# MEASURING PERFORMANCE OF LOGISTICS SERVICE PROVIDERS: A PROPOSED CONCEPTUAL FRAMEWORK

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## Introduction

Performance measurement of logistics service provider (LSP) is an important element in the logistics outsourcing process. Logistics activities are considered to be the activities that do not need to be managed by firms themselves, as they can be outsourced to a professional external party (Ho *et al*., 2012; Ciravegna *et al*., 2013). Firms seek to outsource logistics activities in order to avoid high fixed costs and heavy investment requirements associated with logistics and to focus more on their own basic activities. Logistics outsourcing has proven to be an effective strategy helping logistics services users to achieve competitive advantages, improve customers' service-levels, and reduce overall logistics costs (Boyson *et al*., 1999).

The performance measurement systems are an instrument for assessing the success of LSP's and identifying corrective actions in respond to service failures (van Hoek, 2001; Wilding and Juriado, 2004). The establishment and continuous monitoring of key performance indicators (KPIs) related to logistics services allow users to compare their achievements with expected service levels. LSP performance measurement can be classified into two perspectives: 1) Logistics Users (LU), which are suppliers, manufacturers, and distributors; 2) LSPs which is third-party LSPs such as logistics companies, couriers, transporters (Fernie, 1999; Parasuraman *et al*., 1985; Gunasekaran and Ngai, 2003).

However, the literature on LSPs has focused mainly on LSP performance measurement in the perspective of logistics users (Chen, 2007; Kunadhamraks and Hanaoka, 2007; Rafiq and Jaafar, 2007; Bhatti *et al*., 2009; Qureshi *et al*., 2009; Banomyong and Supatn, 2011; Kumar and Singh, 2012; Sahu *et al*, 2013; Alkhatib *et al*., 2015; Lan *et al*., 2015; Govindan *et al*., 2015). There is lack of study and assessment standard that could directly address LSPs in the perspective of non-users (e.g., third-party LSPs). Howerver, there are three notable exceptions. Firstly, the study by Min and Jo (2006) adopted Data Envelopment Ananlysis to measure the competitiveness of the major third-party LSPs in the US... The second examined the performance of LSPs and provides using financial statement analysis and potentially benefits to logistics executives, analysts and researchers (Hofmann and Lampe, 2012). The last presented a content analysis of corporate social responsibility reports published by 350 international LSPs, and analysed factors influencing the level and scope of reporting (Piecyk and Björklund, 2014).

This study proposes a framework to assist researchers in analysis of LSP's performance and provides the decision-making supporting tool to meet logistics industry's needs. It proposes an advanced comprehensive LSPs' evaluation framework based on the comparative literature outcomes. The literature review is derived by consolidating knowledge on logistics performance measurement systems perceived from and developed by the perspective of LSPs. There are threefold contributions made by this study. First, it presents a systematic literature review of LSP performance measurement by studying the existing articles related to LSPs evaluation dated back to the first article published in 1978. Second, it proposes the conceptual framework identifying any possible shift regarding to how LSPs are evaluated and measured. Finally, research agendas are presented to guide future studies on LSP performance measurement system and KPIs.

## Literature review

### Theoretical foundation

In this section, existing theory and frameworks on performance measurement found in literature are explored and reviewed. . There appears to be three commonly used approaches to measure LSP performance: transaction cost economics (TCE), resource-based theory (RBT) and agency theory. The

differences between these are summarised as follows.

TCE, the most frequently used theory, suggests that operations should be viewed as the sum of productions and transaction costs at minimised level (Williamson, 1975, 2008; Riordan and Williamson, 1985). Transaction costs represent the costs of physical and human resources incurred in order to complete the exchange of goods and services between parties. Meanwhile, RBT views firms as a bundle of resources (Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984) and competencies that represent the basis for their competitive advantages (Barney, 1991; Conner, 1991). Outsourcing is the way that a firm can secure resources from its environment in order to survive and improve its operational performance (Olavarrieta and Ellinger, 1997; Rungtusanatham *et al.*, 2003). Lastly, the agency theory provides a justification for the establishment of alliances between organisations and their service providers (Blancero and Ellram, 1997; Stock, 1997; Logan, 2000). It refers to the methods by which one party (the principal) ensures the development and maintenance/monitoring of beneficial relationships with another party, i.e., service providers and vendors (the agent) (Stump and Heide, 1996).

In summary, TCE is generally accepted as a useful framework for analyzing logistics and outsourcing decisions. RBT concerns of resource utilisation in order to sustain a firm's competitiveness. The agency theory focuses on the costs and benefits of supply chain relationships. As the purpose of this study aims at proposing the measurement framework for LSPs performance as to maintain their competitive advantages, the appropriate theory should provide the LSPs sustainable competitive advantages gained from an appropriate access to a bundle of valuable, rare, non-imitable and non-substitutable resources (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). Some LSPs are asset-heavy focus (property-based) but some are asset-light and knowledge-based (Das and Teng, 2000). Such phenomena can be explained by the RBT. RBT thus provides a key theoretical foundation for the LSPs' competitive advantages and is the theory adopted in this study.

**Summary of the authors' previous literature review works**

One objective of this study is to review the literature and identify research domains and evolutions of performance measurement in the LSPs' context. Thus, the systematic approach was selected as the review methodology. The main strength of a systematic literature review from other styles of literature review is that it provides a standard research methodology. This method also provides a rapid comprehensive identification of main research themes and clusters regarding to the logistics service provider performance domain.

The first stage of the review process involves the identification of papers and reports studying LSP performance measurement spanning from the year the first article was published in 1978 to recently ones in 2017. In order to cover all the relevant articles, ProQuest and Scopus were selected as the main database for this systematic literature review. Since these databases have the coverage for potential databases and websites which are searched namely Emerald, Science Direct, Taylor & Francis, Springer and Wiley Online Library. In total, 209 articles published in 112 journals were read over through abstracts and keywords. Finally, 93 articles from 45 journals were selected and deemed suitable for inclusion in the systematic literature review.

The next step was the analysis and interpretation of the selected articles according to the guidelines provided by De Nooye *et al.* (2005) who used the social network analysis (SNA) as the key linking articles with Pajek software 4.01. The SNA approach can offer a more objective analysis than the authors' judgment (Colicchia & Strozzi 2012). The initial finding suggests that LSP performance measurement can be classified into five categories: efficiency and effectiveness (47 articles), service quality (21 articles), inter-organisation relationship (16 articles), socio-environmental performance (5 articles) and financial performance (4 articles).

Furthermore, the authors drew a map of knowledge structure by conducting a Main Path Analysis of articles within each research domain. The first path is efficiency and effectiveness which includes Beamon (1999), Gunasekaran *et al.* (2001), Mentzer *et al.* (2001), Lieb and Miller (2002), Lai *et al.* (2002), Neely (2005) and Jharkharia and Shankar (2007).

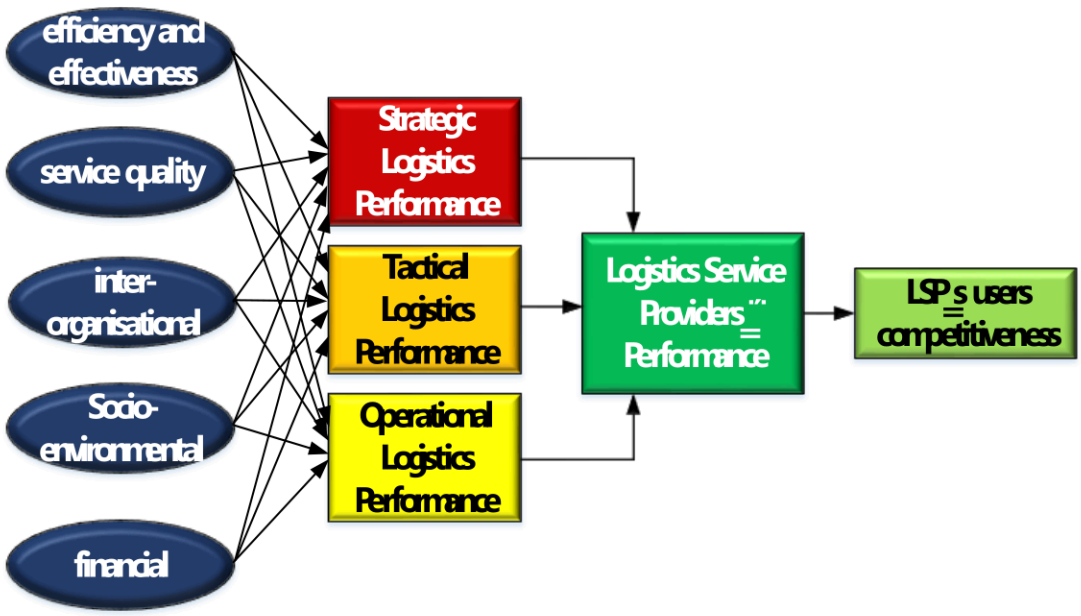
This path concerns on the status of logistics performance measurement in corporations and provides a benchmark for organisations to assess the quality of their logistics performance measurement

practices and identify opportunities for significant improvement. Secondly, the service quality path consists of six articles: Parasuraman *et al.* (1988), Bienstock *et al.* (1997), Mentzer *et al.* (1999), Lai (2004), Grant (2003) and Seth *et al.* (2006). It is related to the assessment on customer perceptions of service quality in LSP's organisation. The next path is inter-organisation relationship which is related to the measure of LSP performance across the supply chain and networks rather than within an organisation, especially between an LSP and its clients. This path includes articles by Neely *et al.* (1995), Beamon (1999), Chan and Qi (2003), Gunasekaran *et al.* (2004) and Bhagwat and Sharma (2007). Besides, the environmental and social perspectives are also taken into account. The last two paths are then the performance measurement concerning on financial (Beamon, 1999; D'Avanzo *et al.*, 2003; Hofmann and Lampe, 2013) and socio-environmental (Gunasekaran *et al*, 2004; Hervani and Helms, 2005; Bjorklund *et al.*, 2012) perspectives. In sum, there is lack of theoretical foundation and unbalanced approaches in adopting theoretical views in order to provide an appropriate, holistic and balanced tool to measure LSPs performance. There is lack of analysis on the causal relationships between KPIs and how they might affect each other. However, it should be noted that these research domains are not exclusive and are based on published peer-reviewed articles in academic journals.

## Conceptual framework

### Framework evaluation

Figure 1 presents the general scheme of the proposed framework. The framework is developed by adapting the models proposed by Fugate *et al.* (2010) and the framework developed by Töyli *et al.* (2008). According to Fugate and Töyli's frameworks, it is assumed that logistics performance is influenced by 8 factors: effectiveness, efficiency, differentiation, responsiveness, quality, operational metrics, and service level and logistics costs. This can be inferred that these factors affect logistics performance and the performance at the organisational level. These factors must be considered independently in order to understand their relationships with logistics performance.




Source: Adapted from Fugate *et al.* (2010) and Töyli *et al.* (2008)

Figure 1: A proposed framework for this study

The conceptual framework consists of three axes of analyses. First, "LSP performance" defines as the degree of efficiency and effectiveness, service quality, inter-organisation relationship and socio-environmental and financial aspects at the different levels of organisational activities (i.e., strategic, tactical and operational). This should provide a clearer guideline on which measures/metrics should be used at the different levels of an organisation. Second, "Firm performance", in addition to represent an organisation's efficiency and effectiveness, represents a company's profitability and wealth of its

stakeholders. Finally, “Competitive Advantage” is the perception of logistics value compared with other companies in the market.

Meanwhile the authors consider different points of view, a system approach, on a company’s performance. Its concept views an organisation as a closed or opened system considering interactions of the organisational environment by means of input, output, process, throughput and outcome (De Leeuw, 1990). The combined use of output, outcome and throughput measurements enables the performance assessment of public organisations in a sense of multi-task fields. The input and output indicators are defined at the starting and ending points of production process which finally generate the outcome, while the throughput indicators are defined somewhere in the production process. For example, the study by Hanman (1997) proposed the methodology for defining the best practice called the Leaders-Laggers Analysis. The outcome of the analysis plotted an organisation’s logistics performance compared to the other organisations separately regarding to logistics inputs and outputs.

Based on the idea that the appropriate LSP should have a superior competitive position, the proposed framework aggregates the most relevant and critical indicators that are found to be fragmentally in logistics studies. The RBT serves as a dominant theory as to distinguish logistics resources and capabilities. Moreover, the authors investigated the importance of LSP factors using the alternative performance measure (the Leaders-Laggers Analysis) which refers to the firm’s success in terms of producing maximum output from a given set of inputs measured relatively to a set of firms (Farrell, 1957). To the best of the authors’ knowledge, this measure is very rarely used in RBT research.

At last, 32 indicators were included in the development of LSP performance measurement system. Each indicator was explicitly frequently mentioned in the literature. Beyond the indicators themselves, one of the key features of this proposed measurement system is its structure. Illustrated in Figure 2, the indicators were firstly grouped into five key themes. The five key themes were then divided into fifteen key dimensions. These dimensions provide the framing which is necessary for an initial constructing of measurement system. A group of linked indicators organised by a hierarchical approach that tied to the firm’s competitiveness is created for each of the fifteen key dimensions. For example, 3 individual indicators were created for the key dimension named as “Cost”. Furthermore, the relationship between the input and output indicators are explicitly highlighted.

Finally, the groups of indicators for each key dimension provide the basis for subsequent levels of structuring. Figure 2 illustrates that three tiers of aggregated measures were created. The first tier of aggregations involves the creation of one sub-index for each of the fifteen key dimensions called “Key dimensions Sub-indices”. The second tier focuses on the development of the sub-index for each of the five key themes called “Key Themes Sub-indices”. In the third tier, a composite index for the transmission system of the firm’s competitiveness was created. In every LSP, the indicators were normalised so that the greater areas covered in the sub-index plot of the “Leaders-Laggers Analysis” could correspond to the greater progress towards the competitiveness goals.

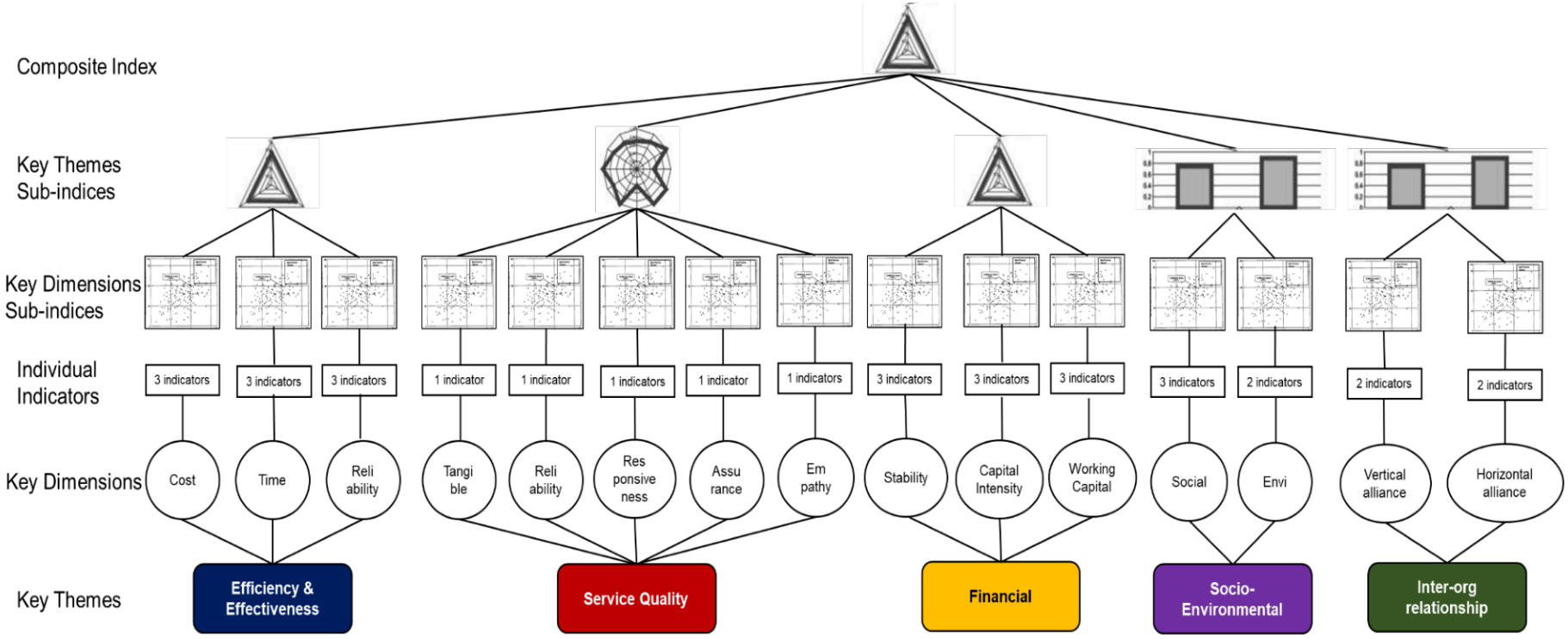



Figure 2: Structure of performance measurement system relevant for LSPs

**Performance measurement indicators**

To study the performance measurement of the LSPs, table 1 illustrates the 32 indicators that were proposed in five key themes, which are efficiency and effectiveness, service quality, financial, socio-environmental and inter-organisation relationship. The listed indicators have been implemented by several researchers studying LSP performance (e.g., Boyson *et al.*, 1999; Gunasekaran and Ngai, 2003; Chen, 2007; Hofmann and Lampe, 2012). However, due to some limitations, the authors could only present the relationship between input and output indicators. The proposed LSP performance measurement framework focused on the activity of LSP firm offers a clear guide for computing and organising the indicators with user-friendly interface.

| Dimensions | Outputs | Inputs |
|---|---|---|
| ***Efficiency & Effectiveness*** | | |
| Costs | Transportation cost | The expense of of shipping goods from suppliers to plants, plants to warehouses and warehouses to customers |
| | Warehousing cost | the expense of storage place for products. Principal warehouse activities include receipt of product, storage, shipment, and order picking |
| | Inventory carrying cost | the expense of opportunity cost, shrinkage, insurance and taxes and obsolescence of holding inventory |
| Time | Average order cycle time | the average cycle time between order placement by the customer and order delivery to the customer |
| | Average transportation time | the average time between order out of factory and order delivery to the customer |
| | Cash conversion cycle | days inventory outstanding<br>days sales outstanding<br>days payable outstanding |
| Reliability | Delivery in-full and on-time | - total items/shipments<br>- number of items/shipments delivery in-full<br>- number of items/shipments delivery on-time |
| | Order accuracy rate | - total shipment<br>- wrong and substitute items |
| | Damage rate | - total items shipped<br>- number of damage items |
| ***Service Quality*** | | |
| Tangible | Appearance of physical facilities and personnel | - Appearance of physical facilities<br>- Availability of resource<br>- Utilization of resource<br>- Staff sufficiency |
| Reliability | Performing services right the first time | - document<br>- time<br>- safety |
| Responsiveness | Willingness and ability to provide prompt service | - Provide enough information to customers<br>- Fast and easy ordering process<br>- Fast document processing<br>- Quick respond to customer claims |
| Assurance | Trustworthiness of customer-contact personnel | - Clear policy on warranty, security<br>- Staff competency<br>- Staff professionalism |
| Empathy | Friendliness of customer-contact | - Understanding specific customers' needs<br>- Ability to accommodate special needs |

| Dimensions | Outputs | Inputs |
|---|---|---|
| | personnel | - Personal attention |
| | | - Assessing customers' future needs |
| ***Financial*** | | |
| Stability | Return on Asset (ROA) | - net Income |
| | | - total Assets |
| | Return on Equity (ROE) | - net Income |
| | | - total equity |
| | Operating Profit Margin | - **operating** earnings |
| | | - revenue |
| Equipment and staffs availability | Non-Current Asset Turnover | - revenue |
| | | - gross fixed assets |
| | | - accumulated depreciation |
| | Total Assets Turnover | - revenue |
| | | - total Assets |
| | Capital Intensity Ratio | - revenue |
| | | - total Assets |
| Working capital | Current Ratio | - current Assets |
| | | - current Liabilities |
| | Cash Ratio | - cash |
| | | - marketable securities |
| | | - current liabilities |
| | Inventory Turnover | - a**verage inventory** |
| | | - c**ost of goods sold** |
| ***Socio-environmental*** | | |
| Environmental | Utilisation | - fuel efficiency |
| | | - electricity consumption |
| | | - water consumption |
| | | - waste recycled |
| | Emission | - total CO2 emissions |
| | | - other emissions (SOx, NOx) |
| Social | Labour practices and decent work | - education and training |
| | | - accidents |
| | Human rights | - training on policies and procedures concerning human rights relevant to operations |
| | Society | - number of community projects supported |
| | | - sponsorships and donations to community projects |
| ***Inter-organisation relationship*** | | |
| Horizontal alliance | Alliance size | - resource utilization within the alliance |
| | Task complexity | - exchange of valuable information |
| | | - facilitates continuous alliance improvement |
| | | - high level of joint decision making |
| Vertical alliance | Operational fit | - highly complementary geographical networks and customer portfolios |
| | Relational fit | - the degree of corporate culture similarity and rivalry between the partners |

Table 1: List of clustered performance indicators for LSPs

**Implication**

As demonstrated, the conceptual framework of LSP performance measurement would encompass all five domains. This proposed framework can be employed to spur future research .The adoption of the proposed framework should provide an agreement on starting point and accepted structural framework for additional development and empirical testing of LSP performance measurement

concepts, principles and methods. This could further aid the identification and resolution of LSP. Given this framework, the development of performance measurement approach will facilitate LSPs to measure and evaluate their day-to-day business operations. A considerable number of publications have been recognised as the importance of LSP management in order to develop a performance measurement system. Although the relationship between logistic outsourcing function and organizational performance has been studied in a scenario regarding large enterprises and supply chain management, there are few studies focusing on this direct relationship.

There are two main implications for both academic and business sectors. For academia, this study moves logistics research towards the performance measurement framework of LSP and provides an opportunity for future research to validate the framework with empirical evidence. The studies of LSP have many hierarchical levels and each level differs in the scope that is represented in the proposed structure. On the other hand, this proposed framework might have implications for business operations. It might allow managers to visualise and consider a wide range of indicators of their outsourcing activities. The framework is also aim to assist practitioners in developing the more structural and understandable performance measurement system which is vital for creating and sustaining competitiveness and profitability in today's business environment.

## Conclusion

The contribution of this paper has twofold. Firstly, the authors presented the literature review on the concept of performance measurement in logistics service provider (LSP). Secondly, the authors presented the framework that captures the dynamics of performance indicators for LSPs and consists of an extensive list of LSP performance indicators. The literature suggested a number of studies on LSP performance measurement. However, these studies mainly focus on particular areas or cases and concern on external and quantitative indicators. In a more holistic view, the literature review therefore considered the areas which are efficiency and effectiveness, service quality, inter-organisation relationship, socio-environmental and financial indicators. The framework presented is a first step towards a long-term aim to use performance indicators ex-ante rather than post-ante. The model considered indicators regarding two main dimensions. On the one hand, the authors looked at the perspective level: operational, tactical and strategic. On the other hand, the authors classified the indicators into inputs and outputs. These two dimensions were encompassed with the Resource-Based Theory.

Since LSP is developing and evolving continuously, an optimal performance measurement framework might not be previously determined. However, the authors believe that the proposed framework could capture LSP performance measurement better than those proposed in previous published because it includes the views of both academic and practitioners. Furthermore, the proposed framework encompasses five themes; efficiency and effectiveness, service quality, inter-organisation relationship, socio-environmental performance and financial performance. These themes have been widely agreed in LSP literature and classified into different levels of organisational activities (strategic, tactical and operational) .While the field of LSP is developing, these core themes are a vital part of LSP and continuously growing and developing .Based on the proposed framework, there are a great number of implications for academic and practitioners.

## References

Can be furnished upon request