, R. N., Morse, J. (2009) "Six Sigma in services - challenges and opportunities", *International Journal of Productivity and Quality management*, Vol. 4, No. 5/6, pp. 658-675
118. Nave, D. (2002) "How to compare Six Sigma, lean and the theory of constraints", *Quality Progress*, Vol. 35, No. 3, pp. 73-78
119. Ninomiya, J. S. (1988) "Wagon Masters and Lesser Managers", *Harvard Business Review*, Vol. 66, No. 2, pp. 84-90

120. Nonthaleerak, P. & Hendry, L.C. (2006) "Six Sigma: literature review and key future research areas". *International Journal of Six Sigma and Competitive Advantage*, Vol. 2, No. 2, pp. 105-161
121. Noone, B. F., Namasivayam, K. & Tomlinson, H. (2010) "Examining the application of Six Sigma in the service exchange", *Managing Service Quality*, Vol. 20, No. 3, pp. 273-293
122. Oliver, J. (2009) "Continuous improvement: role of organisational learning mechanisms", *International Journal of Quality & Reliability Management*, Vol. 26, No. 6, pp. 546-563
123. Pamfilie, R., Petcu, A.J., Draghici, M. (2012) "The importance of leadership in driving a strategic Lean Six Sigma management", *Procedia-Social and Behavioral Sciences*, Vol. 58, pp. 187-196
124. Pepper, M.P.J. & Spedding, T.A. (2010) "The evolution of Lean Six Sigma", *International Journal of Quality & Reliability Management*, Vol. 27, No. 2, pp. 138-155
125. Pisani, M. J., Hayes, R., Kumar, A. & Lepisto, L. (2009) "Is Six Sigma culture bound? A conceptual model and propositions for further inquiry", *Total Quality Management & Business Excellence*, Vol. 20, No. 10, pp. 1123-1137
126. Prabhushankar, G. V., Devadasan, S. R., Shalij, P. R. & Thirunavukkarasu, V. (2008) "The origin, history and definition of Six Sigma: a literary review". *International Journal of Six Sigma and Competitive Advantage*, Vol. 4, No. 2, pp. 133-150
127. Prajogo, D. I. & McDermott, C. M. (2005), "The relationship between total quality management practices and organizational culture", *International Journal of Operations & Production Management*, Vol. 25, No. 11, pp. 1101-1122
128. Quarterman, L. (2007) "Implementing Lean Manufacturing", *Management Services*, Vol. 51, No. 3, pp. 14-19
129. Rajamanoharan, I. D. & Collier, P. (2006) "Six Sigma implementation, organizational change and the impact on performance measurement systems". *International Journal of Six Sigma and competitive advantage*, Vol. 2, No. 1, pp. 48-68
130. Ready, D. A. (2004) "Leading at the enterprise level", *MIT Sloan Management Review*, Spring 2004, pp. 87-91
131. Reidenbach, R. E. & Goeke, R. W. (2007) "Six Sigma, value and competitive strategy", *Quality Progress*, Vol. 40, No. 7, pp. 45-49
132. Rich, A. B. (1997) "Continuous improvement: the key to future success", *Quality Progress*, Vol. 30, No. 6, pp. 33-36
133. Ricondo, I. & Viles, E. (2005) "Six Sigma and its link to TQM, BPR, lean and the learning organization". *International Journal of Six Sigma and Competitive Advantage*, Vol. 1, No. 3, pp. 323-354
134. Salah, S., Carretero, J. A. & Rahim, A. (2009) "Six Sigma and Total Quality Management (TQM): similarities, differences and relationship", *International Journal of Six Sigma and Competitive Advantage*, Vol. 5, No. 3, 237-250
135. Schon, K. (2006) "Implementing Six Sigma in a non-American culture". *International Journal of Six Sigma and Competitive Advantage*, Vol. 2, No. 4, pp. 404-428
136. Seddon, J. & Caulkin, S. (2007) "Systems thinking, lean production and action learning", *Action Learning: Research & Practice*, Vol. 4, No. 1, pp. 9-24
137. Senapati, N. R. (2004) "Six Sigma: myths and realities", *International Journal of Quality & Reliability Management*, Vol. 21, No. 6/7, pp. 683-690

138. Shahin, A. & Alinavaz, M. (2008) "Integrative approaches and frameworks of lean Six Sigma: a literature perspective", *International Journal of Process Management and Benchmarking*, Vol. 2, No. 4, pp. 323-337
139. Shanmugaraja, M., Nataraj, M., Gunasekaran, N. (2013) "Total performance excellence - a model for successful implementation of Six Sigma", *International Journal of Procurement Management*, Vol. 6, No. 3, pp. 297-328
140. Singh, B., Garg, S. K. & Sharma, S. K. (2009) "Lean can be a survival strategy during recessionary times", *International Journal of Productivity and Performance Management*, Vol. 58, No. 8, pp. 803-808
141. Sisson, J. (2015) "Achieving success with Lean: an analysis of key factors in Lean transformation at Toyota and beyond", *International Journal of Lean Six Sigma*, Vol. 6, No. 3, pp. 263-280
142. Smith, B. (2003) "Lean and Six Sigma-a one-two punch", *Quality Progress*, Vol. 36, No. 4, pp. 37-41
143. Snee, R. D. & Hoerl, R. W. (2012) "Leadership – Essential for developing the discipline of statistical engineering", *Quality Engineering*, Vol. 24, No. 2, pp. 162-170
144. Snee, R. D. (2001) "Dealing with the Achilles' heel of Six Sigma initiatives", *Quality Progress*, Vol. 34, No. 3, pp. 66-72
145. Snee, R. D. (2004) "Six Sigma: the evolution of 100 years of business improvement methodology". *International Journal of Six Sigma and Competitive Advantage*, Vol. 1, No. 1, pp. 4-20
146. Snee, R. D. (2004) "Weave Six Sigma into the fabric of an organization", *Quality Progress*, Vol. 37, No. 9, pp. 69-72
147. Snee, R. D. (2009) "Digging the holistic approach", *Quality Progress*, Vol. 42, No. 10, pp. 52-54
148. Snee, R. D. (2010) "Lean Six Sigma – getting better all the time", *International Journal of Lean Six Sigma*, Vol. 1, No. 1, pp. 9-29
149. Soti, A., Shankar, R. & Kaushal, O.P. (2010) "Modelling the enablers of Six Sigma using interpreting structural modelling", *Journal of Modeling in Management*, Vol. 5, No. 2, pp. 124-141
150. Soti, A., Shankar, R. & Kaushal, O.P. (2011) "Modelling the barriers of Six Sigma using interpretative structural modelling", *International Journal of Business Excellence*, Vol. 4, No. 1, pp. 94-110
151. Spear, S. & Bowen, H. K. (1999) "Decoding the DNA of the Toyota production system". *Harvard Business Review*, September-October 1999, pp. 96-106
152. Subashini, S., Antony, J., Kumar, M., Douglas, A. (2012) "Six Sigma and leadership: some observations and agenda for future research", *TQM Journal*, Vol. 24, No. 3, pp. 231-247
153. Sui-Pheng, L. & Khoo, S. D. (2001) "Team performance management: enhancement through Japanese 5-S principles", *Team Performance Management*, Vol. 7, No. 7/8, pp. 105-111
154. Sunder, V. (2013) "Six Sigma - a strategy to increase Employee Engagement", *Journal for Quality and Participation*, Vol. 36, No. 2, pp. 34-38
155. Swank., C. (2003) "The Lean Service Machine". *Harvard Business Review*, October 2003, pp. 123-129
156. Takeuchi, H. & Quelch, J. A. (1983) "Quality is more than making a good product", *Harvard Business Review*, Vol. 61, No. 4, pp. 139-145

157. Taner, M. T. & Sezen, B. (2009) "An application of Six Sigma methodology to turnover intentions in health care" *International Journal of Health Care Quality Assurance*, Vol. 22, No. 3, pp. 252-265
158. Thirunavukkarasu, V. et. al. (2008) "Conceptualization of Total Six Sigma function deployment through literature snapshots". *International Journal of Applied Management Science*, Vol. 1, No. 1, pp. 97-122
159. Thomas Foster Jr., S (2007) "Does Six Sigma improve performance?", *The Quality Management Journal*, Vol. 14, No. 4, pp. 7-20
160. Thomas, D. & Bendoly, E. (2009) "Limits to Effective Leadership Style and Tactics in Critical Incident Interventions", *Project Management Journal*, Vol. 40, No. 2, pp. 70-80
161. Thompson, J., Holdy, K., Engelbert, J., Burgess, T., Atkins, P., Leary, S. (2005) "Six Sigma is an effective leadership strategy to implement a hospital-wide diabetes improvement initiative", *Diabetes*, Vol. 54 Suppl 1, pp. A300
162. Tjahjono, B., Ball, P. et al. (2010) "Six Sigma: a literature review", *International Journal of Lean Six Sigma*, Vol. 1, No. 3, pp. 216-233
163. Townsend, P. L. & Gebhardt, J. E. (1995) "The revolution continues", *Executive Excellence*, Vol. 12, No. 7, p. 12
164. Tribus, M. (1998) "Maintaining the Quality Spirit", *Total Quality Management*, Vol. 9, No. 4/5, pp. 223-229
165. Trivedi, Y. B. (2002) "Applying Six Sigma", *Chemical Engineering Progress*, July 2002, pp. 76-81
166. Tubbs, S. L., Husby, B. & Jensen, L. (2009) "Integrating Leadership Development and Continuous Improvement Practices in Healthcare Organizations", *Journal of American Academy of Business*, Cambridge, Vol. 15, No. 1, pp. 279-286
167. Waldman, D. A. et. al. (1998) "A qualitative analysis of leadership and quality improvement". *Leadership Quarterly*, Vol. 9, No. 2, pp. 177-201
168. Watanabe, K. (2007) "Lessons from Toyota's long drive". *Harvard Business Review*, July-August 2007, pp. 74-83
169. Waterbury, T. & Bonilla, C. (2008) "A Lean Six Sigma execution strategy for service sectors: what you need to know before starting the journey", *International Journal of Six Sigma and Competitive Advantage*, Vol. 4, No. 4, pp. 395-408
170. West, A. H. (2009) "Critical Stage: Six ways to keep Six Sigma fresh and prevent it from becoming 'just another initiative' management will gloss over and eventually disregard", *Quality Progress*, Vol. 42, No. 9, pp. 22-27
171. White, D.E., Jackson, K., Norris, J.M. (2013) "Leadership, a Central Ingredient for a Successful Quality Agenda: A Qualitative Study of Canadian Leaders' Perspective", *Healthcare Quarterly*, Vol. 16, No. 1, pp. 62-68
172. Womack, J. P. & Jones, D. T. (1994) "From Lean production to Lean enterprise". *Harvard Business Review*, March-April 1994, pp. 93-103
173. Womack, J. P. & Jones, D. T. (1996) "Beyond Toyota: how to root out waste and pursue perfection". *Harvard Business Review*, September-October 1996, pp. 140-158
174. Womack, J. P. (2006) "Ford needs to consider the lean way forward", *Tooling & Production*, Vol. 72, No. 11, pp. 6-8

175. Wu, K.S., Yang, L.R., Chiang, I.C. (2012) "Leadership and Six Sigma project success: the role of member cohesiveness and resource management", *Production Planning and Control*, Vol. 23, No. 9, pp. 707-717
176. Yarrow, D. J. & Prabhu, V. B. (1999) "Collaborating to compete: benchmarking through regional partnerships", *Total Quality Management*, Vol. 10, No. 4/5, pp. 793-802
177. Zhang, W., Hill, A.V. & Gilbreath, G. H. (2011) "A research agenda for Six Sigma research", *Quality Management Journal*, Vol. 18, No. 1, pp. 39-53
178. Zu, H., Fredendall L. & Douglas, T. (2008) "The evolving theory of quality management: The role of Six Sigma". *Journal of Operations Management*, Vol. 26, pp. 630-650
179. Zu, X. & Fredendall, L. D. (2009) "Enhancing Six Sigma Implementation Through Human Resource Management", *The Quality Management Journal*, Vol. 16, No. 4, pp. 41-54