

An Empirical Analysis of the Role of Internal Auditing in Lean Six Sigma

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Abstract: This study is an empirical analysis of the role of internal auditing in Lean Six Sigma (LSS) whereby the involvement of an internal auditor in LSS projects and the effective internal audit capabilities can be highly beneficial for a company to identify the processes, adding true value and leading to sustainable performance improvement in the company. The research method presented in the study draws both on the researcher's experience and the survey in the area of LSS and internal auditing. The outcomes from the survey and literature proved that internal auditors are still looking for the fact that they can play important roles in LSS but on the other hand the study also discussed several roles that internal audit activities are either not ready to pursue or should not pursue. The study of the role of internal auditing in LSS can provide leaders or internal auditors the information to understand role of internal auditing in LSS projects or any performance improvement programmes.

Key words: Internal auditing, lean six sigma, performance improvement, DMAIC, Malaysia

INTRODUCTION

Besides other operational concepts, quality management has been the most important one because it guides the organisations or companies towards being open and proactive to competitions and on the same time being effective on its own. According to Gadenne and Sharma (2009) the most famous quality management methodologies and concepts namely (Quality Assurance, QA; Quality Circles/Quality Control, QC; Kaizen, ISO 9000 standards; Total Quality Control, TQC; Total Quality Management, TQM) have been copiously experimented by organisations.

With the aim to improve and achieve desired results, researchers or even practitioners are learning to integrate <1 methodologies such as the combination of six sigma and lean as discussed by George (2002) and Rubrich *et al.* (2001) in their studies. Taking benefit of this academic knowledge, practitioners are trying to reduce defects and variation using six sigma while implementing lean at the same time. LSS methodologies have been popularised by successful implementations at companies such as General Electric and Toyota (O'Rourke, 2005).

One of the major problems in a typical LSS project is the time it takes to complete the projects. With the right problem, focus and leadership, this entire process can be tightly condensed into the span of only 5 days

(for small-scale projects). Albert Einstein once said that "we cannot solve the problems with the same kind of thinking we used when we created them". Therefore, to overcome changes of the implementation process, the involvement of an internal auditor in the LSS projects may be beneficial for supporting the long-term success of LSS in the company.

Thus, companies should address and focus on quality management issues to cope with the emerging trends of dynamism. According to Williams (2002) "internal auditors have the opportunity to be recognised as delivering value at the highest levels of their organisations". In the conclusion to his study, Williams (2002) argues that the catalytic opportunities for an internal auditor are driven by the initiatives and activities from acquisitions and mergers along with expansion resulting from globalisation.

To extend the definition of internal auditing for addressing the needs of the global business environment, the Institute of Internal Auditors (IIA) identified the important changes that need to be incurred. Of its definition of 'internal auditing', the IIA (1999) states: "internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organisations operations. It helps an organisation accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve

the effectiveness of risk management, control and governance processes". Since then, the role of an internal researcher along with required skills and knowledge have been the subject of discussion (Williams, 2002).

It has been observed that an expectations gap occurs when audit clients (senior management, for example) fail to recognise the value of the internal audit function. The needs and expectations of the internal audit function as stated by Justin is to bring value to the organisation. This can be done when internal audit function and the most necessary concerns of management and by focusing on the issues critical to success are aligned with each other.

An internal auditor can be perceived as an "in-house consultant" in terms of his responsibilities. However, it is the management decision whether to accept or not any advice according to its fuller understanding of the situation. To function effectively, internal auditors and the management should possess a common understanding of what makes internal auditing a value-adding. Failure to attain this understanding could result in the perception that the internal audit is simply an obstacle to achieving the organisational objectives. Hence, the study attempts to give a holistic perspective of internal auditing's role in the LSS project as a part of the internal audit's effectiveness on organisational performance.

Literature review

LSS and DMAIC: Six sigma helps to remove errors for an organisation to be effective and lean focuses on efficiency, speed and making a process waste-free. For a company to improve on financial, operational, real and measurable grounds, six sigma and lean are two methodologies that can work both together.

Alike six sigma, LSS also uses a problem-solving algorithm called DMAIC (DMAIC (an abbreviation for Define, Measure, Analyse, Improve and Control) is a process defined by Motorola as part of their six sigma management philosophy). The DMAIC toolkit of LSS comprises all the lean and six sigma tools. The LSS training can be accessed through the belt based training system. For each of these belt levels, skill sets are readily available that describe which of the LSS tools are probable to be applied. The learning elements that a participant needs to acquire or gain after the training programme are described in detail by these skill sets. DMAIC methodology is properly a roadmap for process improvement. It is a standard method which improves work processes by removing problems.

DMAIC being iterative nature plays an important role in structuring processes inside an organisation. Moreover, the data-driven quality strategy

improves processes along with productivity. The DMAIC improvement cycle is also the fundamental part of LSS scheme that steers LSS projects. It holds the position of an objective quality improvement procedure and can be implemented as part of other improvement initiatives such as Lean (Borror, 2008; Sajeev and Vinod, 2013). In fact when most people refer to LSS, they are referring to the DMAIC methodology. Today, most companies begin implementing LSS using the DMAIC methodology and later, add the DMADV (The five phases of DMADV are defined as: define, measure, analyse, design and verify) or other methodologies when the organisational culture and experience level permit or they are ready to go to the next level.

LSS role structure: Six today, the team responsible for LSS implementation is up against its own unique challenges, mainly the special classification, focused training for team members and specific tasks. In fact, the concept of LSS is incomplete without addressing the structure and nomenclature of its team of implementers.

According to the (International Association for Six Sigma certification, IASSC; American Society for Quality, ASQ) LSS professionals exist at every level each with a different role to play. At the project level, there are champions (The champion translates the company's vision, mission, goals and metrics to create an organisational deployment plan and to identify individual projects. Identifies resources and remove roadblocks) Master Black Belts (Master Black Belt trains and coaches black belts and green belts. Functions more at the LSS programme level by developing key metrics and the strategic direction. Acts as an organisation's LSS technologist and internal consultant) Black Belts (Black belts lead problem-solving projects. Train and coach project teams) Green Belts (Green belts assist with data collection and analysis for LSS projects. Lead small-scale projects) Yellow Belts (Yellow belts participate as a project team member. Review process improvements that support the project) and White Belts (White belts can work on local problem-solving teams that support overall projects but may not be part of an LSS project team. Understands basic LSS concepts from an awareness perspective). These are the key personnel responsible for projects and implement improvements.

According to Zu *et al.* (2008), there is hierarchical coordination of work for quality improvement across multiple organisational levels. For instance, the senior executives serve as champions for making the organisation's strategic improvement plans and black belts (or a green belt for a simple project) to lead the project team in problem-solving. This mechanism helps to

organise and control work across organisational levels to ensure the overall business strategy success (Zu *et al.*, 2008).

One of the important components of LSS methodology is training employees. The training session can be in-house as well as involve third-party consultants. Khurshid (2012) argues that well-structured infrastructure is required because all the titles in the implementation hierarchy represent special skills and experience. LSS also demands a devoted and focused human resource approach to achieve the desired goals and objectives (Snee, 2010) and this is the reason that a strong and commanding infrastructure for training is needed when organisations implement LSS as a programme or initiative.

Contribution of internal auditing to the organisation:

Internal auditing plays a significant role in preventing and detecting fraud within organisations which if not checked, could lead to serious losses for the organisations, including the loss of resources and investors. Internal auditing does this by cross-checking and detecting accounting errors, pinpointing them and advising on the best way to provide solutions. Internal auditing also helps prevent weakness related to control in organisations, hence promoting and enhancing the reliability of the organisation's activities. Internal auditing is arguably the most cost-effective method of prevention and detection of fraud that companies can make use of (DeLoach, 2000).

Over time, the role of the internal auditor has comprehensively changed the traditional perception of a corporate watchdog to a more consultative profession that inspects work done by the different departments within an organisation with well focus on risk management and improving the performance of the business. This is because with multiple departments, it becomes difficult for managers to identify and communicate factors that may influence the organisation negatively.

Internal auditors also help organisations implement cost-effective processes that are associated with the management's objectives as they expected to have several skills and qualifications because of having an in-depth understanding of the entire organisation, its objectives, risks and the proper combination of the effective internal controls. As a result, unnecessary processes are removed, therefore minimising administrative costs and in turn, contributing to higher operating margins for the companies. Internal auditors have been given a broad mandate to play a significant role in creating better-managed companies and more value for

shareholders. Internal auditing also effectively facilitates the achievement of the organisational goals including operations, obligations, regulatory compliance and financial reporting (DeLoach, 2000).

Internal auditors are multi-skilled in areas such as operational and financial reporting as well as compliance skills. To assist the process of risk assessment and management, internal auditors are uniquely qualified. In today's business environment, setting up the internal audit function is not as costly as perceived as there are many options offered that can be customised to fit the size and complexity of the business. Some companies can also do away with the constant cost of a full-time auditor by outsourcing the internal audit function.

Internal auditors are involved in identifying key activities and relevant risk factors. However, changing trends and the business environment have a huge impact on the way internal auditors assess the risks. The emerging techniques of internal auditing have transformed from a reactive process to a proactive and risk-based approach, enabling internal auditors to be in a position to anticipate possible future concerns and opportunities in addition to identifying current issues (DeLoach, 2000).

Modern day internal auditors are also involved in evaluating controls across the various departments of the organisation. They are in a position to assess the tone and the culture within the organisation at all levels, providing a comprehensive evaluation of the effectiveness of the implementation of management policies at all levels and how interactions are fostered so the organisation can be run efficiently and more profitably.

MATERIALS AND METHODS

This research study was carried out through questionnaires survey and the researcher's experience in LSS and internal auditing. This conceptual framework of this study focuses on the two methodologies of management practices that determine the general area of the research: LSS and internal auditing. Figure 1 represents the conceptual framework for the integration of LSS and internal auditing for performance improvement. The gaps in the conceptual framework and literature led the researcher to pose the following research questions:

- Q1: What is internal auditing's role in LSS?
- Q2: What should be internal auditing's role in LSS?

The survey was administered online using sugosurvey.com. Participants of the study are internal

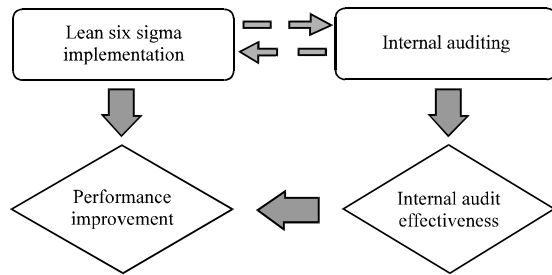


Fig. 1: Conceptual framework

audit practitioners in Malaysia and they were contacted via email. The IIA Malaysia Annual Report in 2015, recorded that there are currently 2,804 internal auditors who are members of the IIA Malaysia and 779 of them are CIA (IIAM, 2016).

The questionnaire was sent to 295 prospect respondents of which only 91 responded (30.9%). Out of the 91 respondents, 65 were categorised as internal auditors. The overall usable response rate was about 22.0% which is satisfactory for this kind of survey (Anthony *et al.*, 2005). The detailed number is summarised in Table 1.

The profile of respondents had been classified into gender, age, employment category, number of years with the organisation and in the current position. The breakup of 65 respondents for the questionnaire survey is shown in Table 2.

In the questionnaire, respondents were asked to indicate their perception of LSS in their organisation and within their department on a five-point scale where 1 indicated “strongly disagree” and 5 indicated “strongly agree”. The scale was assumed to be an interval scale. The mean scores of a five-point Likert scale were computed to answer research questions about what is and what should be, internal auditing’s role in LSS. The results of mean and standard deviations which examined the internal auditor role in LSS projects at the organisation level is presented in Table 3.

Table 3 summarised the six different internal auditor’s roles. The first two roles have highest mean values but the first role has a minimum standard deviation between all the roles which means that the first role has the most consistent mean value among all the other roles. Followed by role b, c and f. Now lastly, there are two roles, role d and role e. Though role e has a little better mean than role d role d has less standard deviation than role e. So in between those two, role d should be preferred. Whereas, in Table 4, the survey of which belt training should possess by internal auditor, a total number of 65 interviewers gave white belt training and/or certification the highest mean value of 3.75 with a standard deviation

Table 1: Response rate

Status	Number	Percentage of response rate (%)
Delivered (total sent)	295	-
Email read/not participated	183	62.0
Dropped out on page	21	07.1
Completed	91	30.9
Completed (usable)	65	22.0

Table 2: Respondent’s demographic information

Variables	Frequency	Percentage of total respondents (%)
Gender		
Male	35	53.8
Female	20	30.8
Did not answer	10	15.4
Age group		
25 years or below	6	09.2
26-35	28	43.1
36-45	26	40.0
46-55 years	5	07.7
Employment category (i.e., current position)		
Audit director	1	01.5
Chief Audit Executive (CAE)	6	09.2
Audit manager	21	32.3
Audit senior	17	26.2
Audit junior	20	30.8
No. of years served in the current organisation		
<2 years	10	15.9
Between 2 and 5	30	46.2
Between 6 and 9	13	20.0
10 years and above	10	15.4
No. of years in the current position		
<2 years	12	18.5
Between 2 and 5	31	47.7
Between 6 and 9	12	18.5
10 years and above	6	09.2
Did not answer	4	06.2

Table 3: Summary responses for internal auditor role at organisation level

Item/Internal auditor role	N	Mean	SD
Can work on local problem-solving teams that support overall projects but may not be part of a LSS project team. Understands basic LSS concepts from an awareness perspective (also known as white belt)	65	3.46	0.937
Participates as a project team member. Reviews process improvements that support the project (also known as yellow belt)	65	3.46	1.017
Assists with data collection and analysis for LSS projects. Leads small-scale projects (also known as green belt)	65	3.25	1.016
Leads problem-solving projects. Trains and coaches project teams (also known as black belt)	65	3.34	1.004
Trains and coaches black belts and green belts. Functions more at the LSS programme level by developing key metrics and the strategic direction. Acts as an organisation’s LSS technologist and internal consultant (also known as Master Black Belt)	65	3.26	1.094
Translate the company’s vision, mission, goals and metrics to create an organisational deployment plan and identify individual projects. Identify resources and remove roadblocks (also known as champion)	65	3.31	1.014

Table 4: Summary responses for internal auditor role within internal audit department

Item/International auditor should possess	N	Mean	SD
White belt training and/or certification understands basic LSS concepts from an awareness perspective	65	3.75	0.811
Yellow belt training and/or certification A LSS yellow belt possesses an understanding of the aspects within the phases of DMAIC (define, measure, analyse, improve, control)	65	3.69	0.809
Green belt training and/or certification A LSS green belt possesses a thorough understanding of all aspects within the phases of DMAIC. They understand how to perform and interpret LSS tools and how to use standard principles of lean (leads or supports improvement projects, typically as a part-time role)	65	3.69	0.865
Black belt training and/or certification A LSS black belt possesses a thorough understanding of all aspects within the phases of dmaic. They understand how to perform and interpret lss tools and how to use standard principles of lean (leads improvement projects, typically in a full-time role)	65	3.52	0.831
Master Black Belt certification-represents the pinnacle of business process improvement expertise. This role is typically reserved for top-performing, high-potential LSS black belts who have delivered exceptional results	65	3.54	0.885

of 0.811. This is followed by yellow belt and green belt with equal means of 3.69 but 0.809 and 0.865 standard deviation, respectively. However, between black belt and master belt, the master belt has a higher mean than black belt but the black belt standard deviation is less than the master belt.

Minitab® 17, the leading statistical software for Six Sigma, quality improvement and statistics education worldwide-was used for analysis purposes. A descriptive analysis was undertaken to gather the general information.

RESULTS AND DISCUSSION

From the literature and response received, internal auditors should be allowed to participate in important projects and initiatives. Respondents perceived that LSS training should be learned by the internal auditor if it is applied to their organisation. However, one of respondent believed that LSS is most crucial for quality improvement related companies as LSS only applies to “manufacturing companies”. He argued that LSS should not apply for an internal auditor who has not worked in the related manufacturing company. However, Silva (2014) examined that LSS can be adopted by a business that offers a product or service that wishes to increase its customer value and volume.

Several respondents agreed that internal auditors should not be actively involved in the operational part or decision made by the management. However, if a company uses the LSS, internal auditors must understand as they can give views and suggestions to the management. Whereas, internal auditors can participate as long as it is not an impairment to the independence or objectivity of the internal auditing processes. The internal auditors can play a role in LSS initiatives as they fall under the remit of internal auditing as a value-added to the organisation.

The internal auditors also may be involved as a consultant or as a reviewer of the programme that is conducted by management. In contrast, one of the respondents believed that internal auditor should not be directly involved as a participant in the programme as a part of the management team. He thought that internal auditor which carry out their role independently and have a direct reporting line to the board or to the board audit committee must not take part in business and operations of an organisation.

The IIA-Australia expressed that many people also make the mistake of assuming ISO-related auditing such as the auditing of Quality Management Systems (QMS) is the same as internal auditing conducted in corporate and public sector organisations. Internal audits, however are an essential pillar of good governance. Internal audits clearly illustrate the risk and control environment of an organisation to its board of directors, the committee, chief executive officer, senior executives and stakeholders with an independent view on the appropriate risk and control environment.

Changing definitions and concurrent expectations of internal auditing has been the primary factor in this process. The ultimate recognition of the role of internal auditors varies and is highly dependent on whether the sector they work in gives independence to their auditing processes. Internal auditing is an independent, objective assurance and consulting activity. Its core role concerning LSS is to provide objective assurance to the Board of directors as well as the committee on the effectiveness of initiatives taken by the management. Indeed, research has shown that board directors and internal auditors agree that the internal auditing provides value to the organisation by providing objective assurance that the business is being managed appropriately and internal control framework are operating effectively (IIA, 2004, 2012). Alike involvement of internal auditing in all forms of risk management which identified by the IIA-UK and Ireland. Figure 2 presents a range of LSS activities using DMAIC approach that indicates which roles an effective professional internal audit

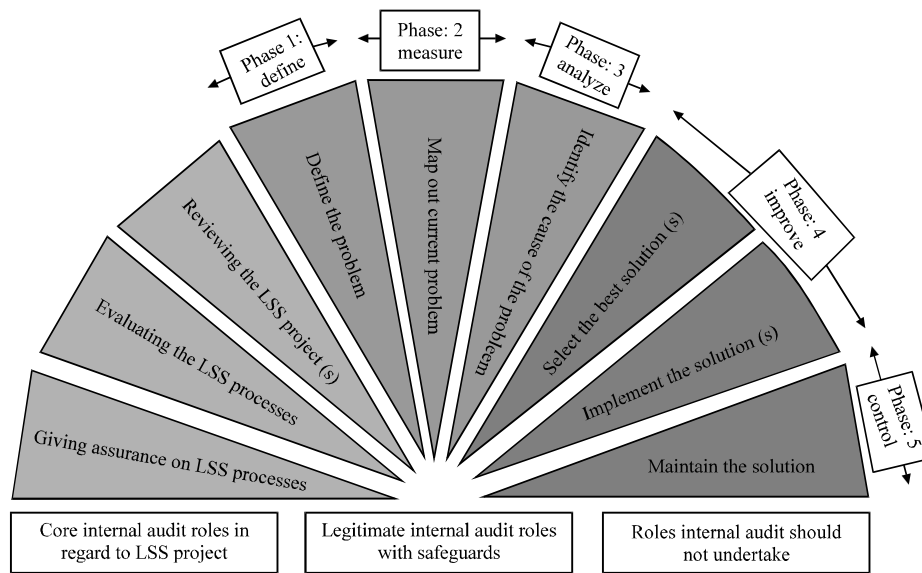


Fig. 2: Internal auditing's role in LSS

activity should and what should not be undertaken within the organisation without jeopardising internal auditor's independence and objectivity.

The activities on the left of Fig. 2 are all assurance activities. Thus, they form part of the broader objective of giving assurance on LSS projects initiated at the management level. An internal audit activity complying with the "international standards for the professional practice of internal auditing" can and should perform at least some of these activities which internal auditor may provide consulting services (as an in-house consultant) that improve an organisation's governance and control processes.

Internal auditor's expertise in an advisory capacity is a valuable additional resource to the management (BNM, 2010) in both understanding the connections between internal auditor and the management in LSS activities and being well-qualified to act as leader and even manager for the projects, especially in the early stages of its introduction. However, due to its independent function, internal auditing's role in championing LSS projects may decrease. Similarly, if an organisation employs the services or hires a consultant, internal auditing's role is more likely to give value by concentrating on its assurance role. However, if management needs the internal auditor to participate, then the internal audit can undertake more consulting activities (Fig. 2) but is unlikely to be equipped to conduct those consulting activities. Thus, the following recommendations are provided about LSS activities that sufficient professional internal audit activity should attempt: consulting roles and safeguards.

Consulting roles (as in-house consultant): The center of Fig. 2 shows the consulting roles that internal auditing may undertake within LSS. Some of the consulting roles that the internal audit activity may undertake are:

- Making available to management the tools and techniques used by internal auditing to define, measure and analyse
- Providing advice, facilitating workshops, coaching the organisation on tools and techniques and promoting the development of a common language, framework and understanding
- Acting as the central point for coordinating, monitoring and reporting on LSS projects (as long it does not impair the independence or objectivity of the internal auditing processes)

The compatibility of consulting services with assurance role can be determined by the internal auditor's management responsibility. As far as LSS projects are concerned, consulting services stay part of internal auditing until no role in the management's responsibility.

Safeguards: Internal auditing may extend its involvement in LSS as shown in Fig. 2, if certain conditions apply. The conditions are:

- It should be clear that management remains responsible for LSS projects
- The internal audit charter should clearly document internal audit's responsibilities that should be approved by the audit committee

- Internal auditor should not implement, select or maintain any solutions on behalf of management
- Internal auditor should provide advice, support to management's decision-making as well as not making decisions themselves
- Internal auditor also cannot give objective assurance on any part of the LSS project for which it is responsible. This is because such assurance should be provided by other qualified and suitable parties
- Any work outside the assurance activities should be accepted as a consulting engagement and the implementation standards related to such engagements should be followed

The internal auditor's core role with LSS is to provide assurance to management and to the board. Further certain safeguards should be applied and relevant guidelines and standards should be met when extending internal auditing activities such as treating the engagements as consulting services. This would take care of the independence of internal auditing along with objectivity of its assurance services.

CONCLUSION

LSS and internal auditing represent some of the most important approaches of modern companies to improve business processes. Specifically by focusing on overall business processes LSS is based on the creation of more value for the customers by doing less work, shortening the processes and elimination of activities that do not add any value by using various instruments to contribute towards continuous performance improvement. Internal auditing, on the other hand, identifies the weaknesses assesses the risks in a process and gives recommendations for improvements that add significant value to the decision-making process.

Various benefits which companies can achieve by applying the LSS are subjected to the planning and quality of the implementation. Through, control and assessment of the LSS, the internal audit can give maximum support though also identifying of the possible areas where the application of this concept is not compatible, given the pre-defined procedures and provision of valuable suggestions which creates space for improvement of the business processes.

On the other hand, the maximum effect can only be achieved by internal audit if it is planned and executed properly. In this sense, there are possibilities to integrate the LSS in the entire process of the internal audit through

projects initiated by the management or applying the concept of LSS to internal audit activities. By using the methodologies, the techniques and the tools of the LSS, the internal auditors get a deeper and better understanding of business processes in a company. This allows them to give adequate recommendations for a continuous improvement. Through recognition and usage of LSS and the potential of internal auditor as an in-house consultant and also through the integration of these two, significant improvements are seen. This consequently contributes to competitive advantage and overall business performance.

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