Sanjay Bhasin

Lean Management Beyond Manufacturing

A Holistic Approach

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Preface

The significant problems we face cannot be solved by the same level of thinking which caused them

Albert Einstein

A Brief Summary of the Rationale for This Book

The decision to carry out this project has been triggered from various sources; in general, there are six very diverse yet interconnected reasons.

In the first instance, I have been requested on numerous occasions to undertake this. Often clients have indicated that when they follow the numerous Lean manuals and "how to" guides, they still encounter practical and everyday issues which are not clearly identified within the literature. Whilst the term "Lean" was conceived in excess of thirty years ago by Krafcik (1988), there still remain erroneous illustrations of the concept Lean as a perception. Despite the advancement made as regards the ingredients professed as vital for Lean to be successful within an organisation, undertakings to deliver a translucent comprehension of the philosophy have been and continue to be relatively mystifying. There currently blatantly exist procedural and philosophical cavities in the prevailing literature which attempts to clearly exemplify the indisputable and decisive requirements which any organisation attempting to adopt Lean and its ideology should both consider and integrate within their own Lean journeys.

Secondly and regrettably, I still find efforts to align the Lean initiative to the prevailing culture of organisations rare. In my experience, the majority of Lean initiatives which fail to achieve their intended objectives can be contributed to this factor coupled with the change management principles adopted by the respective organisations. Lean always needs to be envisaged as an everlasting expedition. Inherently within this voyage, efforts need to be made to alter the prevalent culture

of the organisation in question which is often either overlooked or measly efforts made to accommodate this. The organisation then seems flabbergasted that its Lean efforts have not materialised into a successful implementation.

Thirdly, I still encounter too many Lean efforts focusing upon the immediate organisation or particular functions within that organisation, namely manufacturing. Lean should always be viewed as a holistic ideology which also requires a need to embrace suppliers rather than viewing them as adversaries. The full benefits of Lean can never be realised unless the continuous improvement principles are applied throughout the organisation's value chain. Within this book, there is awareness that increasing product obsolescence, tighter launch deadlines and shrinking profit margins are forcing organisations to look for many ways to reduce the cost and time involved in manufacturing. Once we add the pressures of sustainability demands and a struggling global economy, a Lean supply chain becomes imperative to success. The book proceeds to indicate the notion of outsourcing, which is typically and erroneously employed to save costs. Very few companies are in a position to produce everything in-house, and the financial investment to do so would be unfeasible.

Fourthly, Lean is and constantly should be observed as integrating a commercial perspective; this has been clearly represented by Toyota who is devoted towards discovering improved methods of creating cars; with this in mind, performance management should be clearly integrated within any efforts to integrate Lean. A comprehensive investigation will be demonstrated in order to decipher whether organisations embracing the Lean principles as part of their overall strategic option managed to secure a competitive advantage. The intention is to decipher the potential benefits an organisation experiences by analysing the impact that the organisation's Lean journey has on its financial and operational efficiency levels. This is considered to assist in establishing an ideal promotional opportunity of any Lean initiative. I am often perplexed when Lean champions state to me that their organisation is seeking the return on investment from their Lean initiative; yet in the first instance, no efforts had been made to integrate effective performance parameters. A balanced portfolio of metrics is often necessary. Lean does not easily correlate itself to the traditional accounting systems; it is for this reason that organisations need to embrace systems which can suitably measure the impact Lean is making within their own organisations. Undeniably, Lean does involve a substantial investment which subsequently reaps exponentially a greater degree of savings. It is for this reason that it is important to gauge reliably the impact of Lean; this information is vital for policy makers within the organisations to make evidence-based decisions. A modified balanced scorecard will be discussed and recommended which embraces strategic, operational and indices focused towards the future prospects of an organisation.

Fifthly, the implementation of any major initiative requires bespoke and dedicated interjections required at particular junctures of the initiative; consequently, a considerable effort will be made to exemplify the phases of a Lean journey which often organisations, whilst espousing to the continuous improvement ideology, pay scant attention to. It is considered vital to plan out the Lean journey and then be

able to categorise the stage of Lean an organisation exhibits in its overall implementation journey. This presents a prospect to guide an organisation of precise prerequisites it needs to gratify if the company is serious regards embracing Lean as an ideology. I have witnessed numerous Lean audits which can often be placed at two extremes of a continuum; they are too vague and consequently not supporting many organisations' Lean journey; alternatively, they are too prescriptive with little flexibility. In the latter's case, the organisations struggle to apply the audit effectively. In this case, I have devised a comprehensive audit which organisations can suitably adapt to gauge their progress.

Lastly, if one seriously proposes the above objectives, it is important to promote the view of Lean as an overarching ideology. An exhaustive review is needed focusing upon the fundamental ingredients of modern-day thinking such as culture, the strategic inferences of Lean, implementation problems, obstacles to Lean, and performance measurement. This includes an evaluation as to whether Lean is indeed a panacea to all manufacturing problems. Lean should not be viewed as another process or initiative; instead, it requires a total radical transformation of existing practices and interconnections. Neither should its principles be viewed as gospel since they constantly need challenging in order to move things forward. However, this needs to be undertaken systematically through evidence-based decision-making and not in isolation without considering the impact upon other areas both within the organisation and across the value chain. This can only be undertaken, in my view, when Lean is adopted and executed by the organisation as an overarching ideology.

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In the first instance, my gratitude goes to my wife Hardeep, whose unremitting encouragement, support, and reassurances afforded during the compilation of this book only proceed to inform part of the support structure she bestowed. It was also her considerable proficiency within the field of IT and unrelenting patience towards any modifications required which were both emphatically valued and wholeheartedly appreciated.

Secondly, it is my late mother, Rampiyari Bhasin, who unfortunately passed away during the compilation of this book. It will always be the values she espoused of integrity, diligence, and endurance which besides being a considerable comfort to me in the last few months will constantly continue to inspire me for the rest of my life.

Contents

Chapter 1
Introduction

Abstract Increased awareness of Lean has resulted in a plethora of "how-do-Lean" literature and a conundrum of Lean definitions, with little emphasis beyond this transactional process and outcome focus. This chapter will begin to explore how the Lean concept has shifted from a technical production system focus to an all-encompassing organisational philosophy. A valued definition coupled with a brief outline of the scope of this book will be provided. A Lean organisation understands customer value and focuses its key processes to continuously increase it. The ultimate goal was to provide perfect value to the customer through a perfect value creation process that has zero waste. To accomplish this, Lean thinking changes the focus of management from optimising separate technologies, assets, and vertical departments to optimising the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers. Eliminating waste along entire value streams, instead of at isolated points, creates processes that need less human effort, less space, less capital, and less time to make products and services at far less costs and with much fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality, low cost, and with very fast throughput times. Likewise, information management becomes much simpler and more accurate.

A Reliable Definition of Lean

It was essentially during a span of four decades whereby in the early stages all the Lean doctrines and procedures were familiar to only very specific manufacturers, academics, and quality proponents. Lean has evolved over the previous forty years, and it is important to recognise a consequent view with regard to its ideology. This has led to various definitions of Lean. It was the Toyota Production System which developed the approaches, practices, and instruments of Lean. This began to change in the 1980s; the phrase "Lean" is attributed to John Krafcik in 1988 who was an

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undergraduate at the MIT, working under the guidance of Jim Womack. The research team were investigating the international automobile industry whereby they identified certain exclusive behaviours at the Toyota organisation. It was during their focus upon the examination of the performance levels whereby they discovered that Toyota excelled at many of the performance indices, whereby Krafcik stated that:

> Lean production is Lean because it uses less of everything compared with mass production–half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also it requires keeping far less than half the needed inventory on site, results in fewer defects and produces a greater and ever-growing variety of products (p. 43).

According to Liker (1998, p. 8), "*Leanness is a process, a journey, not an end state*"; Wilson (2010) suggested that "*the Lean solution is a large paradigm shift*" (p. 16). Doolen and Hacker (2005) pointed towards the concept that Lean is a multifaceted concept.

There also exist definitions which concentrate on the point of production (Shah and Ward 2007); some look at its philosophy to eradicate waste (Cross 2012) or the creation of a balanced flow (Campell 2006). Beitinger (2012) focused upon how Lean through eradicating waste will facilitate Leanness, enabled the company to become "*subsequently more flexible and more responsive by reducing waste*" (Wilson 2010, p. 9). In reference to this book, the views of Prof. Liker's (1998) are also considered whereby he proposed that Lean is "*a philosophy that when implemented reduces the time from customer order to delivery by eliminating sources of waste in the production flow*" (p. 481); this view whilst holding a significant intensity of relevance is not thought to fully encapsulate the contemporary thinking behind Lean. The relevant principles of Lean are now also increasingly being applied to the service sector; consequently, an investigation undertaken by NIST (2003) has complete prominence in reference to the pursuing investigation; it suggested that Lean is "*a systematic approach to identify and eliminate waste through continuous improvement; flowing the product at the pull of the customer in pursuit of perfection*" (p. 1).

Brief History of Lean

In an effort to provide a brief historical account, the notion of Lean is often stated to have started with Benjamin Franklin who in 1733 began publishing "*Poor Richard's Almanack*"; at that stage, they were written on an annual basis and included weather reports, recipes alongside homilies, i.e. "*a penny saved is two pence clear; A pin a day is a groat a-year*" (Smalley 2006, p. 3). Henry Ford adopted the "Lean" concept within his business initiatives (Ligus 2007). Equally, Frank Gilbreth constantly stressed the notion of waste. F.W. Taylor pioneered what is presently referred to as standardisation and best practice deployment in the

"*Principles of Scientific Management*" (1911). Shigeo (1989) regarded as the prominent advocate of single minute exchange of die (SMED) and mistake proofing singles out F.W. Taylor as his role model.

Subsequently, Henry Ford assisted to provide a spotlight on waste whilst developing mass assembly. The concept of "*Design for manufacture*" (DFM) is attributed to Ford and mentioned within "*My life and work*" (1922). Sakichi Toyoda, within his textile company operating looms recognised the wastage as production, was interrupted once a thread snapped; the concept of Jidoka is attributed to him, whilst Kiichiro Toyoda, the creator of Toyota, acknowledged the importance of preventing poor quality occurring in the first instance through particular attention being attributable to the various processes and their alignment. It was, subsequently, Ohno (1988) who then developed the core concepts further and increased their use; this was evidently applied to manufacturing in the 1950s; this developed to vehicle assembly within the 1960s and pursued within the broader supply chain in the 1970s. The "supplier manuals" within the 1970s made the concept of Lean more obvious to the many organisations external to Toyota.

The actual concept of "Lean" was created by Krafcik (1988); this was undertaken as a researcher working for the "International Motor Vehicle Program" (IMVP) as part of the Massachusetts Institute of Technology. The level of Lean awareness within the Western world is attributable to Womack et al. (1990). "*Lean Enterprise*" as an idea was instigated by Womack et al. (1990) in an effort to illustrate the expansion of the Lean principles outside the host organisation. The advancement of Lean concentrated upon quality in the earlier years of 1990s towards quality, cost, and delivery in the late 1990s; this has been extended to "*customer value*" from 2000 onwards. The expression "*Lean Provision*" (Womack and Jones 2005, p. 8) represents the phases in order to be able to supply the desired value to the customer. The contemporary research implies that this could involve extending the principle to a number of organisations.

Wincel and Kull (2013) suggested that within the existing economic environment of ever escalating universal competition, organisations are driven to improve flexibility, sharpen market responsiveness, improve output, and simultaneously reduce their overall costs. Lean manufacturing is one of the keys but not only means by which this is being pursued. The fundamental principle of Lean utilises continuous improvement to concentrate upon the eradication of waste or non-value-added procedures existing within the organisation (Womack and Jones 2005). Lean as a concept should form part of a company-wide strategy with its objective to increase the market share enjoyed by the organisation, whilst simultaneously endeavouring to decrease its operating cost base (Wilson 2010).

Lean as a system enables organisations to decrease their costs by eradicating waste; it enables the organisation to improve its quality levels and levels of customer fulfilment. Samuel (2010) advocated that an organisation embracing a Lean production system expects complete support from its various functions such as administration, HRM, and finance. The supporting functions have to undergo a transformation since the processes have to become better synchronised and linked with the ultimate goal of attempting to reduce levels of waste in the organisation.

Liker (2004), Hines et al. (2008), Camp (2013), Singh et al. (2010), Samuel (2010), and Marksbury (2012) suggested that the wastes which Lean endeavours to concentrate upon are as follows and usually associated with Lean management:

(i) **Overproduction**
Overproduction occurs when your company produces more than your customer requires. You could be producing items for which there are no orders or producing more than is required at the correct time. This is the worst waste as it has a knock-on effect in multiplying all the other wastes. Overproduction increases defects, impacts on inventory costs, process chains, and waiting alongside unnecessary motion and transportation.

(ii) **Inventory**
Inventory is the quantity of parts required to manufacture a product, or finished good and products held in stock. When not in use or not being utilised in production, they take up valuable space/volume. They may become obsolete whilst in stock and detract raw materials and parts from use elsewhere. Competitive companies make sure that their paper or IT systems control their inventory so that money is not wasted on unwanted or unnecessary materials, parts, or finished goods.

(iii) **Defects**
Defects result in scrap and reworking/reprocessing as a result of products being found to be defective and have to be reworked or disposed of, both a costly process. Defects are caused by poor or inferior manufacturing processes as a result of either human error or equipment breakdown or both. Reworking takes additional time and therefore increases the cost of the finished product. Scrapping or disposal incurs additional costs and unnecessary use of resources that impacts an organisation's bottom line performance.

(iv) **Waiting**
Every task in a manufacturing process is dependent on the processes that take place upstream and downstream. If operators, equipment, information, or materials delay the production process for any reason, time is wasted and your cost of production will increase further impacting, cumulatively, on your profitability.

(v) **Transportation**
The unnecessary movement of information, items, materials, parts, and finished goods from place to another wastes time, resources, and money. Unnecessary transportation is usually paired with unnecessary motion, damage to, and even loss of product. Even the paper or IT systems (if any) to track the movement can be adversely affected.

(vi) **Motion**
Unnecessary motion relates to staff, and in particular operators, moving around the workspace wasting time and effort. All unnecessary motion can be caused by poor standard procedures and practices, poor process design, or poor work area layout.

(vii) **Over-processing**
Over-processing involves the taking of any unnecessary steps during the manufacturing process. It can also mean producing parts or products of a higher quality than is required. This may be due to malfunctioning equipment, errors in reworking, ineffective processes, poor communication, and not benchmarking against the customers' requirements, including internal customers further down the process.
Another one which has been adopted in much of the recent literature; i.e. Wincel and Kull (2013).

(viii) **Incorrect use of staff and their abilities**
Not properly utilising the skills and abilities of staff, and even not engaging with them loses your organisation time, non-use of skills and ideas, missed improvement opportunities, and learning opportunities by simply not listening to your staff. Your staff need to be integral to the complete production process, whether that be manufacturing or administration. From the "shop floor", they can generate ideas which can eliminate the other seven wastes. Such engagement will help to improve your processes and staff development continuously.

An easy way I learned at a seminar to remember the wastes, they spell TIM WOODS

T—Transport—moving people, products, and information;
I—Inventory—storing parts, pieces, documentation ahead of requirements;
M—Motion—bending, turning, reaching, lifting;
W—Waiting—for parts, information, instructions, equipment;
O—Overproduction—making more than is IMMEDIATELY required;
O—Over-processing—tighter tolerances or higher grade materials than are necessary;
D—Defects—rework, scrap, incorrect documentation;
S—Skills—under-utilising capabilities, delegating tasks with inadequate training.

Numerous acronyms for these eight wastes have been proposed as aids to memory, but the one that seems to have caught on best is DOWNTIME. It is simple, straightforward, and appropriate. Here is what each of the letters stands for:

Defects
Overproduction
Waiting
Non-utilised/underutilised talent
Transportation
Inventory
Motion
Excess Processing

Principles of Lean

Atkinson (2010) proposed that the central theme for Lean is to exploit customer value through reducing the wastes that are generated within an organisation. In essence, Lean attempts to generate more value for its customers, whilst utilising less resources. The Lean ideology develops from an attempt to widen the organisations' remit by attempting to persistently improve the customer value (Clarke 2011). In order to achieve this, the organisation has to alter its focus from vertical transformations to a situation whereby the products of the complete value streams flow horizontally across the various functions towards the customer. The literature, Bicheno and Holweg (2009), Camp (2013), Womack and Jones (2005), and Marksbury (2012), is abundant, suggesting that there exist five essential principals to Lean, namely:

(i) Identify the customers and specify the value; clearly define value for a product in view of the customers' perspective; targeted attempts to waste reduction can occur,
(ii) Proceed to categorise and map the value stream which essentially comprises of all the collective activities used to deliver the end product,
(iii) Improve the flow by eradicating the waste which assists to reduce the lead time of delivery,
(iv) Be responsive to the customers' demand schedules, and
(v) Continuously pursue perfection.

One considers that the a prominent and overall challenge faced by Lean organisations is to develop a culture which assists to both generate and maintain a long-term obligation from senior management towards the entire workforce.

Scope Covered by the Book

It is imperative to clearly clarify at this stage of construction that, whilst the principles, procedures, ideology, and theory of Lean is being increasingly applied within the service sector, its roots remain firmly within the manufacturing sector and it is this area that this book's focus will concentrate upon. It is considered that a very broad discussion on Lean would loose focus and any attempts to make generalisations as the impact of Lean on performance requires particular direction. Likewise, often the cultures of a service and manufacturing organisation are too diverse which would have impacted upon the recommendations and conclusions made.

Nonetheless, the principles of Lean outlined within this book are transferable to other sectors. The intention is to enable organisations viewing Lean as a strategic deployment to fully comprehend and recognise the possible pitfalls, whilst concurrently improving the potential implementation rates. Undeniably, both in my

experience and extensively collaborated through other empirical research, as will be reflected upon within the book, the predominant factor for most Lean initiatives failing to achieve their intended outcomes centres upon both the prevailing organisational cultures and the change management systems utilised. Consequently, there will be a considerable focus within the book clarifying aspects which organisations need to be attentive about in their endeavours to both implement and sustain their respective Lean initiatives.

Likewise, during my investigations of Lean implementations in the past, company executives and Lean champions have often reflected upon the sustainability aspect of their Lean programmes. The conversations seem to centre upon the true impact of the initial successes which were not maintained. As a Lean practitioner, this opens up an extensive debate about sustainability which, whilst acknowledging the impact of culture, also needs to examine the need to consider the implementation remit and scope of Lean. For Lean to be effective at a strategic level, it needs to be embedded within the entire organisation and then progressively extended to the entire value chain. Otherwise, the benefits from Lean will never be fully realised. Frustratingly, the company executives and Lean champions will often depict excuses about Lean and its ideology rather than undertaking their own root cause analysis. With this in mind, a sophisticated Lean audit has been devised which can prove fundamental for companies to assess the juncture of Lean that they have reached as an organisation on their journey. It encompasses indices under various categories in order to identify particular areas the organisation needs to concentrate upon. The added benefit of this audit is that it helps to identify possible lines of action open to the organisation in order to either consolidate its Lean initiative or to try and embed Lean to a greater degree.

Lean initiatives still have a chequered record of success which is clearly evident in Britain. Consequently, there is a dedicated section which assists to elucidate the possible pitfalls that companies should be mindful of in their quest to successfully implement Lean. The predominant barriers will be ascertained and substantiated by the research undertaken for this book. Furthermore, as a result of ones experience of Lean initiatives within many organisations over the last twenty years, possible counteractive measures will be explored. It is important that an organisation embarking upon its Lean quest is fully conversant with the problems and complications that can accompany a company's decision to adopt and implement the Lean principles.

Whilst a wide-ranging discussion on Lean as a strategic option needs closer scrutiny whereby its principles and ideology will be analysed in depth; it is necessary to try and determine whether those organisations adopting Lean, as part of their strategy, proceed to perform better than would have been the case otherwise. This needs a detailed investigation since often companies profess to be embracing Lean, though upon a closer investigation, it becomes apparent that only some components of Lean are instilled. It is then also often evident that the company is devoid of commitment necessary to fully embed Lean into its overall entity.

In order to clarify that Lean resulted in a sustained improvement in the business's performance, the analysis will consider the performance measurement

doctrine in order to gauge whether this actually happens in practice. In order to make this judgement, it is vital that the analysis proceeds further than a review of an organisation's financial statements. Although the balanced scorecard methodology (Kaplan and Norton's 1992, 1993, 2001, 2005) will be utilised, it was important to extend this principle for reasons which will become clear during the investigation. A tailored adaptation of the balance scorecard was used which was based upon the idea forwarded by Maltz et al. (2003). This will be used as part of the methodology and data capture in order to determine the impact of Lean on the organisation in question. In order to make a valid judgment, it was necessary to examine indices which explored an organisation's performance from a multifaceted perspective, namely:

- Financial,
- Operational,
- HRM,
- Procedural, and
- Sustainability, looking at the future prospects of the organisation.

A subsidiary development of the book will focus upon the Lean journey; the literature review proceeds to clarify the inputs required should an organisation be deemed to be on classed as fully embracing Lean. It was felt that an additional gauge is necessary in order to try and determine whether an organisation was fully committed to Lean ensuring that this judgment could be reliably made; alternatively, the investigation would have lacked rigour since a standardised approach would not be possible. Figure 1.1 illustrates the objective of the book in a pictorial format.

The book proceeds to empirically validate the data captured in order to provide the reader with evidence-based decisions with regard to aspects covered within the overall discussion. Sophisticated statistical investigations will be undertaken in an effort to test the assertions advocated through literature reviews and the authors own extensive involvement with Lean initiatives within the UK. Furthermore, there will be an attempt made to investigate whether there is a distinction between the Lean journeys of organisations within three sectors. In order to facilitate triangulation,

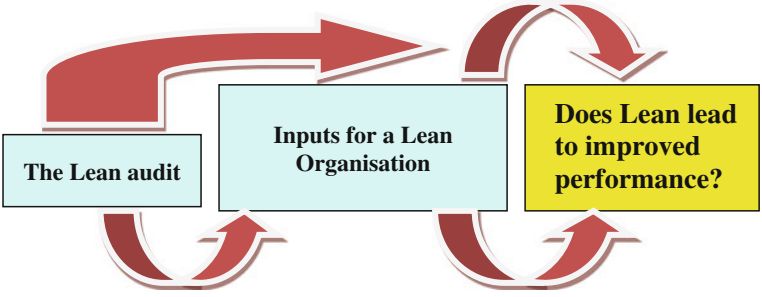

Fig. 1.1 The objectives

small, medium, and large organisations will be investigated within several sectors, namely:

(i) Electronics,
(ii) Automotive components, and
(iii) Generic small components.

Summary

In any investigation of this magnitude, it is important to try and clarify the possible consequences if Lean is not promoted and implemented appropriately. Similarly, Lean cannot and should never be viewed as a panacea to every manufacturing problem. In this context, the prevailing considerations will need to be evaluated with view towards providing companies with a balanced view of both Lean's potential and possible limitations. Finally, the author is absolutely convinced with regard to the need to portray a message that any organisation serious in regard to its Lean commitment needs to both adopt and view it as an overarching ideology. Consequently, it is imperative that the Lean concept should be regarded more as a philosophy or condition than as a process. In that respect, "*Leanness is a relative measure*." Ohno's principles clearly assisted to reflect how the Toyota Production System was much more than a production system since he promoted it as a complete management system. In this situation, Lean needs to be regarded as an ideology or philosophy since there is a requirement for its commitment from all the various levels within the organisation. Lean transcends far beyond the engineering and management disciplines since at its core, it always tries to emphasise the concept of value and the eradication of waste in a continuous method based on common sense. To be successful, the organisations need to separate the Lean philosophy from the techniques and tools used to support the philosophy. Lean is essentially an arrangement of techniques embraced from a structure that has descended from a philosophy. Consequently, Lean must always be observed as a philosophy with the tools such as Six Sigma acting as enablers.

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Chapter 2
Clarification of the Lean Concept

Abstract This chapter explores the concept of Lean in detail and will attempt to tackle many of the existing misconceptions regards Lean. Lean is a complex ideology that requires considerable effort if implemented appropriately. The procedural aspects will be discussed at length, outlining the importance of implementing the Lean principles in a systematic fashion. Furthermore, there exists empirical evidence that suggests that most Lean initiatives fail. The literature and evidence available is analysed to explain possible causes. HR, culture, and change management are often cited as prominent reasons for Lean not being successfully implemented. This aspect will be further scrutinised. Furthermore, as this investigation hopes to consider whether Lean aids competitiveness of organisations, a thorough evaluation will be undertaken to judge whether existing empirical research verifies or refutes this assertion.

Understanding the Concept of Lean

As intimated earlier, it was the Toyota Production System (TPS) that developed the relevant approaches, Lean practices, and instruments. The phrase "Lean" is attributed to John Krafcik who in 1988, as an undergraduate at the MIT, worked under the guidance of Jim Womack stated that:

> "Lean production is Lean because it uses less of everything compared with mass production – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also it requires keeping far less than half the needed inventory on site, results in fewer defects and produces a greater and ever-growing variety of products" (page 43). An exploration undertaken by NIST (2003) has complete prominence in reference to this pursuing investigation; it suggested that Lean is "a systematic approach to identify and eliminate waste through continuous improvement; flowing the product at the pull of the customer in pursuit of perfection" (page 1).

Liker and Franz (2011) suggest that there are still only two per cent of Lean programme implementations that reach their expected results. The rationale for this is that there is often little understanding of organisational factors that enable successful

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implementations and continuation. There are many obstacles that a Lean journey encounters (Henderson and Larco 2003). Ransom in his investigation (2008) states that "*there are really only 5 % who practice the art skilfully in a world class master practitioner kind of way*" (p. 4). Liker's earlier work (2004) reviewed that "*50 % of the auto suppliers are talking Lean, 2 % are actually doing it*" (p. 2). Likewise, the "*Manufacturer*" (2002) authenticated this whereby it suggested that whilst one hundred Lean companies were questioned regards their proximity towards becoming a total Lean organisation; only 3 % suggested that they were beyond "doubt" Lean; however, 22 % implied that they were only approaching this state.

Toyota's philosophies were moulded by the personalities, ethics, and capabilities of its creators in the Toyoda family. The Lean principles are firmly founded on shrewdness and scientific methods (Bicheno and Holweg 2009). Koenigsaecker (2005) proposes that Lean success as a strategy necessitates imagination, reflection, and trialling. Taiichi Ohno, Shigeo Shingo, Sakichi, and Kiichiro Toyoda reflected this doctrine. The prevailing assertion within a substantial amount of the literature states that the main objective for Lean "*is to eliminate waste*" (Lewis 2008). In practice, the chief driver for Lean is the need to construct a thriving and resilient company (Singh et al. 2010). Unfortunately, there still persist misconceptions regards Lean; this is in spite of hundreds of books and proportionately more papers and articles coupled with supplementary resources devoted towards Lean.

Radziwill (2013) suggests that Lean is principally and notably a system, in essence an assimilated sequence of portions with a noticeably defined objective. Lean expects total dedication and should be extended further than just the engineering and management disciplines whilst stressing the concept of value in its endeavour to eliminate waste in a sustainable manner. Similarly, it is important that the companies distinguish the Lean ideology from the techniques and tools such as Six Sigma utilised to maintain the ideology. Whilst proponents of Lean such as Toyota inform us of the Lean instruments, organisations need to discover their own methods of improving these instruments (Liker 2004). The Toyota way fundamentally outlines the doctrine of the Toyota culture, allowing the TPS to operate successfully. Regrettably, many organisations consider the TPS has a collection of tools aiding better effectiveness. Instead, they should view Lean as a complete system which persuades its employees to constantly advance the processes they utilise (Singh et al. 2010). Consequently, often countermeasures were instigated and these have become a necessity for engineers and others in their manufacturing processes (Womack and Jones 2005).

The TPS should be viewed as facilitating a complete management ideology focused upon overall customer fulfilment. Equally, Montgomery (2010) suggests that it promotes a setting of teamwork and enhancement simultaneously advancing quality in the process. Organisations hoping to demonstrate that Lean aids performance levels for their own company are required to implement a more wide-ranging approach to performance management (Neely et al. 2005). Dimancescu et al. (1997) made an initial breakthrough to measure the impact Lean makes on an organisation though the analysis was somewhat restricted. The reimbursement an organisation accrues from Lean is not always obvious and not captured

appropriately through traditional accounting methods. Further work from Bond (1999) and Wade (1997) coupled with the comprehensive addition to the field of performance management by Kaplan and Norton (1992, 1993, 2001, 2005) proceeded to provide a more comprehensive system to gauge the performance of an organisation.

Nonetheless, the study by Maltz et al. (2003) will be analysed as they were able to extend the principles of the balance scorecard further by looking at sustainability of an organisation's performance levels. Lean needs to be viewed as an overarching strategy or a prominent strategy as has been advocated (Atkinson 2010). Fullerton and Wempe (2009) suggest that too often, there still exists a profound prejudice towards viewing Lean as a manufacturing concept rather than viewing it as a company-wide notion. The Lean success requires total devotion from all tiers of an organisation (Hines et al. 2008; Jones 2009). There is a consensus amongst academics (Cocolicchio 2008; Haskin 2010; Koenigsaecker 2005) that the main objective of Lean is to secure organisational profitability resulting from superior performance levels.

Lean Development

A truly Lean organisation such as Toyota communicates that Lean is more than a compilation of tools and that its ideology focuses upon a need to reduce three categories of waste (Koenigsaecker 2005), namely Muda (non-value adding work), Muri (overburden), and Mura (unevenness). Liker (2004) suggests Lean is both challenging and needs to be innovative. Whilst an organisation could learn from benchmarking exercises, it needs to recognise that the Lean journey for any one organisation is a unique experience and needs to be handled as such (McVay et al. 2013). Ohno (1988) reflects that the TPS was more than a simple production system since it was developed into a wide-ranging management system. Bicheno and Holweg (2009) suggest that to reap the full benefits of Lean, it needs to be extended to the complete value chain. It needs to be recognised that organisations operate uniquely with each one displaying idiosyncratic struggles and limitations (Cross 2012). It is vital that the company in question adopts all the Lean principles that will help it find its own solutions (Mcvay et al. 2013; Cocolicchio 2008). A company on the Lean journey is required to appreciate where it is heading (future position) and its present position (Johnston 2009).

It is fair to say that over the last quarter of a century, the term "Lean" has spread to almost every sector. In the early days of implementation, the manufacturing companies visiting Japan to see what Toyota was doing had a number of false starts or lessons learned (depending on whether your glass is half empty or half full!). Early implementations focussed on empowered teams and continuous improvement (kaizen) or attempts to replicate a pre-defined box of tools such as 5S, Single Minute Exchange of Dies (SMED), SPC, and kanban. Likewise, for many, Lean became synonymous with kaizen events—which were actually kaikaku—radically

reconfiguring individual operations. For some, this led to them developing their version of Toyota's famed Production System (TPS) including their own schematic "house" or "temple" of Lean along with departments of continuous improvement specialists.

Procedural Requirements for Lean

A fundamental prerequisite is the need to ensure that the suitable tools are put into practice within the right circumstances and contained in a manner that proceeds to support the organisation's value chain (Bicheno and Holweg 2009). A kanban system, for instance, when operational in an environment of fluctuating demand would be regarded as waste (Womack and Jones 2005). Research (Angelis et al. 2011; Black 2007; Conner 2009; Dalal 2010; Henderson and Larco 2003; Laureani and Antony 2012; Wheatley 2005) implies that any organisation hoping to implement Lean has to guarantee that it does not utilise a few exceptional tools, and that instead, it is vital that the company uses and applies the majority, if not all, of the following:

- Cellular structures since it is imperative that the requirements to produce a product(s) are grouped closely for efficiency (Lee 2008)
- Kanban methodology needs to be fully embraced (Smalley 2009)
- Kaizen which focuses upon the constant quest of advances in quality, cost, delivery, and design
- This also requires the need to detect problems with feedback loops ensuring modifications are implemented (Campell 2006)
- Single-piece flow systems to be adopted need to be geared towards adding value (Bartels 2005)
- This needs to be combined with process mapping indicating the product and information flows (Jones 2009).

Furthermore, an organisation needs to actively work towards supplier development (Bicheno and Holweg 2009); likewise, this needs to be combined with supplier base reduction which aids scheduling and planning; equally, the relationship with suppliers needs to be one of collaboration and not an antagonistic one (Hines et al. 2008); SMED attempts to reduce hold-ups in changeover times on machines (Bicheno and Holweg 2009); kaikaku attempts to support the incremental changes required as opposed to kaizen, when appropriate (Sim and Rodgers 2009); 5S and common visual organisation are needed to reduce untidiness and disorganisation (Womack and Jones 2005); and total productive maintenance (TPM) is required focusing upon dependability, reliability, and capability of equipment through maintenance as forwarded by Ohno (1988). Imperatively, an organisation should never lose focus upon the concept of value and the wastes should always be considered, namely over production, waiting, transportation, inappropriate processing, inventory, unnecessary motions, and defects; proponents have recently added an eighth waste, underutilised people.

Predicted Benefits of Lean

There exists an accumulation of literature and empirical evidence suggesting the benefits of Lean. Subsequently, primary empirical research has been undertaken as part of this investigation. However, the intention of this chapter is to provide an indication of the more thorough and robust considered research that has been undertaken. Bicheno and Holweg (2009) advocate that the effective companies assimilate methodical variations to align the demands of the customer, strategy, and stakeholders within the business. Lean has to extend behind manufacturing to be successful (Womack and Jones 2005; Stump and Badurdeen 2012). Inherently Lean endeavours to fulfil customer requirements through timely delivery, reducing variability and consequently the overall cycle time at an enhanced quality level (Waurzyniak 2009; Wilson 2010; Halliday 2005). Empirical evidence (Hines et al. 2008; Laureani and Antony 2012; Marksbury 2012) suggests that the more competent companies abridge and level the flow from raw material input to the final product; whilst managing to reduce waste, followed by a certainty of what they are doing. Likewise, the strictly world-class companies, i.e., Toyota, exhibit several distinctive management behaviours; the prominent one being quoted is the ability to link the respective organisation's strategy to action (Jones 2009).

Empirical Evidence on the Benefits of Lean

"*The Lean Strategies Benchmark report*" (Bartels 2005) discovered when an organization realistically adopts Lean across the entire organization, that it is three times more likely to be regarded as industry best-in-class. The NIST report (2003) discovered Lean can result in operational improvements such as cycle time being condensed by 90 %. Likewise administrative benefits including a reduction in order processing time are also possible as suggested by the McKinsey & Company's Production System Design Centre (PSDC 2002); They proceeded to suggest that 60 % of the better performing companies had adopted Lean effectively.

The EEF final investigation (2001) conducted in companies that had adopted four or more of the key Lean tools reaped greater benefits from their Lean journeys. Shah and Ward (2007) discovered a positive association of Lean with operational performance. Koenigsaecker (2005) summarises an investigation undertaken by the Association of Manufacturing Excellence (AME) whereby the quoted benefits included a saving of 95 % in lead time. The Manufacturing Foundation findings (2004) stated that 62 % of their sample reaped benefits from Lean. Ransom (2008) quotes that Lean awards companies a competitive edge, namely a revenue expansion of 10–12 %, and an income development rate of 12–15 %.

Rationale for the Low Numbers of Successful Lean Initiatives

Similarly, Lean initiatives suffer from a low record of successful programmes; once again, the subsequent section highlights the existing evidence. Nonetheless, an attempt is made to subsequently provide the reader with a more detailed input regards how the record of successful Lean initiatives could be improved. A considerable literature exists which dictates the reasons for the low numbers of successful implementation; Table 2.1 summarises the empirical evidence of the possible hindrances towards Lean and the mindset change required from proponents should they hope to combat the existing trend of experiencing low numbers of successful initiatives; this proceeds to recognise the contribution made from the main literature sources.

Table 2.1 Main hindrances to successful implementations

Literature explanations for the low numbers of successful implementations	
Rationale forwarded	Literature sources
Improve the internal communications systems; required to aid empowerment and to adopt the principles of Lean	• Angelis et al. (2011) • Camp (2013) • Eisenhardt and Martin (2010) • Hines et al. (2008)
Need to observe Lean more than a manufacturing improvement strategy and allow its remit to surpass outside manufacturing	• Koenigsaecker (2005) • Liker (2004) • Shook (2010) • Spear (2004)
Effectively manage the sub-cultures; no company has a homogeneous culture and it is important to retain focus upon the Lean mission and vision	• Stefanie et al. (2012) • Wincel and Kull (2013) • Angelis et al. (2011)
Recognise that every Lean journey is distinctive; there does not exist a stable formula to achieve Lean success; and the respective companies commence with a dissimilar arrangement of constituents (or influences and restrictions)	• Sim and Rodgers (2009) • Johnston (2009) • Laureani and Antony (2012) • Bartels (2005) • Campell (2006)
Customised accounting procedures need to be adopted; both standard costing or activity-based systems are unable to accommodate the complexities of Lean. Preferably, value stream/product-based costing taking into consideration product development whilst vending alongside production and supplier costs is required; in this way, the personnel involved within the value stream are able to detect if they are influencing a greater degree towards value instead of costs	• Neely et al. (2005 • McVay et al. (2013) • Schonberger (2008) • Singh et al. (2010) • Tangen (2005) • Saurin et al. (2011) • Baggaley (2006)
Promoting the Lean paybacks; there is a sketchy record of organisations treating Lean as an business initiative	• Gremyr and Fouguet (2012) • Cocolicchio (2008) • Doolen and Hacker (2005)

(continued)

Table 2.1 (continued)

Literature explanations for the low numbers of successful implementations	
Rationale forwarded	Literature sources
Lean has to considered as a long-term venture and one whereby the benefits may not be obvious within the first year	• Wheatley (2005) • Cross (2012) • Fullerton and Wempe (2009)
Companies are required to adopt appropriate compatible IT systems; there exists a need to link the operational level to effective enterprise software proceeding to extend it to the customers' value chain	• Cross (2012) • Marksbury (2012) • Montgomery (2010) • Williams and Duray (2012)
Adapt the organisational structures; a definite requirement exists to shape in line with the "*value streams*" concentrating upon the customer and product groupings	• Radziwill (2013) • Mehta and Shah (2005) • Montgomery (2010) • Jones (2009)
A need to sustain the Lean momentum; it is essential that the company intermittently elucidates objectives for individual value streams whilst deducing the accomplishment disparity between the customers' requirements and the actual provision	• Wilson (2010) • Motley (2005) • Pullin (2005) • Ransom (2008) • Camp (2013)

HRM Implications for Lean

Relevance of an Organisation's Culture

The entire concept of Lean cultures has a dedicated section subsequently, and this notion should be awarded total prominence. Most Lean journeys suffer as a result of prevailing cultures, and this section provides an indicative clue to the surrounding issues. Liker and Franz (2011) suggest that Lean should be viewed as a journey and at the onset, it is essential to decipher the current state; the current stated ideals and behaviours have to be contrasted with the Lean principles and behaviours. The part played by managers is the essential component of supporting progress (Celani and Singh 2011). Employees cannot just be viewed as a significant resource to the company; instead, they need to be viewed as the organisation (Skabelund 2012). Fundamental factor to most Lean initiatives failing can be attributable to an organisation's culture and change (Mann 2005; Hines et al. 2008; Montgomery 2010). A company's culture encapsulates the conventions, principles, norms, and noticeable artefacts of its employees and their behaviours (Wincel and Kull 2013). Daft (2001) captures the concept as he suggests a company's culture "*is the set of values, guiding beliefs, understandings and ways of thinking shared by members of an organisation and taught to new members as correct*" (p. 322). Managing around the culture is a distinct possibility; however, this may not result in sustained success (Marksbury 2012; Angelis et al. 2011; Zokaei et al. 2013). In order to induce organisational change, there is a need to initially change behaviour (Laureani and Antony 2012; Montgomery 2010; Stefanie et al. 2012). Efforts to replicate a

formula that has proven effective in one organisation under different restrictions has proven to be irresponsible (Camp 2013; Skabelund 2012).

It is vital that the Lean organisation develops a more conducive culture, whilst managing around the culture is a distinct possibility as there exist several ways to achieve the desired goals (Angelis et al. 2011). However, this may not result in sustained success (Marksbury 2012). A popular view (Montgomery 2010; Shook 2010) suggests that it is futile to bring about organisational change by attacking attitudes and values. In order to induce organisational change, there is a need to initially change behaviour (Laureani and Antony 2012). Zokaei et al. (2013) suggests that companies hoping to secure Lean success need to relinquish the conventional disciplinary and personnel administration and instead look to adopt strategic human resource management (Montgomery 2010; Stefanie et al. 2012). Knowledgeable leadership encourages the motivation and enthusiasm of employees. The research shows that this will facilitate fresh resolutions, a quicker acceptance of innovative ideas with the intention to fulfil customer needs (Johnston 2009; Wincel and Kull 2013). Lean proponents suggest that a company's organisational strengths and faults are often varied to those discovered in another organisation; consequently, an intention to replicate a formula which has proven effective in one organisation under different restrictions would be irresponsible (Camp 2013). The association between Lean and HRM is obvious (Skabelund 2012). It is essential that HRM needs to absorb techniques in order to apply the Lean principles and especially the Plan, Do, Check, Act (PDCA cycle) to all of its undertakings (Wilson 2010).

Considerations for an Appropriate Change Strategy

Alongside culture, the literature focuses upon an appropriate change strategy in order to achieve a successful Lean implementation (Wilson 2010). The recommendations forwarded concentrate on the key requirements for success: to create and then communicate a vision and an overarching comprehensive plan that all the employees can both comprehend and share with (Ohno 1988), and to develop an awareness of determination to succeed in a concentrated fashion and to try and cascade this principle to the entire organisation (Liker and Franz 2011). It is also suggested that there has to be an internal sensei whose responsibility centres on the Lean initiative whilst cascading its principles in order to encourage empowerment and self-ownership (Shook 2010). To accomplish Lean, it is vital than the organisation views training as an asset (Stephanie et al. 2010). Likewise, the training needs to be directed towards resolving issues within a specific area (Camp 2013). Value stream mapping, for instance, is an imperative aspect for Lean to flourish, though it is frequently snubbed because it can seem dreary and theoretical (Wilson 2010). Similarly, whilst formal training continues to contribute a crucial role, the developmental aspect needs to be embedded within the culture of the organisation (Mann 2005). Managers should be required to provide team members with persistent feedback and coaching (Wincel and Kull 2013).

From a performance gauge perspective, it is vital to utilise an appropriate Lean performance management system (Camp 2013); this will be clarified at length within the course of this investigation. It is vital that an organisation on the Lean journey views the Lean initiative as an investment with greater returns to be reaped subsequently, as expenditure is required for aspects such as reorganisation and training (Henderson and Larco 2003). It is also crucial that a conducive culture is instigated as discussed earlier; this needs to link the remuneration systems with performance management and the reorganisation necessary (Wincel and Kull 2013). In this context, there exists a need to guarantee strictness and entrench the modifications in formal policies, procedures, processes, work standards, job specifications, and competence classifications (Marksbury 2012). In many recent Lean initiatives, the process of piloting the Lean principles and procedures before cascading them to the remaining parts of an organisation have yielded positive results (Sim and Rodgers 2009). The importance of commemorating and broadcasting the triumphs has operated effectively in many recent initiatives (Mann 2005).

Potential Issues Associated with Lean

Similarly, in a dedicated section later in the book, the author analyses potential issues with Lean if executed incorrectly. This chapter again provides a sense of the existing thinking.

It is important to evaluate some of the literature that is critical towards Lean. Cooney (2002) argues that in certain circumstances, alternative manufacturing strategies may prove more beneficial and essentially that the market characteristics prevalent in a sector may dictate the choice of the production strategy selected. Critics have suggested that some aspects of Lean such as mixed model scheduling or heijunka attempt to squeeze or limit the demand supply (Kincaid 2004). Consequently, agile production focusing upon customer demand variability can provide other options. The nature of long-term contracts found within Japanese organisations is not often the norm (Mehta and Shah 2005). In situations whereby companies are expected to make low amounts of dissimilar and fluctuating product lines, whereby it then becomes extremely difficult to attain a stable flow of product centred on the standard times (Kincaid 2004).

Stump and Badurdeen (2012) mention the concept of the decoupling point that has appeared within literature and essentially that stock could be held in a modular form and only pursued to completion once the exact customer specifications are known. In this case, an organisation could utilise the Lean principles up to decoupling point and pursue agile for the remaining stages. In essence, an increase in the organisation's products or a change in the volumes ensures that the decoupling point shifts upstream permitting the value chain to become more agile (Stump and Badurdeen 2012). Sceptics of Lean have also focused upon the association of Lean upon personal stress (Sawhney and Chason 2005). Gill (2003) intimated that Lean can pose greater stress levels that are manifested by employee attrition and

absenteeism as a result of accidents. He suggested that Lean can prove challenging for managers.

Lean and Performance Measurement

Baggaley (2006) suggests that any organisation needs to recognise the prominent performance measures that can assist to influence higher results in particular areas. The literature suggests that by overseeing and enhancing the processes, coupled with customer and employee relations, which the commercial perspective should progress as a result (Haskin 2010; Malone and Sinnett 2005; Maskell and Baggaley 2004). Current research has shown that numerous standard businesses concentrate on the performance measures linking the internal processes without a strong association to the customer needs in their particular targeted markets (Singh et al. 2010; Wan and Frank 2008). Likewise, whilst benchmarking systems can harvest encouraging results, if particular care is not taken, the organisation could be heading in a false direction through its focus on the identical processes and practices of the prevailing sector, without awarding appropriate importance on the customer (Malone and Sinnett 2005). A disparity in both time and quantity exists in all processes within a supply chain; this is a major issue that Lean has to address; consequently, an appraisal of Lean would need to ensure that this is considered (Baggaley 2006).

Neely et al. (2005) insist that performance indices need to be selected which allow an organisation to assess whether improvement is occurring against objectives and check points (milestones). Too often, companies select generic indices with very slight thought of their significance. The test for any company, which is serious about ensuring that Lean improves its competitiveness, is to select measures for the proper level of the company (Tangen 2005). Wan and Frank (2008) propose that too often, the true gains secured as a result of Lean are difficult to quantify. It is also important to try and ensure not only that the indices selected proceed to reflect the product portfolio and their respective life cycles, but also that they gauge important parameters for the organisation both internally and externally (Shah and Ward 2007).

The literature suggests that there has been a huge augmentation in the scope of global competition which now concentrates upon the service levels, degree of flexibility, customisation, and extent of innovation (Womack and Jones 2005; Shah and Ward 2007; Shetty et al. 2010; Singh et al. 2010). Montgomery (2010) proposes that an organisation cannot be outstanding at all of its competitive priorities concurrently, i.e., cost, quality, delivery, flexibility, and service. Terry Hill's "order qualifiers" and "order winners" principle needs to be considered alongside its links with the decoupling point which proceeds to offer a better indication when choosing the performance factors (Neely et al. 2005). Furthermore, the conventional accounting systems tended to focus upon apportioning overheads largely centred upon direct labour (Neely et al. 2005; Tangen 2005). The systems and structures of

manufacturing have altered to such an extent that this does not provide an accurate assessment; in modern times, direct labour forms a very tiny proportion of the cost of goods sold.

The empirical research draws attention to the conventional metrics that have been utilised and proven to be unsuitable for modern progressive organisations hoping to compete on a global scale. By way of summary, the limitations are mentioned within the literature regards the standard metrics, namely the conventional indices are often historical which makes it harder to make correlations (Lawson et al. 2003); many of the standard financial accounting instruments are not appropriate for the types of strategic decisions organisations presently; cost alone cannot always be the prominent factor (Kaplan and Norton 2005); and that they present modest amounts of information on the actual source of particular issues that the organisation may be truly facing (Malone and Sinnett 2005). Often, the association between both the financial and non-financial measures is delicate and not obvious which specific indices need to address (Tangen 2005). A greater emphasis is needed towards the intangible assets that are often neglected in many performance measurement systems (Lawson et al. 2003; Shah and Ward 2007). For Lean, the concept of value adding needs considerable emphasis which is often neglected in many systems (Bicheno and Holweg 2009; Womack and Jones 2005).

Empirical evidence (Baggaley 2006; Haskin 2010; Shah and Ward 2007) reflects that effective metrics do facilitate an efficient execution of strategy; conversely inadequate or bias gauges can actually be detrimental to an organisation (Neely et al. 2005). At a strategic level propose Shah and Ward (2007) that it is vital:

- that the measures selected strengthen an organisation's strategy,
- are conducive to the prevailing culture, and are
- constant with the established existing acknowledgment and reward systems.

Montgomery (2010) suggests that a high degree of consideration is required to ensure that the performance measures selected enable an organisation to progress, for instance, different products on varied stages of a product life cycle may need differing measures.

In the case of organisation-wide measures, a high technology business, for instance, at the start may need to focus upon reliability, speed, and efficiency in order to secure credibility and brand awareness. At the growth phase, the prominent gauge may then become market share. On the other hand, within mature industries, price, operational costs, and capacity utilisation may play a more prominent role. Likewise, in the case of an ageing industry, the respective cash flow indices may begin to take on a greater significance (Schonberger 2008). Tangen (2005) suggests that there exist three categories of performance indices:

- the basic measures concentrate upon the traditional measures such as finance,
- the intermediate levels focus on a more balanced perception, and the
- uppermost level, analyses the connecting interaction across the entity.

Table 2.2 summarises this process aptly by describing which measures apply at differing stages: