Chapter 12
Lean Sustainability Audit

Abstract This chapter has naturally evolved as a result of the previous research the author has undertaken and as a direct consequence of feedback from clients that it was necessary to be able to decipher the journey an organisation encounters in its quest to become a truly Lean organisation. This formed a vital output of my cumulative research, since I considered it imperative to be able to clearly identify which stage of the Lean journey that an organisation had accomplished; inherent in this is the need to be able to subsequently advise the policy makers of the organisation in question regarding their next course of action. Undeniably, there does exist extensive body of knowledge which attempts to undertake this role, namely measuring the "leanness" state of an organisation; however, there is a definite void of a comprehensive Lean audit which proceeds to undertake several associated roles, namely:

- Determine which stage the organisation has reached on its Lean journey in comparison with achieving a state whereby the organisation has adopted Lean as a philosophy;
- Provide an organisation with detailed and constructive feedback regarding areas which need improving;
- Specifically recommend the course of action needed for it to achieve the next stage of its Lean journey;
- The scrupulous audit which examines all the inputs which need to be considered by an organisation in its quest to achieve Lean status; and
- The indices were determined after considerable research which also considered the potential barriers to Lean and consequently the appropriate prominence paid to culture and change management systems adopted by organisations.

The chapter ultimately highlights the extensive Lean audit which evolved as a direct result of experience of consulting within disparate manufacturing organisations and subsequently piloted within several organisations achieving the desired results. In accepting the proposition that Lean must always be deemed as a journey, it is essential to be able to classify the expedition an organisation is required to accept in its pursuit to be regarded as an authentic Lean organisation.

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Concept of the Lean Audit

On the whole, it has been through my links with many dissimilar organisations both as a consultant and as a researcher whereby a definite requirement for an extensive Lean audit became evident. Often, senior policy makers of organisations have requested feedback upon their Lean initiatives, and I have felt that a tangible, credible, and visible audit would assist to provide the sought after reaction. I have been in numerous organisations which have tried to embrace the concept of Lean as an ideology. They have often tried to utilise the proposals documented by both:

- Henderson and Larco (2003) and
- Kobayashi (1996).

However, without failure upon a closer scrutiny, I have found them to be deficient and not instructing the organisation suitably. Furthermore, an extensive search of the literature has already acknowledged the necessity for an explicit audit since the frameworks acknowledged assist to ascertain the state of a Lean implementation, though two particular deficiencies have been identified:

- The existing audits did not entirely scrutinise the accurate state of Lean as evidently there exists a heavy reliance on the operational aspects of Lean within most of the audits. Consequently, the sustainability and ideological facets relating to Lean were largely ignored; and
- The distinct correlation of the audit results to an organisation's position on its Lean journey was not clearly recognised.

The investigation undertaken for the book and past experience do proceed to dictate the numerous ingredients necessary for Lean to both be initiated and ultimately sustained within an organisation. The various ingredients necessary should an organisation hope to succeed at implementing Lean and numerous others include the following:

- Suitable rationale for the adoption of Lean in the first instance,
- The procedures and instruments to challenge the barriers to Lean,
- The overall procedures to track the results of Lean and feedback mechanisms,
- The overall company's aspirations from its Lean journey,
- Extent of Lean adoption within the organisation,
- The breadth and depth of tools adopted,
- The cultural factors evident and the need to
- Measure the impact of Lean using various performance indices, and
- The need to adopt the ideology of Lean and integrate it into the organisation's mission.

With this in mind, it was considered necessary to be able to establish how these factors were measured.

Review of the Prevalent Lean Assessment Tools

There are no real "best" or "perfect" studies or methods. The general critique of the literature recognises that each assessment tool or method focuses upon a different side of Lean operations but rarely on the complete picture. Whilst some focus upon the perceptions of employees using a qualitative approach (Goodson 2002; Shah and Ward 2007), others utilise various performance metrics creating a quantitative assessment though what is required is a qualitative and quantitative approach being applied simultaneously. This assists to provide an overview of an organisation's leanness efforts. Frequently, the literature inaccurately proposes that the Lean measures are synonymous to an audit assessment of Lean as initially suggested by Schonberger (1987). In a similar fashion, the QCDMMS measures identified by Bicheno and Holweg (2009) whilst facilitating the overall continuous improvement journey do generally lack the adaptability of evaluating the standing of an organisation's complete Lean journey. Likewise, Goldratt (1990) profoundly emphases upon an organisation's supply chain alone.

The DTI 7 measures (2014) proceed to offer a wider perspective to many of the previous offerings and can be employed to advance production performance throughout manufacturing. Nonetheless, they along with Goodman (2002) and Shah and Ward (2007) undeniably fail to recognise the impact of change management, culture and a need to embrace Lean as an ideology on an organisation's quest to implement the Lean philosophy. In a similar fashion, Schonberger (1996), Kobayashi (1996), Goodman (2002), Mann (2005), Henderson and Larco (2003) and Lee (2008) do strive towards attempting to integrate Lean beyond the manufacturing sections of an organisation and endeavour to contemplate suppliers (Lee 2008) marketing and promotion (Goodman 2002); nonetheless, they are still profoundly attentive on performance and neglect to understand the necessity to view Lean as an way of life as steered by Toyota. Schonberger (1996) had already not fully appreciated the true extent of the impact that an organisation's employees have upon that company's Lean journey.

Kobayashi's (1996) "20 keys" deliberate on conveying together 20 of the world's best manufacturing improvement approaches; the overall intention is to assimilate them into a vibrant arrangement whereby permitting organisations to acclimatise to a continuously changing economic and competitive environment. Whilst Kobayashi (1996) endeavours to incorporate the significance of particular workplace practices such as teamwork and empowerment, it is considered that the indices reflecting upon the impact of and on the people are largely disregarded. The EFQM Excellence model (Graben 2006) is the most widely used organisational management framework in Europe, and it is suggested to be used by at least 30,000 organisations across more than 25 European countries; this is being widely applied outside European countries too and has become accepted within the Middle East and South America (WWW.bpic 2009). In areas where it is utilised as an assessment, it provides an indication of how the organisation is performing in comparison with other companies which may or may not be similar kinds of organisation. The model can be used as a business-wide

framework in a all-inclusive, focused, and concrete fashion. The greatest influence of the excellence model is appreciated from the linkages between the results and enablers which proceed to provide an indication of the potential areas for improvement. These linkages may be discovered at two distinct levels: across the model itself between the results and enablers and the second level of linkages is within each criterion, e.g. for "policy and strategy". The sub-criteria support a methodical sequence and assist to identify which areas of the chain may be fragile which inform the company of the areas and particular indicators for improvement. The model has many subsidiary advantages besides from those resulting from the self-assessment. The EFQM can be considered as a monitor to the introduction of a TQM initiative since the model combines the ideologies or essential concepts of TQM in perfect and concise language. WWW.bpic. (2009) has come under some scrutiny; Bou-Lluser et al. (2005) state that the empirical research on the causal relationships within the model are still limited since the model is largely grounded on studies that test isolated associations. Equally, whilst the EFQM Excellence model recognises the need to adopt a holistic view in quality systems, it remains a well-used general assessment framework and is not detailed enough for Lean.

Goodson's Rapid Plant Assessment (RPA) guidelines and overall process permit a team to determine a factory's leanness precisely solely from visual indicators and discussions with employees. At the core of the RPA process, there exist two key assessment tool, namely:

- the rating sheet and
- the questionnaire.

The rating sheet includes eleven categories including safety, scheduling, inventory, teamwork, and supply chain which assist to establish a plant's leanness. The questionnaire features a set of twenty "yes" or "no" questions which focus upon the underlying behaviours contained within the categories. The assessment tool is intended at valuable benchmarking and assessment of supplier plants; proceeding a plant tour, the team can make an assessment using the Goodman methodology. The prominent benefit of this tool is that in total, eleven categories are employed. Each category is rated from "poor" to "best in class". The categories appraise customer satisfaction, safety, and H&S issues. Furthermore, HR is taken into account and since certain indices evaluate teamwork and motivation. In addition, supply chain integration is also acknowledged precious of an exploration. Finally, in general, the model is effortless to learn, can be quickly applied, and can create results within a day. However, there are several limitations associated with Goodson's RPA; on the whole, it fails to recognise Lean as a never-ending journey. Furthermore, Lean is not observed as an ideology which accordingly means that the sustainability indices are not awarded adequate consideration. In addition, the change process necessary for Lean is not directly scrutinised by this model; there is a limited reference made to the concept of recognition of employees and possible workforce involvement. Lastly, it is considered that the indices are reviewed in isolation with very scarce verification examining the existent relationships between the categories.

Schonberger (1996) commonly could be regarded to be a concise channel to Leaner operations. This aspect is reinforced by the fact that whilst focusing at customers, workforce involvement, training, and marketing, it proceeds to appraise the general concept of waste including variation and the root cause principles. The possible influence of performance measurement is examined to an extent, and generally, the indices can assist an organisation to become further demand led and facilitate a greater level of organisation by customer groups. Likewise, the model allows comparisons to be made with other organisations; this can assist a benchmarking exercise. However, there are present certain concerns with Schonberger's model too. It commonly fails to encapsulate that Lean must always be regarded as a never-ending journey. Similarly, the whole ideology of Lean is not fully embraced and not assesses. The sustainability indices are not paid sufficient emphasis; moreover, the change process is not openly investigated although some reference is directed towards a need to recognise employees and workforce involvement.

Kobayashi (1996) acquired impetus both as a manufacturing and implementation channel to Lean. As a result of its subsequent analysis, it is feasible to make comparisons with other organisations; this also assists to establish benchmarking exercises to be embarked on. A five-point scale is offered for each key by means of initiating a self-assessment exercise to be carried out; the categories span between a level 1 "beginner" to level 5 "ideal". In addition to integrating good links with other keys, the assessment promotes the need to achieve in one area, which permits the organisation to excel in most of the remaining keys. In addition, the model appropriately considers waste, 5S, team working, continuous improvement, and cross-functional working and looks at supplier relations too. Conversely, Kobayashi's model (1996) exhibits several imperfections too. It inspects the processes and operations, but does not examine in vigour into the role of Lean and the change process. The whole idea of sustainability and culture is awarded insufficient emphasis which accordingly results in the matter of culture and the requirement to treat Lean as an ideology being abandoned on the whole. Likewise, there is a profound focus devoted towards the shop floor; as a result, the need to recognise that Lean should enable the organisation to achieve encouraging business results is by and large ignored too.

Goodson's (2002) and Shah and Ward's (2007) Lean assessments are totally devoid of the obligatory organisational development needs if an organisation is to flourish at Lean. Similarly, Mann (2005), Henderson and Larco (2003), Lee (2008) and Shah and Ward (2007) do not fully appreciate the full influence of culture on the success of Lean. Lee (2008) suitably concentrates on the nine key areas of manufacturing comprehensively. Nonetheless, he proceeds to appraise the nature of teamwork within any organisation and proposes a need to build long-lasting and successful associations with suppliers. On the other hand, the importance of sustainability, the change process and culture are not totally acknowledged through the indices utilised. This results in the fact that the need to treat Lean as a philosophy is not entirely appreciated. Furthermore, Lee's audit (2008) does not recognise the need to treat Lean as a business ideology neither.

Henderson and Larco (2003) correctly observe in depth the procedures and the function Six Sigma plays in a Lean implementation. Correspondingly, the audit focuses upon teamwork and change management through the "continuous pursuit of perfection" (p. 279) indices. Nonetheless, Henderson and Larco (2003) do not scrutinise in ample depth the part sustainability and culture play in a triumphant Lean implementation; consequently, the need to treat Lean as a philosophy is not followed within the exploration. A critical constituent also absent within the audit is the need to measure whether an organisation's Lean endeavours have resulted in an enhanced business performance. Whilst virtually all Lean failure (Parks 2002; Mann 2005) can be accredited to a different causes, underlying all of them are the deep-rooted issues of corporate culture and change management. Lee (2008) rightly selects quality as a category but then proceeds to opt for four questions whereby three have a heavy SPC focus, whilst the other seeks to establish the defect rates.

Shah and Ward (2007) primarily endeavour to elucidate the concept of Lean by developing and authenticating a multidimensional measure of Lean. The results are split into three sections:

- *what* is Lean (i.e. identify critical factors),
- *how* are the various features of Lean associated with each other, and
- *why* are they interrelated.

Commendably, they analyse ten factors regarded as representative of the operational requirements for Lean to flourish, i.e. supplier development, customer involvement, and the process categories. They emphasise that it is the harmonising and synergistic effects of the ten different but highly interconnected essentials that give Lean its exclusive disposition and its advanced ability to accomplish multiple performance goals. Shah and Ward (2007) accurately endorse that none of the individual components are comparable to the system, but together, they represent the system. Nonetheless, the assessment looks at process and operations, but does not appraise in adequate intensity the role of Lean change, sustainability, and culture should an organisation hope to secure the full benefits that Lean has to offer. Like many other models, the indices do not completely identify the requirement to determine the performance of Lean in order to interpret the accurate impact Lean has made to an organisation.

Mann's audit (2005) was a product of deductions he was able to make; essentially, he recognised that whilst the Lean tools were in place, the operators and team leaders did not instinctively appreciate how to manage the changes. According to Mann, the "Four Principal Elements of Lean Management" which are well documented within the audit are as follows:

(i) Leader standard work,
(ii) The visual controls,
(iii) The daily accountability process, and
(iv) Leadership discipline.

Mann's (2005) highlights the eight categories of process and behaviour defining the assessment with 5 levels, with 1 = "pre-implementation" to 5 = "sustainable

system". The audit provides a good method of self-assessment which appraises processes vigilantly and process development in considerable detail and strongly examines process improvement too. However, the unconstructive aspects of the audit whilst analysing the control and accountability process, there is a derisory emphasis placed upon performance measurement. Similarly, Lean is not viewed as an ongoing journey, and overall, the measures are too static and do not really promote development. Intrinsically, inadequate prominence is placed upon culture and change measurements within the audit.

The Shingo Prize (2014) is very adaptable and can be practically applied to all industries, public or private sector, profit or non-profit sectors, and individual sites, plants or entire businesses. Furthermore, the Shingo Prize criteria assist to diminish uncertainty, clarify objectives, and provide intensely useful advice to organisations that have selected to pursue this prize. Furthermore, the Shingo Prize criteria have been slightly changed after the criticism received for awarding a prize to Delphi which subsequently went bankrupt. Shingo Prize has developed from a manufacturing focus to one expanded to "operational excellence". Further categories were added for the public sector and research. Nonetheless, the Shingo Prize intrinsically possesses certain limitations also. The assessment procedure is exceptionally stretched and involves six stages. These procedures entail:

(i) The initial application an organisation makes for the Shingo Prize, the silver or bronze medallions, generally one year before the intended "Achievement Report",
(ii) Achievement reports are submitted and reviewed, and this often involves a 30-day lead time. The report must be written in the format that closely aligns it to the Shingo Prize model and can be up to 75 pages in length. Characteristically, a Lean mature organisation will take six months preparing their achievement report and could receive notice of their award status within another three months,
(iii) Reports with encouraging recommendations receive a site visit designated examiners; the time period for this can be between 30 and 60 days after the application notification,
(iv) Based on a site visit, recommendations are made to the "Executive Committee" for bronze and silver medallion or the Shingo Prize,
(v) Organisations are often informed of the decision, no later than 30 days after the site visit; official recognition occurs at the annual conference or regional conference; in certain circumstances and where appropriate, applicants receive written feedback, and
(vi) Companies requesting additional recognition at a local facility may request Shingo representative whereby travel expenses would need to be covered.

In addition, the costs involved with the application can be extreme; the application fee is £1400 for a small category and £3800 for a large category. The "Achievement Report" can cost between £7k and £12k for large organisation, £3k for medium, and £1k for small companies. The site visit can total to £7k–£12k for larger organisation. Clients are expected to attend a two workshop; the cost of

attending is nearly £1k per candidate. In addition, the decision is always final with no appeal; the awards are valid for five-year cycle whereby at this stage, the organisation must rechallenge for the prize.

Like any other awards, one feels it appropriate to pursue the prize though for the right reasons; the award should be viewed in a manner whereby the results are actioned upon from feedback received from customers and other stakeholders; executing tools for the rationale of achieving a prize is like cramming for an exam—one may achieve a high score but not excellence. The Kotani forging plant near Himeji, for instance as Miller (2008) suggests, would probably not score highly on the Shingo Prize criteria as there are no cells, no 5S, no kanbans, and no instruction sheets. Nonetheless, Kotani is a second tier supplier to Toyota with sales per employee twice the US average for forging shops and has managed to achieve its results by focusing on technology. In addition, Table 12.1 (Miller 2008) illustrates results of companies based on public reports. Whereas the Shingo Prize winners were 10 % more profitable, they lost market share and cut costs, whilst their competitors did the opposite.

Critics have been critical regarding the Shingo Prize; Graben (2006) suggests that if you invested in the Shingo Prize winners since 2001, you would have secured a net return of −0.75 %. Even if Delphi is removed from this equation, the net return of Shingo Prize winners is still −0.55 %. Justifiably, there are other factors involved in a company's performance which may not have been fully accommodated within the criteria.

Overall, any assessment should be able to understand the notion of quality and integrate this into an organisation's Lean journey. The criteria selected should be carefully considered which should enhance a company's overall effectiveness. The criteria utilised also need to gauge whether Lean is viewed as a journey, which consequently means that the initiative will be sustained. Any organisation needs to be creating value presently, but whether they will be doing similarly in five years' time is not readily considered in most of the assessments outlined. Lee (2008) and the WWW.bpic. (2009) neglect to maintain the notion of viewing Lean as an expedition. Equally, Mann (2005), Henderson and Larco (2003), Lee (2008), and Shah and Ward (2007) are also culpable of not recognising the significance of organisational development requirements of Lean, such as the:

- Organisation's prevailing culture,
- Lean pay systems,

Table 12.1 Performance in the market

	Sales growth (%)	Profitability (%)	Employment growth (%)
All Shingo winners	13	6.38	−0.54
All competitors of winners	14.71	5.8	1.26
Shingo Prize winners <$10B/year in sales	9.14	3.63	−3.64
Competitors of winners <$10B/year in sales	14.09	6.1	0.84

- Performance reward systems,
- Lean measurement systems,
- Impact on and of the workforce, and the
- Change management process.

Although reference was made of the DTI seven measures (2014) promoted by the *Industry Forum* of the *Society of Motor Manufacturers and Traders* (SMMT) beneath the umbrella of quality, cost, and delivery (Q, C, D), they are, nevertheless, proposed to support a structure for continuous improvement, raise potential levels of customer satisfaction whilst greatly improving the management of production. Undeniably, measuring QCD provides noteworthy benefits, namely:

- accuracy; these indices can emphasise the priorities for improvement in production management with lucidity and focus,
- minimalism since even an intricate manufacturing process can classify a straightforward direction towards performance improvements,
- Feedback, as the seven QCD indices can be utilised to compute the results of changes to the process. The outcome of a change can be compared with the status of the process prior to the change. QCD provides speedy feedback and quantifiable numeric comparisons,
- Benchmarking since QCD facilitates the basis for concrete comparison with benchmarked processes or the performance of a benchmark company. This then assists to illustrate processes which offer better methods and practices, and
- An invaluable gauge since the business survival is reliant on the profit generated from gratifying customers. QCD is a strong production tool which enables a computable impact on manufacturing efficiency; it assists to advance competitiveness, develop businesses, and increase profit.

Nonetheless, these indices are designed to provide a rational and inclusive analysis of production performance and proceed to offer the basis of continuous measurement and improvement but are not intended to be treated as a Lean audit. Likewise, Bicheno and Holweg's (2009) essential measures of Lean are given as follows:

- Lead time,
- Customer satisfaction,
- Schedule attainment, and
- Inventory turns.

Similarly, Goldratt's (1990) proposed measures for supply chain effectiveness:

- throughput dollar days and
- inventory dollar days coupled with

the QCDMMS, an acronym for a set of measures that many Lean organisations exhibit at each line or area (Henderson and Larco 2003):

- Quality,
- Cost,

- Delivery performance,
- Morale,
- Management, and
- Safety

are admirable measures to support efficiency but not intended to be used as an audit to measure Lean. Table 12.2 provides a summary by emphasising the most salient points of the Lean audits discussed and evaluated earlier.

Table 12.2 Analysis of the Lean audits

The comparative strengths and weaknesses of the important Lean audits		
The Lean audit	Strengths	Possible shortcomings
Eugene Goodson	• Easy to grasp; rapid application is possible and it facilitates results in a day or less • Focuses upon customer satisfaction, safety, and H&S issues • Also focuses upon HR, i.e. teamwork and motivation	• The sustainability indices are inadequately covered • Change procedures are very indirectly analysed although make reference to recognition of employees and workforce involvement • Indices are reviewed in seclusion with few interconnections explored between the categories
Shingo Prize (2014)	• Its flexibility and application are appealing as it can be applied to all sectors • The criteria assist to reduce confusion which assists to elucidate objectives, and • The criterion has changed to represent expectations	• Reasonably prolonged assessment process • The application outlay involved may dissuade some organisations • Substantial deliberation remains regarding its business value
EFQM Excellence model	• Regarding its assessment qualities; it can assist benchmark comparisons • The associations between the enablers and the results • Allows other benefits of self-assessment such as a guide to TQM	• Too generic as a framework and not specific towards Lean • The empirical evidence of the correlations is blurred • It does not specifically identify the stage of a Lean journey achieved
Schonberger's principles	• Analyses the role of performance measurement • The measures suggest that organisations become more demand led, to be organised by customer groups • Comparisons are possible with other organisations; accordingly, a benchmarking exercise is possible	• Unable to view Lean as a journey and subsequently does not view Lean as an philosophy • The sustainability indices are paid less emphasis • The change process lacks any concentration though it does make reference to the acknowledgement of employees and workforce involvement

(continued)

Table 12.2 (continued)

The comparative strengths and weaknesses of the important Lean audits		
The Lean audit	Strengths	Possible shortcomings
Kobayashi	• Judgments can be made with other companies; subsequently, a benchmarking exercise is feasible • Good associations with other keys; to achieve in one area, it is necessary for the company to stand out in most of the keys • Looks at waste, 5S, team working, continuous improvement, cross-functional working, and the supplier relations	• Analyses process and operations, but inadequately into the influence of change on Lean • Consequently, culture and the need to treat Lean as an ideology are not examined • Main concern—Lean should produce results—whole field not judged in any depth
Mann's audit	• Offers a firm and valuable system of self-assessment • Focuses at procedures connected with Lean carefully • Does concentrate at overall process improvement and kaizen ideology	• Whilst examines the control and accountability process—inadequate prominence on performance measurement • Not viewed as a journey with indices too immobile and not meant to sponsor improvement • Culture and change not paid sufficient prominence
Henderson	• Focuses at the overall processes and the role of Six Sigma • Also concentrates on teamwork and change management through the "continuous pursuit of perfection" indices • Broadens the concept of Lean away from the shop floor and looks at management styles too	• Sustainability and culture awarded inadequate emphasis • Accordingly, culture and the need to treat Lean as a philosophy are not promoted • Main concern—Lean should result in business results—whole area not awarded sufficient prominence
Lee	• Concentrates expansively at nine key areas of manufacturing • Does appraise the nature of teamwork within the organisation • Tries to analyse the requirement to build long-term and successful relationships with the suppliers	• Culture coupled with the prerequisite to treat Lean as an ideology is not explored • Prominent concern—Lean has to reap business results—whole area awarded insufficient attention • Change is also not awarded sufficient consideration
Shah and Ward	• Ten factors are scrutinised regarding the need to constitute the operational accompaniment • The matching and synergistic effects of the ten separate but highly interconnected essentials give Lean its unique character • A recognition that no component is equivalent to a system, but together, they constitute a total system	• Concentrates at process and operations, but unsatisfactorily into the change systems needed for Lean • Accordingly, culture and the necessity to treat Lean as a philosophy are not promoted • Major issue—Lean should facilitate business results, and this area is once again insufficiently tackled

(continued)

Table 12.2 (continued)

The comparative strengths and weaknesses of the important Lean audits		
The Lean audit	Strengths	Possible shortcomings
Pakdil and Moustafa Leonard (2013)	• Looked at qualitative and quantitative measures • Good underpinning process recommending way forward for organisations • In total, fifty-one evaluation items are used	• Looks at process and impact of people, not viewing Lean as a journey • Insufficient emphasis paid to Lean principles and culture, and • Interlinkages are not recognised and not explored in any depth

The Role of Lean Audits

An assessment should take place at regular intervals in order to explore the general status of an organisation's Lean position. In an extensive literature review, it was discovered that whilst there were nine books which made reference to Lean assessments, none included a particular chapter or materials enabling a quantitative assessment of managerial or organisational leanness to be made. In fact, it was only Mann (2005) who endeavoured to look at quantitative assessment of managerial or organisational leanness. This through the authors experience is particularly important at the early stages of Lean. Likewise, the questions should correspond to the values an organisation is striving towards. In many instances, within any Lean evaluation, an organisation may need to reiterate the values it aims to achieve; this is since Lean is dynamic in character. The appraisal should always inform an organisation of the progress it has made since the inception of Lean. This is vital to be able to promote the benefits securing further buy-in. Moreover, the outcomes of the appraisal should facilitate an organisation to focus its efforts towards areas requiring further energy. Research (Mann 2005) proposes that quarterly assessments are satisfactory. The assessments must not merely be regarded as a customer-based activity but embarked on frequent basis and embrace the ideas of time and speed as important components of Lean.

Similarly, when the appraisals are undertaken on a three-month cycle intervals, it is significant to keep them uncomplicated and devoid of bureaucracy. It is also important to contemplate the size of the organisation in question before commencing upon a habitual programme of assessment. Similarly, it is vital to persuade team leaders to carry out the appraisal. Preferably, a unit's appraisal score should be based on the assessment by the team leader of the next level in the organisation. However, when this becomes unfeasible, a mixed model of assessors should be considered in order to retain the credibility and validity. The senior management teams could be involved since this assists to sustain a common understanding of appraisals. Larger sub-units could be measured by a nucleus of managers from other areas supported by internal expertise. The amount of categories will be dependent on the intricacy of the operations and the company itself. Similarly, an assessment of different dimensions is essential since a single average may possibly not induce

suitable action. An appropriate proposal is a radar screen profile which should be utilised subsequently. When feasible to compare one unit over time, a "*consistency*" (Mann, p. 168) index may well be developed.

A Comprehensive Lean Assessment

The audit that is proposed attempts to determine the prevailing status of an organisation in question and then ensues to fit into the contemporary models. We should recognise the various opinions of Lean implementation which are as follows:

- Feld (2001) splits the Lean implementation journey into five segments; the Lean appraisal looks at the current state gap, the future state design, alongside the implementation and finally reiterates the need for continuous training,
- Harbour (2001) utilises the four stages, namely the organisational development, discipline construction, tool employment, and continuous improvement,
- Motley (2004) splits the Lean implementation journey into six stages; these are as follows: classify value from the final customer's perspective, classify the value stream, map current and future states, build up a product-focused organisation, introduce pull systems, and proceed to achieve the earlier steps of continuous repetition, and
- Drew et al. (2004) on the other hand scrutinise five phrases; the foundation stage, an appraisal of the current state, defining a desired future state, implementing a pilot, and finally the continuous improvement.

The Position of Lean Audits

Whilst a Lean audit may prove a challenging task, nonetheless when undertaken inappropriately, it can represent a substantial risk to an organisation. The organisations that benefit most are those which recognise the goals they anticipate to meet and ensuring that the audit measures the most appropriate aspects. Periodically, an assessment should take place to investigate the overall status of an organisation's Lean standpoint. Equally, the questions should represent the standards an organisation is striving towards. Often, in any Lean assessment, an organisation may need to redefine the standards it aims to achieve, since Lean is dynamic in nature. The assessment also informs an organisation of the progress it has made since the inception of Lean. Similarly, the outcomes of any assessment should assist to focus an organisation towards areas requiring further effort. Research (Mann 2005) proposes that quarterly assessments are sufficient. The assessments should not be viewed as a customer-based activity but undertaken on a regular basis and embrace the ideas of time and pace as important ingredients of Lean.

Likewise, if the assessments are to take place at 90-day intervals, it is important to keep them simple and free of bureaucracy. Consider the size of the organisation in order to commence a regular programme of assessment wherever, possible, it is useful to encourage team leaders to undertake an assessment. Ideally, a unit's assessment score should be based on the appraisal undertaken by the leader of the next level in the organisation. Where this becomes impractical, a mixed model of assessors could be considered to retain the credibility and validity. Senior management should be involved in order to maintain a common understanding of assessments. Large sub-units could be assessed by a core of managers from other areas backed by internal managers. The number of categories will depend on the complexity of the operations and the organisation. Similarly, an examination of various dimensions is imperative since a single average would not induce appropriate action. An appropriate proposal is a radar screen profile which is used subsequently. When feasible to compare one unit over time, a "*consistency*" (Mann, p. 168) index should be developed.

Application of the Lean Audit

Significantly, all the ten categories with the complementary set of indices within each cluster were employed in the assessment. Having acted as a Lean champion and subsequently consulted and advised numerous organisations, the prominence of culture, change, and sustainability became apparent and naturally formed distinct areas to scrutinise in a Lean appraisal. During the compilation process, it transpired that indices relating to culture had a natural focus relating to either the organisation's processes as a whole or the employees as individuals. In this case, a decision was made to utilise two distinct categories. The importance of the Lean tools and the corresponding technical components was drilled into the training received and assisted to formulate the flow, processes, and design of quality indices. The importance of safety and the general visual management is perceived as complimentary factors, and a decision was made to develop specific suites of indices. Whilst it would have been possible to combine continuous improvement with change, it was deemed vital to keep them separate since change and culture were considered to play a prominent role in all Lean implementations. Likewise, any organisation deciding to implement Lean should consider its impact on the business performance which accounted for these respective set of indices. Finally, whilst the notion of Lean philosophy embraces all the aspects mentioned, there were certain specific criteria not logically assimilating into another category and helped to form a separate group; consequently, the categories were as follows:

(i) General visual management and organisation;
(ii) Manufacturing, general flow, and processes;
(iii) Quality planned within the product;

(iv) Continuous improvement;
(v) Change strategy;
(vi) Sustaining the Lean journey;
(vii) Culture regarding processes;
(viii) Culture regarding people;
(ix) Lean viewed as a commercial venture; and
(x) Lean ideology.

Experience suggests that certain aspects are not adequately covered in many audits and the literature reinforces this since often the sustainability, the respect for people, culture, and the need to embrace Lean as an ideology are often lacking which proves to be detrimental to an organisation. An important weakness of most existing studies is that particular performance indicators are employed using a very limited perspective. It is necessary to present a comprehensive model which examines all the primary aspects of Lean operations. Each performance dimension within the audit measures a unique part of the Lean implementation. Likewise, the association to the seven wastes and the audit should be obvious. This has been summarised in Table 12.3. Although the Lean concepts have a strong quantitative component, a qualitative perspective is needed. Perceptions are vital which cannot always be incorporated within quantitative methodologies. The proposed audit should be integrated into a comprehensive problem-solving methodology.

As identified previously that many organisations have tried to implement Lean, nonetheless, most attempts do not provide a true picture since organisations decide to implement parts of the Lean system. Similarly, Lean performance is not evaluated using a comprehensive measurement system or tool; often, managers feel that the analysis will cost too much.

Table 12.3 Links between the audit and the wastes

The audit dimensions	Links to the wastes
Manufacturing, general flow, and processes	Waiting time, possible delays
Quality planned within the product	Transportation of parts and materials, inventory-associated costs
Continuous improvement	Not make defective parts
Change strategy	Transportation of parts and materials
Sustaining the Lean journey	Overproduction
Culture regarding processes	Over-handling, possible delays
Culture regarding people	Over-motion, underutilised personnel
General visual management and organisation	Motion
Lean viewed as a commercial venture	Delivery, inventory-associated costs
Lean ideology	Possible delays, underutilised personnel

CI/Lean Assessment

Scoring system

A scoring system of 0–6 is to be used against each of the respective indices or metrics:

0 = no adherence or compliance to the listed criteria specified within the metric,
6 = complete adherence to the listed criteria outlined within the metric,

(As an aid to the scoring, the prevailing situation that should be in place is indicated under each criterion; this assists to score the organisation against the specified metric on a scale ranging between 0 and 6.)

General visual management and organisation	Score
Health and safety 0 = Wholly unsafe; many dangers can be identified; no observance of policies 6 = Entirely safe; no dangers and complete observance of polices	
Hygiene 0 = Completely cluttered with no systems implemented for cleaning 6 = Impeccably clean with a programme for all supporting areas	
Overall orderliness 0 = Haphazard and no systems for markings or to find any tools 6 = Just necessary items readily available; clear markings for tools	
Graphical appearance 0 = Totally avoided and no structures; no performance statistics evident 6 = Complete prominence; team performance stated in administration areas too	
Warehouse stocking 0 = No locations allocated; levels not specified nor optimum or minimum 6 = Fixed locations with strong minimum and maximum levels	
Shop floor stocking 0 = No locations allocated; levels not specified nor optimum or minimum levels 6 = FIFO adherence, static locations with kanban systems	
Pictorial indicators 0 = Never used or assisted to inform employees 6 = Constantly used	
Finished good inventory/total inventory 0 = 10 % worse than industry average 6 = 20 % better than industry average	
Total inventory/total sales 0 = 10 % worse than industry average 6 = 20 % better than industry average	
Score = /54	

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Manufacturing, general flow, and processes	Score
Continuous flow 0 = Poor or no flow systems with no established batch sizes 6 = Advanced flow and smaller batches	
Documentation of processes 0 = No processes are evident, and where they exist, they are totally unstandardised 6 = Processes are apparent and standard	
Pull systems 0 = No evidence that systems are built to meet customer demands 6 = Systems are built to meet customer demands	
Line flexibility 0 = Little or no line flexibility built in; slow changes 6 = Quick switches within acceptable TAKT time including batch changes	
Customer provision and forecasting 0 = The integration between forecasting and customer provision is totally unclear 6 = Complete integration; scheduling occurs at the lowest level	
Reaction to product mix alteration 0 = Any product mix changes pose considerable issues and disruption 6 = No issues caused	
Manufacturing stages controlled in work cells 0 = Little or no manufacturing stages are controlled in work cells 6 = Exceed 75 %	
Production process 0 = Anything but one-piece flow; no real structures 6 = Wholly one-piece flow	
Total productive maintenance 0 = TPM is not evident and no culture to promote this in place 6 = A meticulous process	
Time spent on unplanned or emergency repairs/total maintenance time 0 = Very high maintenance required on unexpected repairs >70 % 6 = Fewer than 10 %	
Average OEE of the production apparatus 0 = OEE generally less than 0.15 % (nature of product to be considered) 6 = Generally 0.85 or above	
Set-up time/total production time 0 = More than 20 % 6 = Less than 5 %	
Total downtime/total machine time 0 = More than 20 % 6 = Less than 5 %	
Score = /78	
Quality planned within the product	Score
5S is relentlessly undertaken 0 = 5s is virtually non-evident and no culture to promote 6 = Completely integrated	

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Equipment devices recognise defects 0 = The equipment devices not instilled to recognise defects 6 = Full stoppage when faults happen	
Permission to operatives to stop manufacture 0 = No authority for operatives to question quality or faults nor stop manufacture 6 = Complete authority is granted	
Mistake proofing to avert defects 0 = Mistake proofing nor evident; not promoted 6 = Total usage on all essential processes	
FIFO systems for stock 0 = No FIFO systems in place or any particular stock management system 6 = Complete observance	
Closed-loop quality problem-solving 0 = No closed-loop problem-solving; culture of "firefighting" 6 = All issues contain a detailed development plan	
Root cause problem-solving 0 = To systems or processes in place to examine or promote root cause analysis 6 = Routine methodological approach to root cause solutions	
Standardised working 0 = No standardised practices in place and no reviews evident or promoted 6 = Completely standardised with constant reviews	
Reception quality 0 = Supplier quality levels vary; no standards established 6 = Main suppliers are self-certified and maintained	
Visual organisation 0 = Little or no analysis undertaken to determine the root cause analysis 6 = Frequently analysed to decipher issues	
Percentage of manufacturing protected by SPC 0 = SPC virtually non-existent 6 = Exceeding 70 %	
Process of product engineering 0 = New designs taking twice the industry standard; still inherent issues identified 6 = Combined effort for new designs taking less than six months	
Regimented obedience to process 0 = No reviews of manufacturing and connected processes; no structures 6 = Pareto driven with regular reviews of manufacture and connected processes	
Defect rates 0 = More than 10 % 6 = Less than 2 % with downward trend	
Total scrap £/total sales 0 = More than 10 % 6 = Less than 2 % with a downward trend	
Score = /90	

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Continuous improvement	Score
Practice of change functioning 0 = Virtually non-existent change systems in place; disjointed 6 = Organisational-wide response	
Change implementation 0 = No one leading the change necessary; no real plans and systems in place 6 = Delegated responsibility to implement change	
Effect of change is gauged 0 = Communication systems are very poor; mixed messages constantly forwarded 6 = Clear and lucid communications and considered impartially	
Operators and administration staff have recurring meetings 0 = Silos apparent between admin and operators 6 = Absolutely no issues	
Continuous improvement team 0 = CI teamworks in isolation; no attempts to cascade responsibility 6 = Many involved within recognised rules with scientific results	
Process improvement 0 = No structures are evident looking at process improvement 6 = First-line leaders responsibility	
Culture of waste 0 = No real recognition of waste; no commitment or promotion for its eradication 6 = Complete commitment	
Tracking the results of the Lean initiative 0 = No real evidence of tracking the results of Lean; haphazard 6 = Weekly meetings	
Use of innovative equipment 0 = little or very isolated evidence of innovative equipment; culture of distrust 6 = Incorporated solutions with company-wide performance measurements	
Total cost of poor quality/total costs 0 = More than 10 % 6 = Less than 2 %	
Total prevention costs/total sales 0 = More than 15 % 6 = Less than 5 %	
Score = /66	
Change strategy	Score
Senior management support 0 = No evidence of SMT support or direction 6 = Absolute support from senior managers	
Existing cultural considerations 0 = No recognition of the impact culture has on Lean 6 = Extensive effort to change behaviour	
Evident Lean champion 0 = Not clear who is leading the Lean initiative 6 = Visibly communicated	

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Culture linked to the company's performance 0 = Role of culture to company's performance is vague and unclear 6 = Overall recognition of the relationship	
Reliable vision is needed 0 = No tangible vision nor mention of Lean in this respect 6 = Lean forms part of the vision	
Widening the Lean remit 0 = No efforts to widen the remit of Lean or its breadth 6 = Genuine audit trail	
Future state mapping occurring 0 = Considered that the Lean journey will occur by chance; no structures 6 = Methodical Lean journey apparent	
Sensei and other professionals utilised 0 = No efforts in place to widen the Lean empowerment or sensei established 6 = Journey towards internalising the process	
Lean and compensation linkages established 0 = No efforts made to recognise linkages between Lean and compensation 6 = Complete endeavours to recognise the association	
Encouragement of a positive culture 0 = Little or no attention paid to culture 6 = Amalgamating culture and strategy; Lean is a journey	
Culture promoting greater stability 0 = No efforts made to explore efforts for stabilisation 6 = Endeavours made to exploit stability	
Subcultures acknowledged 0 = Evidence of subculture not aligned to Lean; no efforts to address this issue 6 = Laborious efforts to ensure that the vision and efforts remain	
Total percentage of managers/total employees 0 = 10 % worse than industry average 6 = 20 % better than industry average	
Score = /78	
Sustaining the Lean journey	Score
Lean tool application 0 = No considerations of using correct or a mixture of appropriate Lean tools 6 = Concurrent application of more than six opportune and appropriate tools	
Tool sustainability 0 = No considerations of persistent use of correct or cocktail of appropriate tools 6 = At least three-year concurrent application of six or more appropriate tools	
Tool application 0 = No strategy to apply tools suitably where required or across boundaries 6 = Entire value chain and incorporating supplier chain	
Lean sections 0 = Lean applied in one or two isolated areas with no direction or conviction 6 = Excess of 70 % of the cost centres are Lean	
Market development 0 = No concerted efforts to explore new markets 6 = New markets relentlessly pursued	

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Association of Lean with company's vision 0 = No associations of the Lean initiative with the mission or vision 6 = The Lean initiative is engrained on to the company's mission and vision	
Value streams promoted 0 = Heavy concentration upon one-product value stream 6 = An acknowledgement of viewing combinations of value streams	
Revenues from new products 0 = Less than 10 % of revenues accounted for from new product ranges 6 = Exceeding 50 %	
Customer retention rate 0 = 10 % worse than industry average 6 = 20 % better than industry average	
Score = /48	
Culture associated with the organisational practices	Score
Structured by customer families 0 = Not organised in alignment of customer families and no evidence 6 = The organisation is influenced through customer families	
Process focus culture 0 = No evidence of processes supporting customers 6 = Complete possession of people realising how customers are supported	
Organisation structures 0 = Little or no integration between the organisational structures 6 = Complete integration	
General self-dependence 0 = Little evidence of control; likewise with suppliers 6 **=** Complete control whilst company preserves internal potential	
Purchasing methodology 0 = Kanban systems not followed in reference to purchasing methodology 6 **=** Complete kanban oriented	
Early supplier involvement 0 = Supplier involvement is virtually non-existent 6 = Organisation culture promotes this	
Finance and administration sections 0 = Departments operate in silos with no recognition of Lean accounting systems 6 = Conducive accounting with metrics assisting operatives	
Organisation by customer families 0 = No emphasis placed upon organising flow to product families 6 = Total company actively encourages organisation by customer families	
Human resources and Lean direction 0 = Lean direction not evident amongst HRM nor clarity of its role with Lean 6 = Completely discernible Lean direction at all levels	
Recompense 0 = Little or no recognition of skills in compensation systems 6 = Totally skill based	
Lean conversion duties allocated 0 = Duties and responsibilities of Lean left to chance with no strategy or systems 6 = Excellent communication with the duties of Lean allocated	

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HRM evaluations 0 = Traditional and conventional HRM evaluations; not conducive to Lean 6 = A 360° system with persistent support for both CPD	
Total indirect employees/total direct employees 0 = 20 % worse than industry average 6 = 20 % better than industry average	
Score = /78	
Culture related to people	Score
Team empowerment and employee participation 0 = No promotion of empowerment and employee participation 6 = Full allocation of responsibility and authority	
Human resources 0 = Role of human relations and Lean not explored; not utilised to look at culture 6 = Recognised that training and communication will bring the culture in line	
Overall leadership styles 0 = Leadership style too autocratic 6 = Complete participation	
HRM coaching and training 0 = Little or no evidence of coaching and training 6 = Very widespread with solid accomplishments	
Overall professional development and Lean awareness 0 = No CPD permitted and Lean awareness and empowerment not encouraged 6 = CPD actively promoted and Lean awareness advocates empowerment and appropriate delegation	
Every day responsibility procedures 0 = Everyday responsibilities remain vague and imprecise 6 = Personnel are fully aware of the concepts and expectations	
Communication channels 0 = Poor communication systems; channels operate ineffectively 6 = Exceptionally open and democratic	
The number of hierarchical levels 0 = 20 % worse than industry average 6 = 20 % better than industry average	
Score = /48	
Lean viewed as a commercial venture	Score
Recognised strategic planning happens 0 = No recognised strategic planning; role of Lean imprecise 6 = Comprehensive five-year plans integrating Lean journey	
Future state mapping 0 = No or little evidence of future state mapping 6 = Evidently happening	
Indices embrace variety of indices 0 = Very narrow indices; financial considerations alone 6 = All areas are covered methodically	
Indices to the KPIs permit company to differentiate from its competition 0 = Indices not aligned to Lean; may be contrary to Leans development 6 = Indices fully associated to the instant and continuing Lean journey	

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Indices are fully comprehended at employee and organisation level 0 = Indices used in isolation where in existence; not aligned to the Lean journey 6 = All comprehend the indices and its association to company's performance	
Connection of value streams and support functions is obvious 0 = The linkages between value streams not recognised 6 = Appreciate that changing a value stream impacts other stream(s) and functions	
Market share 0 = Downward trend 6 = 20 % better than industry average	
Lean not restricted to operational improvements 0 = Scope of Lean viewed narrowly and restricted to operational improvements 6 = Broad view of Lean; Lean promoted to every aspect of the organisation	
Profit after interest and tax/total sales 0 = Worse than industry average 6 = 20 % better than industry average	
Total orders delivered late/total deliveries 0 = Worse than industry average 6 = 20 % better than industry average	
Score = /60	
Lean ideology	Score
Complete lucidity of the vision 0 = No evidence of direction for Lean or association with the vision 6 = The Lean journey is completely evident and mapped	
Lean is viewed as a dogma for the organisation 0 = Lean viewed very narrowly as few isolated tools 6 = Seen as an dogma	
Tools are seen as effective techniques 0 = Lean tools viewed in isolation and their remit nor widened 6 = Lean tools viewed as a techniques assisting to solve problems	
Learning and development culture 0 = No promotion of the Learning and development culture 6 = The learning and development aspects are aimed at altering behaviour	
Process resolute management 0 = Processes used in an ad hoc fashion; not process oriented towards customers 6 = Leaders concentrate on processes focused upon the customers	
Establish a victorious and healthy business 0 = No clear direction regarding the company's aspirations 6 = Profitability is still the main goal	
Reflection is ingrained into the culture 0 = Culture not promoting reflection nor its benefits fully realised 6 = Overall reflection is completely evident and applied	
Total % employees involved in Lean/total employees 0 = Worse than industry average 6 = 20 % better than industry average	
Score = /48	

Proposed Seven Stages of Lean

Any organisation should regard Lean to be comprising of a journey consisting of seven stages, which are depicted in Table 12.4. In this context, any organisation at the final stage will have experienced every one of the preceding six stages. Most organisations have failed to reach the summit stage, and this is reinforced by the lack of successful Lean implementations. Whilst the aspiration should always be the philosophical stage it recognises that if the status quo is to be maintained, the philosophy of continuous improvement needs to be fully incorporated. The cylinder chart (Fig. 12.1) outlines the seven stages an organisation is regarded to encounter in its journey towards being classed as an organisation achieving complete leanness. It indicates the percentages against the various stages of Lean. The length of time spent on each juncture is dependent solely upon an organisation's willingness to tackle issues such as culture, remuneration systems, the standard of training, and choice of the appropriate tools and their implementation in a suitable manner and at an appropriate time. Suffice to mention at this stage that the terminology that is applied to the seven proposed stages of an organisation's Lean journey is as follows:

(i) Preparation;
(ii) Developmental;
(iii) Mechanical;
(iv) Enhanced;
(v) Holistic;
(vi) Innovative; and
(vii) Philosophical.

Further clarification is awarded to the specific categories and percentages applied below.

Table 12.6 proceeds to list the seven phases or junctures and endeavours to provide the indicative characteristics which will often be found to be in place within each juncture. The intention for the organisation in question is to evaluate the progress made to date but to then systematically plan how it needs to achieve the next stage of its Lean implementation journey. It needs to be clarified that the timelines and milestones will vary amongst organisations; these are largely determined by existing structures, size of organisation, commitment levels, skill sets available, financial availability, and age of the organisation and product groups and lines amongst others.

Figure 12.1 illustrates graphically the percentage scores allotted to each juncture of the Lean journey. Essentially, the methodology to derive the percentage scores is as follows:

Total score that an organisation could secure = 648 points (Table 12.5).

Table 12.4 Lean stages clarified

Junctures of a Lean journey	
Seven stages	Indicative characteristics displayed by the organisation
Preparation	• No implementation has taken place • The benefits are clearly evident • No infrastructure and no organisational decisions have been implemented • Implementation plans may have been formulated • Sensei or Lean champion sourced or in place • The policy makers and senior management teams in agreement with unions regarding the commitment towards Lean
Developmental	• Implementation started or beginning to be rolled out • Pilot area selected and work commenced • No evidence of widening the application to other areas • Few tools with little subsequent commitment evident • Importance of culture not recognised • Implementation plans may have been formulated • No promotion of Lean to other areas
Mechanical	• Pilot progressing well and being promoted • Few tools embedded within internal organisation but largely within manufacturing only • Tools are implemented in a piecemeal fashion with little consideration of correlations • Some implementation plans may have been formulated • Importance of culture not recognised • Team leaders or proponents of Lean encouraging its spread within the internal organisation
Enhanced	• Pilot has proven successful and very well promoted • A roll-out programme progressing in other key areas within the internal organisation • Predominantly manufacturing base concentration of Lean • Team leaders or proponents of Lean encouraging the spread within the internal organisation and being used extensively • Good lessons learnt culture and evidence of more systematic plans for wider Lean adoption • A realisation that Lean can aid overall efficiency levels • A recognition that culture and the organisational practices need addressing, but few tangible signs visible towards accomplishing this
Holistic	• Roll-out programme on track • Most of the internal organisation nearly incorporated • Suppliers incorporated and signs towards integration of the whole value chain • A recognition Lean aids overall efficiency levels and being promoted strategically • A realisation that culture and organisational practices need addressing; some perceptible signs visible towards accomplishing this • Organisational and cultural developments still in their infancy
Innovative	• Lean values applied across the whole internal organisation • Good progress towards integrating across the whole value chain • Some cultural and organisational development issues fully implemented but further progress required

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Table 12.4 (continued)

Junctures of a Lean journey	
Seven stages	Indicative characteristics displayed by the organisation
	• Lean has been ingrained as an overarching strategy • Suppliers have been encouraged to adopt the Lean principles and obvious indications towards integration of the whole value chain • Lean practices adopted within the supporting structures such as inbound logistics, recruitment, and finance sections
Philosophical	• Lean tools, culture, and organisational practices alongside the ideology implemented across every component of the value chain • Recognised as a combination of value streams • Lean viewed as the way of working with a quest for perfection apparent • Lean forms part of the vision • Suppliers not viewed as adversaries • Lean yielding genuine business benefits

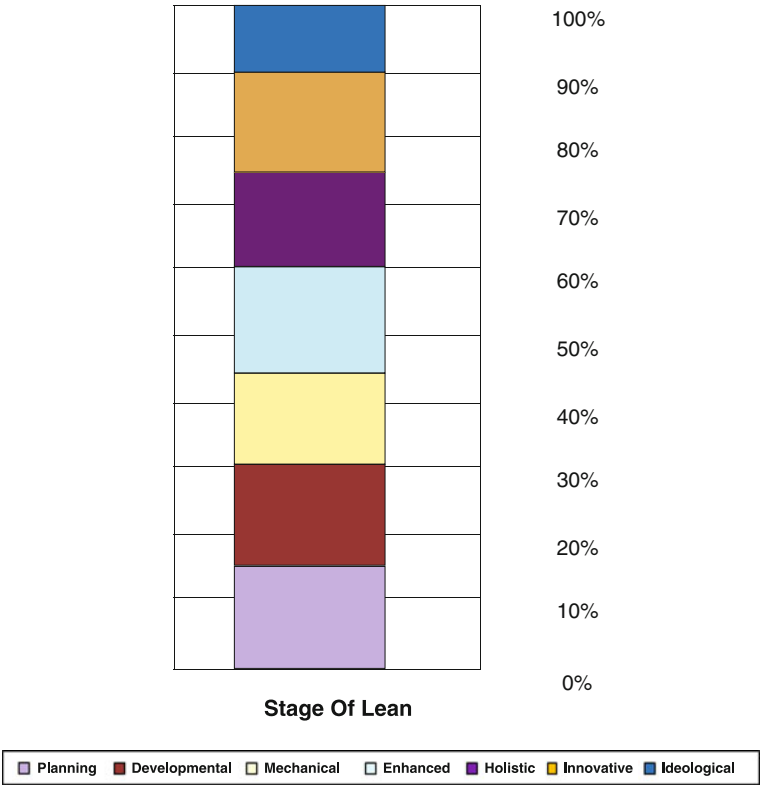

Fig. 12.1 Lean stages

Table 12.5 Audit scores

Audit categories	Total score available
General visual management and organisation	54
Manufacturing, general flow, and processes	78
Quality planned within the product	90
Continuous improvement	66
Change management	78
Sustaining the Lean journey	48
Culture regarding processes	78
Culture regarding people	48
Lean viewed as a commercial venture	60
Lean ideology	48
Total	648

(i) This total score **648** equates to **100 %**.
(ii) Consequently, the score the organisation achieves is divided by the total possible score; this provides the organisation with an overall percentage.
(iii) These percentage scores can then be classified as follows:

- Preparation—0–15 %,
- Developmental—more than 15 %,
- Mechanical—more than 30 %,
- Enhanced—more than 45 %,
- Holistic—more than 60 %,
- Innovative—more than 75 %, and
- Philosophical—more than 90 %.

(iv) Consequently, an organisation could score 335 points—Table 12.6. According to the audit, it has achieved the "enhanced" stage. This means whilst still pursuing this hypothetical example, the fictitious organisation has three probable Lean courses of direction:

- It may progress to the next stage by tackling the existing barriers,
- It could stay at this level but never reap the full benefits Lean offers, or
- It fades and either settles at a lower phase or its Lean journey begins to fizzle out.

The philosophical stage is tantamount for an organisation viewing Lean as a philosophy and the juncture that any organisation hoping to reap the full benefits Lean has to offer.

Table 12.6 Audit classification

Lean stage	Percentage of the maximum score of 648 points available	Percentage score (%)
Philosophical	584+	>90
Innovative	487+	>75
Holistic	389+	>60
Enhanced	292+	>45
Mechanical	195+	>30
Developmental	98+	>15
Preparation	0–97	≤0–15

Summary

Whilst the quantitative assessment leads an organisation to an acceptable leanness level, the respective stakeholders perceptions about leanness levels could well result in an opposite result. In order to minimise the probability of this occurring, organisations should be able to employ both perception-oriented and measurement approaches simultaneously in order to assess their implementation efforts. The audit proposed proceeds to deploy an evaluation approach which includes both quantitative and qualitative sources. In reality, it is hoped that the audit can assist organisations to assess their Lean implementation in a systematic way and eventually develop stronger Lean systems, resulting in a tremendous competitive advantage. The analysis is overwhelming in its evidence that Lean should be regarded as a journey, an end destination that may never be achieved by most organisations. Nonetheless, there is a need for a flexible audit which can be customised permitting an organisation to gauge the level or stage of leanness that it has accomplished. The audit devised is a comprehensive which besides the technical inputs necessary for Lean also scrutinises the change management and cultural components necessary for Lean to be successful. Likewise, the metrics take into account a consideration of whether Lean has led to improved performance levels for the organisation.

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