科技部補助專題研究計畫成果報告
期末報告

運籌服務業的績效與其決定因素：人力資本觀點

計 畫 類 別 ： 個別型計畫
計 畫 編 號 ： MOST 103-2410-H-263-010-SSS
執 行 期 間 ： 103年08月01日至104年07月31日
執 行 單 位 ： 致理學校財團法人致理科技大學行銷與流通管理系

計 畫 主 持 人： 黃建榮

計畫參與人員： 博士班研究生-兼任助理人員：黃愷平

報 告 附 件 ： 出席國際會議研究心得報告及發表論文

處 理 方 式 ：
1.公開資訊：本計畫涉及專利或其他智慧財產權，2年後可公開查詢
2.「本研究」是否已有嚴重損及公共利益之發現：否
3.「本報告」是否建議提供政府單位施政參考：否

中 華 民 國 104 年 10 月 22 日

中 文 摘 要 ： 近年來，線上購物已成為趨勢，企業對運籌服務之需求亦隨之增加，統籌企業物流配送作業的運籌服務業者地位也越趨重要，因此如何強化運籌能耐及提升運籌績效，成為一個重要的課題。此外，傳統偏重有形的實質資產為公司基礎的觀念已逐漸式微，無形的人力資本對於績效的優劣正逐漸扮演著舉足輕重的地位。根據資源基礎觀點，人力資本是組織競爭優勢的重要來源，而且也會影響組織績效。然而人力資本領域的學者與專家鮮少對靜態的人力資本與動態的運用人力資本能耐進行區辨，而本研究認為這是兩種不相同的概念，希望瞭解運籌服務業者運用人力資本對其運籌績效的影響。因此，本研究結合資源基礎與動態能耐觀點，以運籌服務公司之高階主管為調查對象，採用結構方程式的統計分析方法，來探索人力資本、服務能耐、創新能耐、彈性能耐及運籌績效間彼此的關係。
本研究以台灣運籌服務業者做為研究樣本，共寄發放出2,100份問卷，回收有效問卷117 份，整體的有效問卷回收率為5.6 %。最後利用結構方程模式(Structural Equation Modeling, SEM)分析，研究結果發現：運籌服務業者的人力資本與運籌能耐會正向影響運籌績效；人力資本也會正向影響運籌服務業者的運籌能耐。雖然人力資本對運籌績效沒有顯著關係存在，然由分析結果發現人力資本可透過運籌能耐之中介效果間接影響運籌績效。因此，本研究建議運籌服務業者欲提升運籌績效時，應積極強化其人力資本，進而提升運籌能耐，以提升運籌績效。

中 文 關 鍵 詞 ： 人力資本、服務能耐、創新能耐、彈性能耐、運籌績效

英 文 摘 要 ： In this study, we take logistics service providers in Taiwan as the study sample. A total of 2,100 questionnaires were hand delivered and the remaining 117, valid and complete, were used for quantitative analysis. The useable response rate was 5.6%. A structural equation modeling (SEM) approach was employed to test the research hypotheses. Results indicated that human capital, and logistics capabilities had a significant positive effect on logistics performance. Results also indicated that human capita had a positive effect on LSPs' logistics capabilities. While human capital was not found to have a direct positive effect on LSPs' logistics performance, it was found to have an indirect effect on logistics performance mediated by logistics capability. According to the results, LSPs should enhance the intangible resource - human capital, further heighten their understanding of logistics capabilities and identify how such capabilities may affect logistics performance, therefore develop effective logistics strategies.

英 文 關 鍵 詞 ： human capital, service capability, innovation capability, flexibility capability, logistics performance.

運籌服務業的績效與其決定因素：人力資本觀點
Logistics Service Providers' Performance and Its Determinants: Human Capital Perspective

1. INTRODUCTION

1.1 Research Background and Motives

Owing to the global internet development and a growing number of using the internet, online shopping has become a trend. Therefore, the logistics industry has become highly competitive, and the percentage of logistics firms entering this market has remained consistently high (Lin et al., 2008; Lu & Yang, 2010). As a result, the increasing competition will continue to drive logistics firms to emphasize their excellent key capabilities in order to survive and grow in the market (Autry et al., 2005; Yang, 2012). Therefore, LSPs should build logistics capabilities that are inimitable and durable to reduce cost and increase organizational performance (Shang & Marlow, 2005; Wu et al., 2006).

An LSP is defined as a provider of industrial logistics services that performs the logistics functions on behalf of their clients (Coyle et al., 2003; Dapiran et al., 1996). Despite the importance of LSPs, particularly in terms of the potential impact of this organizational adjustment to effectiveness and performance in supply chains, there have been few studies analyzing the relationship between LSPs' capabilities and performance (Lai, 2004; Mentzer et al., 2004; Shang, 2008).

According to the RBT, sources of competitive advantage begin with the notion that firm resources may be heterogeneous and immobile (Barney, 1991; Barney et al., 2001). Differences in market performance are fundamentally due to the distinctive resources and capabilities that are valuable, rare, inimitable and non-substitutable (Barney, 1991; Barney et al., 2001; Grant, 1991; Wernerfelt, 1984). In addition, a firm's competitive advantage can be sustained when it implements a strategy that is not easily duplicated by its competitors (Barney, 1991; Barney et al., 2001). How to leverage resources in creating and sustaining competitive advantage for a firm has become the central focus for scholars that link various types of assets (Chen et al., 2005; Wu et al., 2006) and capabilities (e.g., Autry et al., 2005; Ethiraj et al., 2005) with the ultimate financial performance of a firm (e.g., Hunt & Morgan, 1995; Voss et al., 2005).

Porter (1985), and Roth and Jackson (1995) indicated that the concept of capability has been strongly emphasized in the strategic management literature. Logistics capability which encompasses a number of aspects relating to supply of services, particularly has been recognized as a crucial source to lead sustainable competitive advantage and superior performance (Bowersox & Closs, 1996; Lai, 2004; Wu et al., 2006). Daugherty and Pittman (1995) also indicated that logistics capability has been recognized as critical to the successful implementation of just-in-time and other

time-based competitive strategies. One increasingly attractive approach to creating superior and hard-to-replicate customer value can be found in the firm's logistics capability. Further, the application of logistics management has been reported to contribute to logistics firms' more efficient, effective and economic operations and, more importantly, to provide value-added services to customers (Warusavitharana, 2004). However, firms' logistics service offering and quality are relatively easily imitated by competitors (Slater, 1996). Thus, in today's dynamic marketplace, it is imperative for LSPs to integrate innovation capabilities into their logistics service activities. Through learning-by-doing, LSPs can build their core capability which will be extremely difficult for competitors to buy and imitate. In addition, Langley et al.'s (2006) report has indicated that service offering and innovation capabilities are key challenges for the logistics industry in future.

Moreover, owing to the fast growth of the logistics industry, the professional logistics specialties also have become the key success factor for the logistics industry (Lin et al., 2008). In addition, in pursuit of higher service levels and improved performance, many firms have begun to examine their internal functions to discover logistics opportunities yet to be leveraged (Bowersox et al., 1999; Voss et al., 2005). Conduit and Mavondo (2001) also indicated that to improve external service levels, supply chain performance, and firm financial performance, the internal service quality must first be improved. Indeed, Teece (2000) suggests that a firm's superior performance depends on its ability to defend and use the intangible assets it creates. Therefore, better use of existing internal knowledge is seen as essential to the survival and prosperity of organizations (Szulanski et al., 2004). Meanwhile, organizations in pursuing superior efficiency and effectiveness should have a comprehensive sentiment to their intangible assets, and knowledge relatedness synergies (Carmeli & Tishler, 2004; Tanriverdi & Venkatraman, 2005).

Most prior researches in logistics industry had proven that the tangible resources are important for LSPs because they provide LSPs with a unique source of sustainable competitive advantages (Autry et al., 2005). Nonetheless, little research has been conducted on how intangible assets influence the firm performance of LSPs. Human capital has been viewed as an important role of intangible assets in creating sustainable competitive advantage (Kaplan & Norton, 2004). Especially in the era of knowledge-based economy, physical assets are no longer the source of firms' economic value. Rather, intangible assets, like human capital, a collection of knowledge and brainpower, can be leveraged to achieve greater organizational performance than tangible assets.

However, how human capital gets accumulated and utilized remain unconnected to the specific types of innovative capabilities organizations possess, with most studies only linking knowledge to generic, broadly defined innovation outcomes such as new product introductions, technology patents and sales generated from new products (Subramaniam & Youndt, 2005; Hogan et al., 2011). Very few have focused their studies on exploring the relationship between human capital and logistics capability, especially in logistics industry. In fact, in order to explain why some firms are able to sustain their competitiveness in a rapidly changing and unpredictable market, some scholars had extend the perspective of RBT to the dynamic market and propose dynamic capabilities (Teece et al., 1997; Zollo & Winter, 2002). However, few of the prior research on human capital had

clearly separated mobilizing capability from intellectual capital the way it had been conducted in the field of strategic management to separate mobilizing resources from static resources (Teece et al., 1997). Whether the stock of human capital is rich or not is a concern of management; how to mobilize it to generate logistics capabilities to increase performance is quite another for LSPs.

Furthermore, most previous research was to explore the human capital of its impact on organizational performance (Wang & Chang, 2005; Chen et al., 2005); while the empirical evidence of logistics performance is less. Therefore, the motive of this research focuses on the integration of human capital, innovation capabilities, and flexibility capabilities in the logistics service activities of LSPs, and develops a conceptual model to examine the effects of different aspects of firm specific human capital, service capabilities, innovation capabilities, and flexibility capabilities on logistics performance of the firm.

1.2 Research Objectives

From the viewpoint of research background and motives, this study would test the relationships among human capital, service capabilities, innovation capabilities, flexibility capabilities, and logistics performance for LSPs based on the theoretical framework. With that in mind, our objectives are four-fold:

1. To offer a conceptual model of human capital, service capabilities, innovation capabilities, flexibility capabilities, and logistics performance for LSPs.

2. To develop scale items of all measures used for the constructs in the model, and then to proceed the measurement model evaluation.

3. To test the effects and relationships of human capital, service capabilities, innovation capabilities, flexibility capabilities, and logistics performance in our conceptual model.

4. To discuss in terms of theoretical and practical implications, and also provide some suggestions for managerial practice and for further research.

2. LITERATURE REVIEW

2.1 Logistics Capabilities and Logistics Performance

2.5.1 Logistics Performance

Logistics models have predominantly utilized two different performance measures: cost and customer responsiveness (Beamon, 1999; Morgan, 2004). Costs may include inventory costs and operating costs. Customer responsiveness measures include lead time, speed and quality of shipped, and fill rate. In addition, the link in a supply chain that directly impacts customers is delivery (Gunasekaran et al., 2004). It is a primary determinant of customer satisfaction; hence, measuring and improving delivery is always desirable to increase competitiveness. According to Morgan (2004), an increase in delivery performance is possible through a reduction in leadtime attributes. Another important aspect of delivery performance is on-time delivery. On-time delivery reflects

whether perfect delivery has taken place or otherwise and is also a measure of customer service level. A similar concept, on time order fill, was used by Christopher (1998), describing it as a combination of delivery reliability and order completeness. Another aspect of delivery is the percentage of finished goods in transit, which if high signifies low inventory turns, leading to unnecessary increases in tied up capital. Various factors that can influence delivery speed include vehicle speed, driver reliability, frequency of delivery, and location of depots. An increase in efficiency in these areas can lead to a decrease in the inventory levels (Novich, 1990).

2.5.2 Logistics Capabilities and Logistics Performance

Tan et al. (1998) found that the creation of customer value through logistics management has been found to result in a positive impact on the firm's profitability and customer loyalty. Delivering a high quality logistics service will also have an influence on the performance of an organization. This is because an LSP that keeps its clients satisfied with its ability to solve problems, keep accurate records, deliver services on time and communicate effectively can increase customer satisfaction (Leuthesser & Kohli, 1995; Morash, 2001) and loyalty which has been viewed as a proxy for market share (Lu & Yang, 2010; Yang, 2012). In fact, high customer satisfaction has been linked to improvements in a firm's economic returns, including market share and profitability (Anderson et al., 1994; Crosby et al., 1990). Daugherty et al. (1998) and Stank et al. (2003) also report empirical investigations indicating a link between logistics service performance (availability, reliability, speed) and an ultimate impact on market share.

Furthermore, the adoption of innovation capability is generally intended to contribute to the performance or effectiveness of the firm (Damanpour, 1991). Innovation capability, i.e. the capacity to engage in innovation as defined in this paper, has been found to be a key component in the success of industrial firms (Hult et al., 2004; Zhou et al., 2005). For instance, Hult et al. (2004) found that through innovation capability, managers devise solutions to business problems and challenges, which provide a basis for firm success into the future. They identified a positive link between innovation capability and business performance. Several studies also have concluded that innovation capability can improve firm performance (Panayides, 2006; Yang et al., 2009; Yang, 2012).

Moreover, there have been several practical logistics and SCM studies on flexibility. Vickery et al. (1999) found that supply chain flexibility is associated with market, finance or growth performance. Stank and Lackey (1997) found operational flexibility to be moderately associated with logistics performance, and personnel flexibility strongly associated with logistics performance. Fawcett et al. (1996) focused on both logistics and manufacturing flexibility and found that flexibility both moderates and mediates the effects of information capability and strategic planning on performance and global reach. Johnson (1999) also referred to flexibility as an important and desirable component in inter-firm relationships and concluded that flexibility can facilitate distributors' strategic integration, thereby enhancing distributors' performance. Thus, hypothesis one is proposed as followings:

H1: *The higher the service capabilities in LSPs, the better their logistics performance.*

H2: *The higher the innovation capabilities in LSPs, the better their logistics performance.*

H3: *The higher the flexibility capabilities in LSPs, the better their logistics performance.*

2.2 Human Capital

Human capital is defined as the knowledge, skills, and abilities owned and utilized by individuals (Schultz, 1960). Edvinsson and Malone (1997), and Stewart (1997) referred it as individuals' capabilities of creativity, innovation, and renewal. Pennings et al. (1998) conceptualized that human capital involves knowledge stock and knowledge flow. Lynn (2000) also indicated that it is an inventory of skill sets and knowledge of individual within an organization. As to knowledge flow, it develops high level of codified and tacit knowledge about a specific business and particular market conditions. Bontis (1996, 1998, 1999), Forbes (2005), and Swart (2006) indicated that human capital refers to the intangible assets which employees' posses, such as knowledge, skills, education, know-how, and experience. These three practices are generally regarded as the most important practice in human capital. Wright et al. (2001) argued that human resource practices lead to higher firm performance through their effects on employee-based firm capabilities and resources. Therefore, the principal components of an organization's human capital are its workforce's skill sets, depth of expertise, and breadth of experience (Carmeli & Tishler, 2004; Subramaniam & Youndt, 2005). Human resources can be thought of as the living and thinking part of intellectual capital resources (Roos et al., 1997). These can therefore walk out at night when people leave. Consequently, this study adopted that human capital includes: (a) skills and competencies of employees, (b) their know-how in certain fields that are important to the success of the enterprise, and (c) their knowledge. Employees' loyalty, motivation, and flexibility also will often be significant factors because a firm's expertise and experience pool is developed over time. A high level of staff turnover may mean that a firm is losing these important elements of intellectual capital.

Furthermore, in a keynote address to the 1999 Transportation and Logistics Educators Conference, William Copacino of Andersen Consulting predicted that the development of human capital will be an increasingly important success factor in the new millennium (Myers et al., 2004). He noted that companies are experiencing unprecedented stress on their skilled labor resources including: lack of skilled knowledge workers in the right locations, rapidly shrinking "half life" of critical knowledge within the enterprise driven by human capital turnover, increased competition for the best and the brightest, and a general talent shortage encompassing both hard and soft skills.

Indeed, the logistics process is human centric. While pressures to secure adequate logistics staffing are evident at all levels from unskilled laborers through the management ranks and to the very top people within organizations, the focus of the recent research is on entry to mid-level logistics managers, even with vast improvements in technology and communications, substantial numbers of employees at the entry and mid-levels are needed to keep supply chains operating

smoothly. Therefore, firms must focus on selecting the most qualified, best-suited managers to work in what frequently involves somewhat unique and isolated environments. The following quotation from Bowersox et al. (2000) describes the typical logistics dynamics involved.

"Effective management of the logistics process... is complicated by the fact that over 90% of all logistical work takes place outside of the vision of any supervisor. No other employees within the typical business enterprise are expected to do so much critical work without direct supervision as those that make logistics happen." (p. 12)

Given such obstacles, what can increase the chance of logistics employees and managers succeeding in their jobs? There are obviously differences among potential employees in the candidate pool. For example, differences involving levels of formal education, type and duration of work experience, and specific skills possessed result in heterogeneous workforces. Such variation in experience, education, and skills are likely to influence employees' competencies and performance.

From the above discussion, in LSPs, human capital plays a significant role in triggering innovation and performance. Satisfied and highly educated logisticians tend to improve organizational capital (e.g. process, culture, and brand value) and then engage in high performances (Ellickson, 2002). While structural capital is owned by organizations and accumulated for a long-time, human capital is possessed by individuals and changed by hiring, training, and retiring (Subramaniam & Youndt, 2005). Thus, organizations' efforts focus on encouraging employees to concentrate on their job as well as on providing them satisfaction to prevent them from leaving the organization or retiring. Consequently, firms make investments in human capital, i.e., people, in order to improve their market competitiveness (Elsdon, 1999). The skills and knowledge of individual employees can be leveraged to increase the ability to efficiently and/or effectively produce market offerings and enhance firm performance (Hunt, 2000; Carmeli & Tishler, 2004). The "people dimension" is especially critical to achieving most supply chain objectives (Van Hoek et al., 2002). The challenge is to hire the best employees. Indeed, employees are important human capital for organizations because they provide organizations with a unique source of sustainable competitive advantages (Lepak & Snell, 1999; Lepak & Snell, 2002; Neal et al., 2005; Pfeffer, 1994). Employees do not only help organizations complete lots of work but also contribute their knowledge, talent, and abilities to the success of the organization. Without the help of employees, organizations cannot success in business. Consequently, no one can ignore the contributions of human capital on logistics performance in LSPs. On this basis it is hypothesized that:

H4: *The higher the human capital in LSPs, the better their logistics performance.*

2.3 Human Capital and Logistics Capabilities

The RBT suggests that competitive advantages originate at the firm; specifically, that they are derived from the resources and capabilities of the firm (Ethiraj et al., 2005; Hafeez et al., 2002; Teece et al., 1997). However, it does not illustrate how to deploy the resources in order to exploit it values (Ambrosini & Brown, 2001; Peppard & Rylander, 2001). Additionally, some researches have

asserted that any of a wide range of firm attributes controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness can be considered resources, such as assets, capabilities, competencies, organizational processes, information, and knowledge (Barney, 1991; Collis & Montgomery, 1995). On the other hand, Grant (1991), and Ethiraj et al. (2005) argued that capabilities are not part of resources and have therefore sought to differentiate them.

From the perspective of Amit and Schoemaker (1993), resources are assets or skills that are either owned or controlled by a firm, whereas capabilities refer to a firm's ability to deploy resources to achieve a desired outcome. Hafeez et al. (2002) also indicated that capabilities are the results of resource deployment and organizational processes having the dynamic "doing" nature. Consequently, capabilities should be independent from resources. In addition, Olavarrieta and Ellinger (1997) stated that resources and capabilities differ in that resources can be tangible or intangible whereas capabilities are always intangible. Moreover, resources are related to "having" while capabilities are related to "doing", making them more invisible. Compared to resources, capabilities have the characteristics of rareness, inimitability, and non-substitutability and are a strong basis for SCA (Barney, 1991; Hafeez et al., 2002). To summarize, resources are input based, whereas capabilities are functional or process based (Carmeli & Tishler, 2004; Javidan, 1998). Therefore, resources are independent from capabilities and are the sources of a firm's capabilities (Grant, 1991; Yang et al., 2009).

Since resources consist of tangible (e.g. equipment, plants, fleets, hardware), or intangible (e.g. organizational processes, skills, knowledge, know-how, reputation) resources. Grant (1991) referred to a wide range of resources, such as financial, physical, human, technological, reputation and organizational ones, while Barney (1991) and Marino (1996) classified resources into three groups, that is physical, human, and organizational. Additionally, Hafeez et al. (2002) indicated that resources can be divided into physical, intellectual, and cultural assets. In the context of LSPs, excellent logistics capabilities rely on firms' resources, such as people, skills, knowledge, organizational processes, and know-how etc. to manage them (Daugherty et al., 1996; Tidd et al., 2001). Several studies also have demonstrated that firms' intangible resources (Carmeli & Tishler, 2004; Hall, 1993) can improve logistics capability (Liang et al., 2006; Lu, 2003).

Furthermore, RBT also suggests that acquisition, development, and deployment of knowledge resources toward internal capabilities (i.e., efficiencies) are likely to influence firm capabilities in dealing with and serving customers (Conner & Prahalad, 1996; Teece, 1998). Autry et al. (2005) also indicated that the WMS-dedicated human resources will be positively associated with WMS-related capabilities. Moreover, Stank and Lackey (1997), and Richey et al. (2005) also indicated that resource commitment is significantly related to capabilities. Subramaniam and Youndt (2005) found that human, organizational, and social capital and their interrelationships selectively influenced incremental and radical innovative capabilities. Auw (2009) and Wang et al. (2008) empirically examined the relationships between human capital and capability. Teixeira and Fortuna (2004) indicated that human capital has a positive impact on innovation capability. In

addition, Tsai (2006) also proposed the effect of social capital on absorptive capability in internet marketing. Therefore, in the context of logistics, we expected that human capital enhanced the transformation or reinforced the prevailing knowledge and thereby influenced an LSP's logistics capabilities. On this basis it is hypothesized that:

H5: *The higher the human capital in LSPs, the better their service capabilities.*

H6: *The higher the human capital in LSPs, the better their innovation capabilities.*

H7: *The higher the human capital in LSPs, the better their flexibility capabilities.*

2.4 Innovation Capability and Service Capability

Innovation capability stresses the organization's ability to turn inventions or new ideas into practice in the new product, service, or process fields. By integrating innovation capabilities into logistics service activities, an effect of learning-by-doing can make LSPs' logistics service capabilities extremely difficult for competitors to imitate (Slater, 1996). Several studies have concluded that innovation in service or processes can create high service quality and better value to customers, which, in turn improves firm performance (Panayides, 2006; Petroni and Panciroli, 2002; Richey et al., 2005).

Clayton and Turner (2000) asserted that process innovation can create better relative value to firms via the achievement of low relative cost and high relative quality, which, in turn increases market share. Petroni and Panciroli (2002) and Richey et al. (2005) indicated that innovation capability is positively related to firms' operation service quality such as flexibility of production and delivery times. Panayides (2006) also found that firms' innovation capability had a significantly positive impact on logistics service quality. Hence, LSPs can use innovation to improve their service process or to differentiate their logistics services. Based on the preceding review of the literature on innovation capability, this study hypothesizes that:

H8: *The higher the innovation capabilities in LSPs, the better their service capabilities.*

2.5 The Mediating Effect of Logistics Capabilities

According to literature review, most of the past empirical researches have conducted to test various concepts as potential links in the human resource management system-firm performance relationship. However, there are also some studies pointed out that there is no correlation between the two. Inconsistency of these findings by implicit with the meaning is human resource management system might have an indirect effect on organizational performance. Therefore, we should establish a complete theoretical model through the study of intervening variables (Becker & Gerhart, 1996; Wright & Sherman, 1999).

Logistics capabilities encompass business behavior and processes as customer service, responsiveness to customers, and order cycle time (Treacy & Wiersema, 1993). Its formation is closely related to the cumulative learning and long-term investment on learning (Zhao et al., 2001;

Shang & Marlow, 2005). Therefore, it can be defined as the ability of LSPs to identify, utilize, and assimilate both internal and external resources/information to facilitate the entire logistics activities and satisfy the logistics needs of their customers in pursuit of better service performance. Since the human resource management system could institutionalize the patterns of personal behavior (institutionalization), thus it could promote greater organizational capabilities (Ulrich & Lake, 1990). In addition, the appropriate human resource management system will help enhance the organizational exclusive knowledge, skills and abilities, as well as the work ethic, and then promote the capabilities of organizational technology, structure and procedures (Tomer, 1987). Indeed, these capabilities make it easier for LSPs to attract, develop and have a better ability to stay on staff, thereby helping LSPs achieve competitive advantage and excellent organizational performance (Kim, 2006; Lu & Yang, 2006, 2007; Shang & Marlow, 2005; Wong et al., 2008).

On the other hand, the RBT views the firm as a bundle of resources (Collis & Montgomery, 1995), and the firm can gain superior performance and competitive advantages by developing and deploying unique and idiosyncratic organizational resources and capabilities (Barney, 1991; Carmeli & Tishler, 2004; Wernerfelt, 1984). From the previous theories we know that human resource management system can enhance organizational performance through the enhancement of organizational capability. In addition, human resource management system will help guide the human resources to result a unique combination of resources that are valuable, rare, inimitable and non-substitutable (Barney et al., 1998). These characteristics are also embedded in the organizational structure, technology, procedures and interpersonal systems, and thus enhance organizational capabilities, which in turn enhance organizational performance (Lado & Wilson, 1994). These arguments have been supported in many empirical studies (e.g., Bowen et al., 1991; Latham & Wexley, 1991; Lawler, 1992).

From the above analysis, organizational capability is produced by human resources (Amit & Schoemaker, 1993). Since human capital emphasizes that by upgrading employees' knowledge, organizational structure, procedures, arrangements and other mechanisms, the competitive advantage of organizations will be enhanced, and this is exactly what some part of human resource management activities. For instance, Snell et al. (1996) had pointed out the intellectual capital, it shows that the human resource management activities make a contribution to the organizational competitive advantage. Therefore, this study considers that the human resource management activities can basically be regarded as the human capital management activities, and will contribute to the establishment of intellectual capital and thus strengthen competitive advantage, which in turn enhance organizational performance. As a result, in the LSPs, enterprises not only by the logistics capabilities to develop and deploy resources (Autry et al., 2005; Carmeli & Tishler, 2004; Mukherjee et al., 2003; Sinkovics & Roath, 2004), through the heterogeneity and non-mobility of logistics capabilities, LSPs can also own a sustainable competitive advantage and achieve superior logistics performance. That is, human capital will impact the logistics capabilities, and then influence logistics performance. Accordingly, this study will consider the logistics capabilities as a mediating variable between human capital and logistics performance. Moreover, several studies

have concluded that innovation in service or processes can create high service quality and better value to customers, which, in turn improves firm performance (Panayides, 2006; Petroni and Panciroli, 2002; Richey et al., 2005). On this basis it is hypothesized that:

H9: *Human capital has a positive impact on logistics performance through the mediating effect of service capabilities.*

H10: *Human capital has a positive impact on logistics performance through the mediating effect of innovation capabilities.*

H11: *Human capital has a positive impact on logistics performance through the mediating effect of flexibility capabilities.*

H12 *Innovation capability has a positive impact on logistics performance through the mediating effect of service capability.*

3. METHODOLOGY

3.1 Variable Definition and Measurement

To ensure the creditability and validity of this questionnaire, we will study the relevant literature and adopt the scales utilized in previous studies while conducting interviewees with 3~5 experts to establishing the characteristics of LSPs. Ascertaining the implication of constructs and ensuring that each statement captures the intended meaning of a specific sub-dimension of constructs, three researchers with expertise in organization behavior and human resources will discuss and modify the survey. The modified survey will then confirm and adjust again through three logistics experts and three academic researchers, respectively, before full-scale data collection efforts. In light of Chen et al.'s (1993) emphasis on the importance of using experts when developing surveys, we will invite both researchers of organization behavior and human resources, and logistics experts to examine each item to ensure that the survey will be appropriate for our sample. For face validity, we will also invite three human resource researchers to review each item to ensure the consistency of items and operational definitions, easy understanding of each item, and to check whether it will be necessary to remove or add items. Finally, three human resource researchers and three logistics experts will be invited to review all the items once more. After all of their opinions and suggestions, it should enhance the reliability and validity of the questionnaire.

The measurement of the questionnaire items in this study will be with a 'five-point Likert scale from 1 to 5' rating from strongly disagree, disagree, neutral (neither disagree nor agree), agree, and strongly agree. The questionnaire will comprise four parts. The first part is the measurement of human capital, the second part is the measurement of logistics capabilities (including service, innovation, and flexibility capabilities), the third part is the measurement of logistics performance, and the fourth part of the questionnaire consiste of the descriptive data of the respondents (job title) and their companies (including the number of employees, year founded, annual revenue, etc). The definitions and measurements of the constructs are further defined as follows.

3.1.1 Human Capital

Human capital in this study was defined as the summation of employees' knowledge, skills, expertise, experience, wisdom, and creativities, etc, and was embedded in employees not in organizations. Human capital, which is not owned by the organization, might be taken away by employees. We use and adjust the measuring scales developed by Subramaniam and Youndt (2005), Edvinsson and Malone (1997), and Pablos (2002). The measurement of human capital comprises the following ten items (Table 1):

Table 1 Measures of Human Capital

Factors	Items	Reference
Expertise and skills	Employees are highly skilled.	Subramaniam & Youndt, 2005
	Employees are widely considered the best in our industry.	
	Employees are creative and bright.	
	Employees are experts in their particular jobs and functions.	
	Employees develop new ideas and knowledge.	
Educational training	Improved education and training programs	Edvinsson & Malone, 1997; Pablos, 2002
	Make every effort to personnel training and education	
	Efficiency of education and training	
	Average number of hours of education and training is higher than that of our competitors	
	Average funds of education and training is higher than that of our competitors	

3.1.2 Service Capability

As regards LSPs, service capability in this study was defined as the ability of LSPs to create and deploy to satisfy the logistics needs of their customers in pursuit of better logistics performance. We use and adjust the measuring scales developed by Kim (2006), Lai (2004), and Lu and Yang (2010). The measurement of service capability comprises the following items (Table 2).

Table 2 Measures of Service Capabilities

Factors	Items	Reference
Service capability	Delivery speed and accuracy	Kim, 2006; Lai, 2004; Lu & Yang, 2010
	Door-to-door service	
	Good protection for goods safety and risk	
	Prompt response to customers' requirements	
	Handle special cargo	
	Good customer service management system	
	Good after sales service	
	Low damage or loss rate	
	Providing tracing service system	
	Prompt response to goods claim	

	Linkage with related industries' information systems	
	Reverse logistics operations in a timely manner	

3.1.3 Innovation Capability

As regards LSPs, innovation capability in this study was defined as the ability of LSPs to turn inventions or new ideas into practice in the new product, service, or process fields. We use and adjust the measuring scales developed by Hogan et al. (2011), Yang (2012), and Panayides (2006). The measurement of innovation capability comprises the following items (Table 3).

Table 3 Measures of Innovation Capabilities

Factors	Items	Reference
Innovation capability	Exploring best methods to achieve corporate goals	Hogan et al., 2011; Yang, 2012; Panayides, 2006
	Regularly improve company's operational systems	
	Modern machinery equipment and pick- up system	
	Application of new operational flow	
	Good techniques in goods movement and distribution	
	Entering into newer service routes	
	Using new technology and innovation	
	Innovative ideas and improvement	

3.1.4 Flexibility Capability

As regards LSPs, flexibility capability in this study was defined as the ability of LSPs to customize the products to customers' specifications based on propriety, learning experiences, skills, and knowledge in the process. We use and adjust the measuring scales developed by Lu and Yang (2007), and Zhao et al. (2001). The measurement of flexibility capability comprises the following items (Table 4).

Table 4 Measures of Flexibility Capabilities

Factors	Items	Reference
Flexibility capability	Accommodate special or non-routine requests	Lu & Yang, 2007; Zhao et al., 2001
	Handle unexpected events	
	Provide flexible operational space	
	Construct flexible operational procedures and systems	

3.1.5 Logistics Performance

Since the widely used operationalizations of logistics performance is mainly "soft" (e.g. self-reported perceptual data) by nature, in contrast, the use of "hard" logistics performance measures (e.g. financial reports-based figures) is much less common (Stank et al., 2001). Therefore, the evaluation of cost and customer responsiveness in this study is from respondents' (i.e., LSPs)

perceptions of their logistics performance. We use and adjust the measuring scales developed by Coyle et al. (2003), and Voss et al. (2005). The measurement of logistics performance comprises the following items (Table 5).

3.1.6 Control Variable

In addition to the above variables, size, the number of employees of the firm, and firm age, will be controlled because a strong positive relationship between size, firm age and performance has been shown in past studies and literatures (Pennings et al., 1998). For example, size might be associated with the use of sophisticated HR practices in companies, which possibly lead to higher productivity (Huselid, 1995; Guthrie, 2001). Therefore, we proposed that firm size and firm age might be important indicators of logistics performance, it was included as control variables in this study.

Table 5 Measures of Logistics Performance

Factors	Items	Reference
Logistics performance	Attain the lowest logistics cost through efficient operations	Coyle et al., 2003; Voss et al., 2005
	Attain the lowest logistics cost by achieving high volume throughput	
	Orders shipped on time	
	Orders shipped complete	
	Orders delivered on time	
	Orders delivered complete	

3.2 Sampling and Data Collection

This study primarily aims to examine the relationships among human capital, service capabilities, innovation capabilities, flexibility capabilities, and logistics performance of LSPs in Taiwan. Therefore, we will identify the Directory of the Taiwan Logistics Almanac, database of Taiwan Yellow Pages, and members of the Taiwan Association of Logistics Management in 2012. In addition, we will also cross-check the survey samples to avoid double mailings.

The questionnaire will be mailed to the top managers of the sampled LSPs, as these target respondents were assumed to have a good knowledge of the human capital, logistics capabilities, and logistics performance of their companies. We solicite only one response from each sampled LSP. Each target respondent will receive an initial mailing, which consisted of a cover letter explaining the purposes of the study, a copy of the questionnaire, and a postage-paid return envelope. Approximately one month later, a second mailing identical in content to the initial one will be sent to the non-respondents, followed by a reminder letter and telephone two weeks after the second mailing.

As a result, the total response rate was therefore 5.6% (117/2,100), an acceptable response rate for such logistics empirical studies on the logistics industry (cf. 11.5% and 17.1% in the studies of Bowersox et al. (1999) and MSUGLRT (1995), respectively).

3.3 Common Method Variance

Use of a single data-gathering method and/or a single indicator for a concept may result in bias. Common method variance is assessed by correlations between different indicators using the same method. The research result is going to cause additive bias because the linear confounding creates a spurious main effect (Podsakoff & Organ, 1986; Podsakoff et al., 2003). In empirical research, CMV has been found to cause inflation (Williams et al., 1989) or deflation (Ganster et al., 1983) in the intensity of variables' correlation (Peng et al., 2006). It includes advance protection and post hoc testing to control CMV. There are two ways to handle advance protection, insulation data collection and questionnaire design. Therefore, we use severity procedure to construct measurement tools of variables in questionnaire contents and considered carefully the wording in order to lower CMV to avoid interrupting respondents. In addition, we will also adopt the suggestion of Anderson and Bateman's (1997) in using Harman's single-factor post hoc analysis (Podsakoff & Organ, 1986) to test the CMV problem.

After exploratory factor analysis, we found a single factor only explained a limited variance from non-rotation factor loading and the explanation percentage of a factor does not show a gathering appearance. It determines the result was not distorted from the same data sources. According to this logic and result, a single factor has only 10.1 per cent of varimax, showing that CMV is not significant in this study.

4. RESULTS

4.1 Measurement model

Measurement quality was assessed using confirmatory factor analysis (CFA) (Anderson & Gerbing, 1992). Although measurement quality is sometimes assessed factor by factor, individual factor analyses do not allow a full test of discriminant validity since potential crossconstruct correlation and interpretational confounding cannot be assessed. It therefore was decided to consider each multiple-item indicator in the study simultaneously in order to provide for the fullest test of convergent and discriminant validity. The results of initial CFA tests suggested that six items lacked sufficient discriminant or convergent validity, based on loading estimates and residuals, and the items were subsequently eliminated from further analysis. The remaining items were then examined further.

The resulting model CFA was tested. All loadings exceeded .7, and each indicator t-value exceeded 21.8 ($p < .001$). The $\chi 2$ fit statistics were 601.729 with 124 degrees of freedom ($p < .001$), while the root mean squared residual (RMSR) was .0587, and the comparative fit index (CFI) was .968. In light of the large sample size and the large number of variables, all statistics supported the overall measurement quality (Anderson & Gerbing, 1992). Furthermore, discriminant validity was evidenced when the proportion of variance extracted in each construct exceeded the square of the coefficients representing its correlation with other factors (Fornell & Larcker, 1981). As the variance extracted in each measure meets this criterion, suggesting adequate discriminant validity.

Therefore, the measures were deemed adequate for testing the hypothesized model.

4.2 Confirmatory Factor Analysis

4.2.1 Discriminant Validity

Table 6 listed the means, standard deviations, and correlations for each of the major variables. The correlations showed initial support for the hypothesized relationships among human capital, logistics capabilities, and logistics performance measures. All correlation coefficients were significant for these variables except for the relationship between human capital and logistics performance. Two originally proposed control variables, firm age and firm size, were not significantly correlated with any of the study variables and were dropped from the subsequent analysis.

In addition, it is also possible to test discriminant validity by comparing the AVE with the squared correlation between constructs. Discriminant validity exists if the items share more common variance with their respective construct than any variance that the construct shares with other constructs (Fornell & Larcker, 1981; Koufteros, 1999). As can be seen in Table 6, the AVE for a construct should be substantially higher than the squared correlation between the construct and all other constructs. Evidence of discriminant validity is also provided by the AVE method presented. The highest squared correlation was observed between human capital and flexibility capability. It was 0.50. This was significantly lower than their individual AVE value of 0.61 and 0.70, respectively. The results demonstrated evidence of discriminant validity for the study constructs.

Table 6 Correlation Matrix and Discriminant Validity Analysis

Constructs	M	Sd	1	2	3	4	5	6	7	8	9
1. Size[a]	2.73	0.69									
2. Age	18.48	6.80	0.12								
3. HC1	3.66	0.52	0.09	-0.03	**0.65**						
4. HC2	3.70	0.56	0.03	-0.04	0.52** (0.27)	**0.61**					
5. LC1	3.74	0.61	-0.08	-0.07	0.43** (0.18)[b]	0.47** (0.22)	**0.63**				
6. LC2	3.78	0.47	0.06	-0.09	0.50** (0.25)	0.53** (0.28)	0.59** (0.33)	**0.64**			
7. LC3	3.56	0.77	0.01	0.02	0.45** (0.20)	0.43** (0.18)	0.51** (0.26)	0.53** (0.28)	**0.55**		
8. LP1	3.69	0.85	-0.02	-0.06	0.57** (0.32)	0.46** (0.21)	0.46** (0.21)	0.47** (0.22)	0.62** (0.38)	**0.58**	
9. LP2	3.57	0.63	-0.04	-0.05	0.41** (0.17)	0.45** (0.20)	0.42** (0.18)	0.49** (0.24)	0.44** (0.19)	0.38** (0.14)	**0.62**

** $p < 0.01$, [a]: Log transformed, [b]: Squared correlation

M: Means, Sd: Standard deviations, Size: Number of employees, Age: Firm age, HC1: Expertise and skills, HC2: Educational training, SC1: Processes and routines, SC2: Information systems, RC1: Employee relationship, RC2: Customer relationship, RC3: Partnership, LC1: Service capability, LC2: Innovation capability, LC3: Flexibility capability, LP1: Delivery performance, LP2: Cost management

The average variance extracted (AVE) are given on the diagonal. The square roots of correlation coefficients of constructs are given under the diagonal.

4.2.1 Composite Reliability and Variance Extracted Measures

To assess whether the specified indicators sufficiently represent the constructs, estimates of the composite reliability and variance extracted measures for each construct were conducted. Composite reliability provides a measure of the internal consistency and homogeneity of the items comprising a scale (Churchill, 1979). It means that a set of latent indicators of construct are consistent in their measurement. The reliability of construct can be estimated using AMOS output. In more formal terms, this reliability is the degree to which a set of two or more indicators share the measurement of a construct. Highly reliable constructs are those in which the indicators are highly intercorrelated, indicating that they are all measuring the same latent construct.

In addition, a complementary measure to composite reliability is the AVE. The average variance extracted statistics measure the amount of variance in the specified indicators accounted for by the latent construct. Higher variance extracted values occur when the indicators are truly representative of the latent construct. Typically, recommendations suggest that the variance extracted value should exceed 0.50 for a construct (Bagozzi & Yi, 1988; Fornell & Larcker, 1981; Hair et al., 2006). The AVE value of each construct in our model was higher than the recommended level of 50% (Bogzzi & Yi, 1988; Fornell & Larcker, 1981). To summarize, the overall results of the goodness-of-fit of the model and the assessment of the measurement model lend substantial support to confirming the proposed model.

4.3 Empirical Results

As shown in Table 7, results support H1~H3, since logistics capabilities was found to have a positive relationship on logistics performance. The findings imply that an LSP with a high degree of logistics capabilities will have better logistics performance. The result was consistent with the RBT of the firm regards logistics capabilities as the source of an LSP's competitive advantage. Summarily, the aforementioned finding was consistent with previous studies on logistics capabilities and performance (Damanpour, 1991; Daugherty et al., 1998; Fawcett et al., 1996; Hult et al., 2004; Morash, 2001; Panayides, 2006; Richey et al., 2005; Stank et al., 2003; Stank & Lackey, 1997).

In H4, predicting that human capital has a positive effect on LSPs' logistics performance was invalidated (γ_{11} = 0.06, t-value = 0.81). Although human capital is recognized as the heart of intellectual capital, a distinctive feature of human capital is that it is movable and does not belong to organizations. In LSPs, firms need the help of certain databases, IT systems, valuable equipment or important machinery to implement orders shipped and delivered. Consequently, the organization can help support employees in their quest for optimum intellectual performance and therefore overall performance. An individual can have a high level of intellect, but if the organization has poor systems and procedures by which to track their actions, the human capital will not reach its

fullest potential. To sum up, from the result of this study, we argue that LSPs will have better logistics performance if they have a large stock of structural and relational capital.

Likewise, this study provided support for H5, H6, and H7, positing that human capital has a positive effect on LSPs' logistics capabilities respectively (γ_{21} = 0.52, t-value =5.49; γ_{22} = 0.49, t-value = 5.15; γ_{23} = 0.45, t-value = 4.62). The findings imply that an LSP with better human capital will have better logistics capabilities. Results suggest LSPs can develop their human capital to improve their logistics capabilities. In the era of knowledge economy emphasizing the importance of innovation, intangible assets are more critical than physical assets. Therefore, the central idea of this study focuses on logistics capabilities, one kind of dynamic capabilities to integrate and reconfigure internal and external organizational skills, knowledge, and competences to generate competitive advantage. Although very few have focused their studies on exploring the relationship between human capital and capability, especially in logistics industry. The finding is consistent with that reported in studies conducted by Auw (2009), Subramaniam and Youndt (2005), Teixeira and Fortuna (2004), Tsai (2006), and Wang et al. (2008). This indicated that whether the stock of intellectual capital is rich or not is a concern of management; how to mobilize it to generate logistics capability to increase performance is quite another for LSPs.

Further, although there was a lack of support for a significant positive relationship between human capital and logistics performance (H4 was not supported). As previously mentioned, human capital was found to have a significantly positive effect on logistics capabilities (H5~H7). In addition, logistics capabilities was found to have a significantly positive impact on logistics performance (H1~H3). In other words, instead of a direct effect, human capital had an indirect impact on logistics performance mediated by logistics capabilities. Thus, human capital had a significantly positive impact on logistics capabilities, and the latter will, in turn, improve LSPs' logistics performance.

Table 7 Results of Hypothesis Testing (n=117)

Hypothesis	Estimate	t-value	Results
H1: The higher the service capabilities in LSPs, the better their logistics performance.	β_{11} = 0.63	6.17	Supported
H2: The higher the innovation capabilities in LSPs, the better their logistics performance.	β_{21} = 0.51	5.70	Supported
H3: The higher the flexibility capabilities in LSPs, the better their logistics performance.	β_{31} = 0.48	5.28	Supported
H4: The higher the human capital in LSPs, the better their logistics performance.	γ_{11} = 0.06	0.81	Not supported
H5: The higher the human capital in LSPs, the better their service capabilities.	γ_{21} = 0.52	5.49	Supported
H6: The higher the human capital in LSPs, the better their innovation capabilities.	γ_{22} = 0.49	5.15	Supported

H7: The higher the human capital in LSPs, the better their flexibility capabilities.	$\gamma_{23} = 0.45$	4.62	Supported
H8: The higher the innovation capabilities in LSPs, the better their service capabilities.	$\beta_{41} = 0.57$	4.83	Supported
H9: Human capital has a positive impact on logistics performance through the mediating effect of service capabilities.			Supported
H10: Human capital has a positive impact on logistics performance through the mediating effect of innovation capabilities.			Supported
H11: Human capital has a positive impact on logistics performance through the mediating effect of flexibility capabilities.			Supported
H12: Innovation capability has a positive impact on logistics performance through the mediating effect of service capability.			Partially Supported

t-value exceeding 1.96 represents a level of significance of 0.05.

5. Conclusion

This study integrated the concept of RBT and dynamic capability to offer a conceptual model of intellectual capital, logistics capabilities, and logistics performance for LSPs. After that, we use and adjust the measuring scales developed by previous research to develop scale items of all measures used for the constructs in the model, and then to proceed the measurement model evaluation. For analyzing for this study, an exploratory study, utilized EFA to identify crucial human capital, structural capital, relational capital, logistics capabilities, and logistics performance dimensions. Moreover, several techniques, such as item-total correlations (or corrected item-total correlations), and Cronbach's alpha were employed to develop and evaluate measurement scales. In addition, a confirmatory study, was undertaken since the aforementioned techniques do not allow for assessing unidimensionality, convergent validity, or discriminant validity, a confirmatory factor analysis (CFA) with a multiple-indicator measurement model has been suggested for assessing the validity of the measurement model.

Once the measurement model is validated, the researcher proceeds to the final step, estimating the structural model between latent variables. To sum up, this study carried out a questionnaire survey to collect data for testing the proposed conceptual model designed to examine the effects and relationships of human capital, structural capital, relational capital, logistics capabilities, and logistics performance of Taiwanese LSPs. From the above rigorous research process, we finally have the results of hypothesis testing as Table 4-13. After that, we discuss in terms of theoretical and practical implications, and also provide some suggestions for managerial practice and for further research.

Several contributions are made from this study. First, the concept of logistics capability has

been commonly examined in the manufacturing area, but rarely in the logistics service industry. Therefore, one of the major contributions of this study is that we attempt to identify crucial intellectual capital, logistics capabilities, and logistics performance in the LSPs. Next, this study contributes by employing logistics capability to develop a dynamic model to examine their effects on LSPs' logistics performance. Third, this study contributes by demonstrating that static resource (intellectual capital) is independent from dynamic logistics capability for LSPs. In addition, human capital has been found to have an indirect positive effect on logistics performance mediated by logistics capabilities. However, the structural and relational capital has direct and indirect positive effect on logistics performance respectively. Fourth, the results support use of the RBT and dynamic capability, and confirm they can provide a theoretical foundation for examining and understanding the relationships among human capital, structural capital, relational capital, logistics capabilities, and logistics performance in the logistics service context. Finally, this study employed rigorous statistical techniques, such as EFA, CFA, and SEM to test the research hypotheses, thus reinforcing the reliability of explanation and implications of findings.

5.1 Managerial Implications

From a research perspective, understanding the intellectual capital and logistics capabilities of LSP and how they may affect logistics performance opens up new avenues to develop theories about LSPs. This study not only integrated the concept of RBT and dynamic capability to provide a conceptual model but also examined the effects and relationships of human capital, structural capital, relational capital, logistics capabilities, and logistics performance of Taiwanese LSPs. The results support the use of the RBV and dynamic capability as lenses through which to understand the unique characteristics of logistics capabilities and study the relationships among human capital, structural capital, relational capital, logistics capabilities, and logistics performance in LSPs.

In addition, results of this study provide some guidance for LSPs to develop intellectual capital and logistics capabilities. The findings reveal that structural capital, relational capital, and logistics capabilities are crucial sources of logistics performance. It is therefore necessary for LSPs' managers to assess strengths and weaknesses in their structural capital, relational capital, and logistics capabilities relative to their competitors and constantly enhance their firms' logistics capabilities to gain superior logistics performance.

Intellectual capital was identified as a crucial source of logistics capabilities. This implies LSPs have to effectively develop and deploy their intellectual capital. More specifically, LSPs should have to possess high quality of expertise and skills, well educational training, high efficiency of processes and routines, advanced information systems, harmonious employee relationship, good customer relationship, and closely with partners. In addition, LSPs also have to develop good service capability, continued innovation capability, and the more excellent flexibility capability.

Further, logistics capability has found to have a positive effect on logistics performance. The result of this study thus suggests LSPs have to improve their logistics capabilities in terms of

service capability, innovation capability, and flexibility capability. Consequently, LSPs could first to enhance delivery speed and accuracy, door-to-door service, goods safety, prompt response to customers' requirements, special cargo handling, tracing service system, and good customer service management system. Moreover, LSPs should not only build good relationships with customers and downstream companies but integrate their information systems with their supply chain partners. Next, in order to strengthen innovation capability, LSPs should have to bring up best methods to achieve corporate goals, regularly improve company's operational systems, bring in modern machinery equipment and pick- up system, make use of new operational flow, and recommend excellent techniques in goods movement and distribution. In addition, LSPs should have to be more innovative in operation methods and processes. Finally, for reinforcing flexibility capability, LSPs should have to accommodate special or non-routine requests, handle unexpected events, provide flexible operational space, and construct flexible operational procedures and systems.

Furthermore, the study found that instead of a direct effect, human capital had an indirect positive effect on logistics performance mediated by logistics capabilities. Therefore, LSPs should also have to enhance their logistics capabilities. To sum up, this study provides a general framework for identifying intellectual capital and logistics capabilities based on LSPs' logistics activities. Such framework can help LSPs' managers to heighten their understanding of logistics capabilities and identify how such capabilities may affect logistics performance, therefore develop effective logistics strategies.

5.2 Study Limitations and Future Research

Several directions are suggested for future research. First, the current study is based on a cross-sectional survey approach, therefore the hypothesized relationships were examined in a static fashion. However, cross-section data can not fully capture the dynamics of change. It might be useful to conduct a longitudinal research design to reveal how perceptions of logistics capabilities change over time, and then augment the findings of our survey.

Next, in terms of the scope of the study, this research was limited to the study of LSPs in Taiwan. Thus, we collected data only from LSPs in one culture. This may limit the generalizability of the results to other cultures. Studies of LSP and their logistics performances in different cultural and social contexts will not only help to generalize the findings, but also contribute to determining how differences in cultural and social context may influence the development of LSP and their logistics performance.

Third, future research may also be conducted on other driving forces behind the development of different types of LSP. LSPs may seek to enhance their logistics capability under customer pressures and institutional forces or according to operations and information technology needs, resulting in different patterns of development in their logistics capabilities.

Fourth, intellectual capital has been demonstrated to be a crucial source to logistics capabilities in this study. However, strategic orientation variables, such as learning orientation and marketing

orientation are also important factors for the development of organizational capabilities (Han et al., 1998; Keskin, 2006; Panayides, 2006). Future research could therefore employ the same conceptual model and incorporate strategic orientation variables in it for evaluation processes.

Fifth, this study provides a good theoretical framework for strategic management research. However, owing to the invisible nature of company's capability, case studies or in-depth qualitative interviews can be more easily measured. Therefore, future research could apply qualitative research such as interviews and case study to deeply understand the development of logistics capability in LSPs.

Sixth, logistics strategy has been viewed as a source of competitive advantage and superior performance. Therefore, another worthwhile direction for future research might be use of the strategic group concept to classify LSPs into different capability oriented firms based on the logistics capability dimensions identified in this study. Such an approach might investigate strategic and operating differences among various firms within an industry.

Finally, Maloni and Carter (2006) recommended that LSPs could be divided into asset-based logistics (such as freight transport services and warehousing and storage services, etc.) and non-asset-based logistics (such as air freight forwarder, ocean freight forwarder, and shipping agency, etc.). Accordingly, future research could further compare the difference between their capabilities and performance indicators.

REFERENCES

Ashenbaum, B., Maltz, A., Rabinovich, E., 2005. Studies of trends in third-party logistics usage: What can we conclude? Transportation Journal 44(3), 39-50.

Autry, C.W., Griffis, S.E., Goldsby, T.J., Bobbitt, L.M., 2005. Warehouse management systems: resource commitment, capabilities, and organizational performance. Journal of Business Logistics 26(2), 165-182.

Auw, E., 2009. Human capital, capabilities and competitive advantage. International Review of Business Research Papers 5(5), 25-36.

Bagozzi, R.P., Yi, Y., 1988. On the evaluation of structural equation models. Academy of Marketing Science 16(1), 74-93.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. Journal of Management 17(1), 99-120.

Barney, J.B., Wright, P.M., 1998. On becoming a strategic partner: the role of human resources in gaining competitive advantage. Human Resource Management 37(1), 31-46.

Barney, J.B., Wright, M., Ketchen, D.J. Jr., 2001. The resource-based view of the firms: ten years after 1991. Journal of Management, 27, 625-641.

Bowersox, D.J., Closs, D.J., Stank, T.P., 1999. 21st century logistics: making supply chain integration a reality, Council of Logistics Management, Oak Brook, IL.

Bowersox, D.J., Closs, D.J., Stank, T.P., 2000. Ten mega-trends that will revolutionize supply chain

logistics. Journal of Business Logistics, 21(2), 1-16.

Bowen, D.E., Ledford, G.E., Jr., Nathan, B.R., 1991. Hiring for the organization, not the job. Academy of Management Executive 5(4), 35-51.

Cakar, N.D., 2006. Enhancing innovation capability through human resource practices: an empirical study in Turkish SEMs. South-East Europe Review 4, 109-126.

Calantone, R. J., Cavusgil, S. T., Zhao, Y., 2002. Learning orientation, firm innovation capability, and firm performance. Industrial Marketing Management 31, 515-524.

Carmeli, A., Tishler, A., 2004. Resources, capabilities, and the performance of industrial firms: a multivariate analysis. Managerial and Decision Economics 25, 299-315.

Carmeli, A., Tishler, A., 2004. The relationships between intangible organizational elements and organizational performance. Strategic Management Journal 25, 1257-1278.

Champy, J., 2003. X-engineering the corporation: reinventing your business in the digital age. N.Y.: Harper Business.

Chen, M.C., Cheng, S.J., Hwang, Y.C., 2005. An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. Journal of Intellectual Capital 6(2), 159-76.

Daugherty, P.J., Stank, T.P., Ellinger, A.E., 1998. Leveraging logistics/distribution capabilities: the effect of logistics service on market share. Journal of Business Logistics 19(2), 35-51.

Day, G.S., 1994. The capabilities of market-driven organizations. Journal of Marketing 58(4), 37-52.

Drucker, P.F., 1959. Challenge to management science. Long Range Planning 5(2), 238-42.

Edvinsson, L., Malone, M.S., 1997. Intellectual capital: realizing your company's true value by finding it's hidden roots. New York: Harper Business.

Ellickson, M.C., 2002. Determinants of job satisfaction of municipal government employees. Public Personnel Management 31(3), 343-58.

Elsdon, R., 1999. Creating value and enhancing retention through employee development: the Sun Microsystems experience. Human Resource Planning 22(2), 39-47.

Ethiraj, S.K., Kale, P., Krishnan, M.S., Singh, J.V., 2005. Where do capabilities come from and how do they matter? A study in the software services industry. Strategic Management Journal 26, 25-45.

Fawcett, S.E., Calantone, R., Smith, S.R., 1996. An investigation of the impact of flexibility on global reach and firm performance.Journal of Business Logistics 17 (2), 167–196.

Fawcett, S.E., Stanley, L.L., Smith, S.R., 1997. Developing a logistics capability to improve the performance of international operations. Journal of Business Logistics 18(2), 101-127.

Forbes, D.P., 2005. Managerial determinants of decision speed in new ventures. Strategic Management Journal 26, 355-366.

Fornell, C. Larcker, D. F., 1981. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research 18(1), 39-50.

Gerbing, D.W., Anderson, J.C., 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. Journal of Marketing Research 25, 186-192.

Ganster, D.C., Hennessey, H.W., Luthans, F., 1983. Social desirability response effects: 3

alternative models, Academy of Management Journal 26(2), 321-31.

Hogan, S.J., Soutar, G.N., McColl-Kennedy, J.R., Sweeney, J.C., 2011. Reconceptualizing professional service firm innovation capability: scale development. Industrial Marketing Management, 40 (8), 1264–1273.

Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Structural Equation Modeling 6 (1), 1-31.

Hult, G.T.M., Hurley, R.F., Knight, G.A., 2004. Innovativeness: its antecedents and impact on business performance. Industrial Marketing Management 33, 429-438.

Hunt, S.D., 2000. A general theory of competition: resources, competences. productivity, economic growth. Thousand Oak, CA: Sage Publications, Inc., 187.

Hunt, S.D., Morgan, R.M., 1995. The comparative advantage theory of competition. Journal of Marketing 59 (2), 1–15.

Hurley, R.F., Hult, G.T.M., 1998. Innovation, market orientation, and organizational learning: an integration and empirical examination. Journal of Marketing 62(3), 42-54.

Javidan, M., 1998. Core competence: what does it mean in proactive? Long Range Planning 31(1), 60-71.

Johnson, J.L., 1999. Strategic integration in industrial distribution channels: managing the interfirm relationship as a strategic asset. Journal of the Academy of Marketing Science 27 (1), 4–18.

Kaplan, R.S., Norton, D.P., 2004. Measuring the strategic Readiness of intangible Assets. Harvard Business Review 82(2), 52-63.

Kim, S.W., 2006. Effects of supply chain management practices, integration and competition capability on performance. Supply Chain Management: An International Journal 11(3), 241-248.

Koufteros, X.A., 1999. Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. Journal of Operations Management 17, 467-488.

Koufteros, X.A., Vonderembse, M.A., Doll, W.J., 2002. Integrated product development practices and competitive capabilities: the effects of uncertainty, equivocality, and platform strategy. Journal of Operations Management 20, 331-355.

Lado, A.A., Wilson, M., 1994. Human resource systems and sustained competitive advantage: a competency-based perspective. Academy of Management Review 19(4), 699-727.

Lai, K.H., Cheng, T.C.E., 2003. Supply chain performance in transport logistics: an assessment by service providers. International Journal of Logistics: Research and Applications 6 (3), 151–164.

Lai, K.H., 2004. Service capability and performance of logistics service providers. Transportation Research – Part E Logistics and Transportation Review 40, 385-399.

Lu, C.S., Yang, C.C., 2010. Logistics service capabilities and firm performance in international distribution center operators. The Service Industries Journal, 30(2), 281-298.

Lynch, D.F., Keller, S.B., Ozment, J., 2000. The effects of logistics capabilities and strategy on firm performance. Journal of Business Logistics 21(2), 47-67.

Lynn, B.E., 2000. Intellectual capital: unearthing hidden value by managing intellectual assets. Ivey

Business Journal 64(3), 48-52.

Murphy, P.R., Daley, J.M., 2001. Profiling international freight forwarders: an update. International Journal of Physical Distribution and Logistics Management 31 (3), 152–168.

Myers, M.B., Griffith, D.A., Daugherty, P.J., Lusch, R.F., 2004. Maximizing the human capital equation in logistics: education, experience, and skills. Journal of Business Logistics 25(1), 211-232.

Neal, A., West, M.A., Patterson, M.G., 2005. Do organizational climate and competitive strategy moderate the relationship between human resource management and productivity? Journal of Management 31(4), 492-512.

Novich, N., 1990. Distribution strategy: are you thinking small enough? Sloan Management Review, Fall, 71-79.

Olavarrieta, S., Ellinger, A.E., 1997. Resource-based theory and strategic logistics research. International Journal of Physical Distribution & Logistics 27(9), 559-587.

Pablos, P.O., 2002. Evidence of intellectual capital measurement from Asia, Europe and the Middle East. Journal of Intellectual Capital, 3(3), 287-302.

Panayides, P.M., 2006. Enhancing innovation capability through relationship management and implications for performance. European Journal of Innovation Management 9(4), 466-483.

Prahalad, C.K., Hamel, G., 1990. The core competence of the corporation. Harvard Business Review May-June, 79-91.

Ray, G., Barney, J.B., Muhanna, W.A., 2004. Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. Strategic Management Journal 25, 23-37.

Richey, R.G., Genchev, S.E., Daugherty, P.J., 2005. The role of resource commitment and innovation in reverse logistics performance. International Journal of Physical Distribution & Logistics Management 35(4), 233-257.

Shang, K.C., 2008. The effects of information technology, integration and organizational learning capabilities on performance in Taiwan's third-party logistics providers. Journal of e-Business 10(3), 665-688.

Shang, K.C., Marlow, P.B., 2005. Logistics capability and performance in Taiwan’s major manufacturing firms. Transportation Research – Part E Logistics and Transportation Review 41(3), 217-234.

Swart, J., 2006. Intellectual capital: disentangling an enigmatic concept. Journal of Intellectual Capital 7(2), 136-59.

Szulanski, G., Cappetta, R., Jensen, R.J., 2004. When and how trustworthiness matters: knowledge transfer and the moderating effect of causal ambiguity. Organization Science 15 (5), 600-613.

Teixeira, A.A.C., and Fortuna, N., 2004. Human capital, innovation capability and economic growth in Portugal, 1960-2001. Portuguese Economic Journal 3(3), 205-225.

Tidd, J., Bessant, J., Pavitt, K., 2001. Managing Innovation: Integrating Technological, Market and Organizational Change, 2ed edition. John Wiley & Sons Ltd., New York, Chichester.

Tomer, J.F., 1987. Organizational Capital. New York: Praeger publishers.

Treacy, M., Wiersema, F., 1993. Customer intimacy and other value disciplines. Harvard Business Review 71 (January-Fehruary), 84-93.

Tsai, Y.C., 2006. Effect of social capital and absorptive capability on innovation in internet marketing. International Journal of Management 23(1), 157-167.

Ulrich, D., Lake, D., 1990. Organizational capability: competing from inside out. NY: Wiley.

Van Hoek, R.I., Robina, C., Richard, W., 2002. Managers in supply chain management, the critical dimension. Supply Chain Management: An International Journal. 7(3), 119-125.

Vickery, S., Calantone, R., Dröge, C., 1999. Supply chain flexibility: an empirical study. The Journal of Supply Chain Management 35 (3), 16-24.

Voss, M.D., Calantone, R.J., Keller, S.B., 2005. Internal service quality: determinants of distribution center performance. International Journal of Physical Distribution & Logistics Management 35(3), 161-176.

Wang, C.L., Ahmed, P.K., 2004. The development and validation of the organizational innovativeness construct using confirmatory factor analysis. European Journal of Innovation Management 7(4), 303-313.

Wang, H.K., Yen, Y.F., Tsai, C.F., Lin, Y.C., 2008. An empirical research on the relationship between human capital and innovative capability: A study on Taiwan's commercial banks. Total Quality Management 19(11), 1189-1205.

Wang, W.Y., Chang, C., 2005. Intellectual capital and performance in causal models: Evidence from the information technology industry in Taiwan. Journal of Intellectual Capital 6(2), 222-236.

Warusavitharana, A., 2004. Logistics management: the competitive edge for container liner ship operators. Logistics Spectrum 38(3), 17-21.

Wernerfelt, B., 1984. A resource-based view of the firm. Strategic Management Journal 5(20), 171-180.

Williams, L.J., Edwards, J.R., Vandenberg, R.J., 2003. Recent advances in causal modeling methods for organizational and management research Journal of Management, 29(6), 903-936.

Wong, P.C., Yan, H., Bamford, C., 2008. Evaluation of factors for carrier selection in the China Pearl River delta. Maritime Policy & Management- An International Journal of Shipping and Port Research 35(1), 27-52.

Wright, P.M., Dunford, B.B., Snell, S.A., 2001. Human resources and the resource-based view of the firm. Journal of Management 27, 701-721.

Wright, P.M., Sherman, W.S., 1999. Failing to find fit in strategic human resource management: theoretical and empirical problems. In Wright, M.A., Dyer, L.D., Boudreau, J.W., Milkovich, G.T. Research in Personnel and Human Resource Management. Supplement 4, 53-74.

Wu, F., Yeniyurt, S., Kim, D., Cavusgil, S.T., 2006. The impact of information technology on supply chain capabilities and firm performance: a resource-based view. Industrial Marketing Management 35(4), 493-504.

Yang, C.C., 2012. Assessing the moderating effect of innovation capability on the relationship between logistics service capability and firm performance for ocean freight forwarders. International Journal of Logistics Research and Applications, 15(1), 53-69.

Yang, C.C., Marlow, P.B., Lu, C.S., 2009. Assessing resources, logistics service capabilities, innovation capabilities and the performance of container shipping services in Taiwan. International Journal of Production Economics, 122(1), 4-20.

Zhao, M., Droge, C., Stank, T.P., 2001. The effects of logistics capabilities on firm performance: Customer-focused versus information-focus capabilities. Journal of Business Logistics 22(2), 91-107.

Zhou, K.Z., Gao, G.Y., Yang, Z., Zhou, N., 2005. Developing strategic orientation in China: antecedents and consequences of market and innovation orientations. Journal of Business Research 58, 1049-1058.

Zollo, M., Winter, S.G., 2002. Deliberate learning and evolution of dynamic capabilities. Organization Science 13(3), 339-351.

附件五

科技部補助專題研究計畫出席國際學術會議心得報告

日期: 104 年 10 月 21 日

計畫編號	MOST103-2410-H-263 -010- SSS		
計畫名稱	運籌服務業的績效與其決定因素：人力資本觀點		
出國人員 姓名	黃建榮	服務機構 及職稱	致理技術學院行銷與流通管理系 助理教授
會議時間	103 年 10 月 24 日 至 103 年 10 月 25 日	會議地點	武漢市武漢大學
會議名稱	(中文)第十九屆直銷學術研討會 (英文) The Proceedings of the Nineteen Symposium on Direct Selling		
發表題目	(中文)直銷商的道德銷售行為、會員信任、滿意與購後行為之關聯性研究 (英文) Relationships among Direct Distributors' Ethical Selling Behaviors, Members' Trust, Satisfaction and Behavioral Consequences		

一、 參加會議經過

第十九屆直銷學術研討會的舉辦地點位於中國武漢市武漢大學之珞珈山莊會議廳，本人於10月23日抵達，與會期間參加了多場研討會議程，並且於10月24日上台發表論文，以及於10月25日參訪業者的物流中心，對大陸的運籌服務業有了更進一步的了解，而本人於10月26日返回國內。

二、 與會心得

此次所參加之研討會屬於流通管理類之研討會，而本人發表之論文亦是與通路業者的管理有關之研究，因此會議場次內的相關研究對於本人之研究相當有幫助。此次會議地點是在武漢市武漢大學，此會議歷經十九屆之舉辦，亦已成為兩岸相關學者交流的重要管道。而此會議之目的在於增進對於流通管理議題與相關消費者行為議題之研究。

所參加發表的場次共有八篇文章，主要是以直銷通路及顧客認知與行為為主軸。有些學者發表之議題為探討直銷通路與物流之互動情形，亦有學者探討直銷業者對於智慧型載具使用上的系統議題，而本人此次所發表之論文是以直銷業的會員為研究對象，探討道德銷售行為、會員信任、滿意與購後行為之關聯性研究，可幫助業者用以瞭解如何提升與加強會員服務來獲得顧客滿意度與顧客信任。與會之學者對於此篇文章之後續發展與品質提升亦多所建議，可謂受益匪淺。

最後，參與國際研討會除了能夠加強學術交流外，亦能練習報告時間的控制及了解業界的發展現況，報告者要掌握報告時間及回答問題的關鍵是參與國際研討會很重要的練習與收穫。

三、 發表論文全文或摘要

顧客的口碑與重複消費是企業經營的重要目標，尤其在直銷業，常需透過直銷商(經營者)與會員(非經營者)或尚未加入會員的顧客互動，以建立長期關係。直銷商在業績壓力之下，常有不道德銷售行為出現，此種行為將破壞會員或顧客對公司的信任與忠誠，影響雙方長期關係。故本文以直銷公司會員為調查對象，從會員對公司的信任度來探討直銷商的道德行為對會員購後行為之影響，整體共回收 579 份有效問卷，經由結構方程式驗證顯示：1.直銷商的道德銷售行為會正向影響會員對公司的信任；2.直銷商的道德銷售行為會正向影響會員對公司的滿意度；3.會員對公司的滿意度會正向影響其對公司的信任；4.會員對公司的信任會正向影響其購後行為；5.會員對公司的滿意度會正向影響其購後行為。此外，本文也發現，直銷商的道德銷售行為對會員購後行為並無直接顯著影響，而是透過會員的信任及滿意來間接影響，其中尤以會員的信任最重要。根據實證結果，本文作進一步之討論並提出管理及實務上之意涵。

四、 建議

對於與會學者所提出之問題雖然於回答之時沒有很完好的表現，報告者在該場次結束後的休息時間是跟提問者再次瞭解問題的好時機，可再確認問題外也能增加未來研究時予以改進的思考方向。

五、 攜回資料名稱及內容

(1)會議章程；(2)論文集

科技部補助計畫衍生研發成果推廣資料表

日期:2015/10/22

科技部補助計畫	計畫名稱: 運籌服務業的績效與其決定因素：人力資本觀點
	計畫主持人: 黃建榮
	計畫編號: 103-2410-H-263-010-SSS　　學門領域: 人力資源管理

無研發成果推廣資料

103年度專題研究計畫研究成果彙整表

計畫主持人：黃建榮			計畫編號：103-2410-H-263-010-SSS				
計畫名稱：運籌服務業的績效與其決定因素：人力資本觀點							
成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數（含實際已達成數）	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	1	1	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	1	1	100%		利用此計畫，博士生亦從事相關議題之研究，其研究議題為探討運籌服務業者的人力資本、運籌能耐與運籌績效，且從中得到很好的研究學習。
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
其他成果		無					

（無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。）	

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

科技部補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估
   ■達成目標
   □未達成目標（請說明，以100字為限）
   　□實驗失敗
   　□因故實驗中斷
   　□其他原因
   說明：

2. 研究成果在學術期刊發表或申請專利等情形：
   論文：□已發表 □未發表之文稿 ■撰寫中 □無
   專利：□已獲得 □申請中 ■無
   技轉：□已技轉 □洽談中 ■無
   其他：（以100字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以500字為限）
   本研究結合資源基礎與動態能耐觀點，以運籌服務公司之高階主管為調查對象，採用結構方程式的統計分析方法，來探索人力資本、服務能耐、創新能耐、彈性能耐及運籌績效間彼此的關係。研究結果發現：運籌服務業者的人力資本與運籌能耐會正向影響運籌績效；人力資本也會正向影響運籌服務業者的運籌能耐。雖然人力資本對運籌績效沒有顯著關係存在，然由分析結果發現人力資本可透過運籌能耐之中介效果間接影響運籌績效。因此，本研究建議運籌服務業者欲提升運籌績效時，應積極強化其人力資本，進而提升運籌能耐，以提升運籌績效。