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**The 2008 Survey of Indian Third-Party Logistics (3PL) Service Providers:
Comparisons with the 2004 Survey of Indian 3PLs and 2006 Survey of North
American 3PLs**

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ABSTRACT

Third-party logistics (3PL), which is growing around the world as shippers are more and more outsourcing logistical activities, is drawing the attention of both academicians and practitioners. This paper presents a survey of Indian 3PL providers and compares the state of the industry with that in 2004 based on an earlier survey. The 3PL industries of India and North America are also compared based on a previous survey of North American 3PL providers. The survey finds that the Indian 3PL industry is in its early stage of development, and lags far behind the North American 3PL industry in terms of global reach and breadth of service offerings. Indian 3PL providers are also underperforming with respect to some of the key variables that determine performance levels. Other problems identified by the survey are lack of awareness among Indian shippers, shortage of management talent, inadequate infrastructure, complex documentations and multiple tax systems. Despite all these, the Indian 3PL industry is growing at a healthy rate of 20%. Sensing the potential of the sector, many global players are entering the Indian market through direct investments, acquisitions and alliances. Steps are being taken by the Indian government to improve infrastructure, reduce paperwork, simplify taxation systems and implement conducive economic policies to facilitate the growth of 3PL. This paper reports the changes in the Indian 3PL industry since 2004 and benchmarks Indian 3PL against North American 3PL. Significant insights are provided for logistics managers, the government and other stakeholders. The paper is concluded with directions for future research.

Keywords: 3PL, Third-party logistics, Survey, India, North America

INTRODUCTION AND RESEARCH BACKGROUND

There is growing interest in third-party logistics (3PL) or logistics outsourcing among practicing managers and academicians alike as shippers worldwide are increasingly outsourcing their logistical activities in order to reduce supply chain complexities, curtail costs and overheads, and expand their global reach. By outsourcing logistics, companies are able to not only focus on their core competencies, but also realize better delivery performance and therefore customer satisfaction. According to research done by Armstrong & Associates, Inc., global gross 3PL revenues in 2007 were USD 487 billion, out of which the U.S. accounted for USD 122 billion or about 25% of the global pie (Quinn 2008). Although due to global recession and hike in fuel prices, the 3PL sector, like any other sector, has been hit, there are opportunities as well for 3PL companies since shippers are outsourcing transportation, warehousing and other logistical activities like never before in order to reduce costs and remain competitive (Anonymous 2008a). So far, there was lack of clarity on 3PL and their roles and responsibilities. However, very recently the role of a 3PL has been recognized by the U.S. federal law. The law accords the status of an intermediary such as a carrier or forwarder to a 3PL provider and specifically stipulates that a 3PL provider is not to be considered a manufacturer, distributor or retailer, exempting 3PL companies to a great extent from stringent legislations and regulations applicable to manufacturers, distributors and retailers towards rising concerns over cargo security and consumer safety (O'Connor and Anderson 2008).

Due to the rising interest in 3PL, there have been many academic and trade publications. While academic publications address theoretical issues and their practical implications, trade publications are mainly concerned with practical issues. Academic publications take various

forms such as (i) theoretical and conceptual model development, (ii) empirical surveys, (iii) studies on 3PL relationships and partnerships, (iv) supplier evaluation and selection, (v) role and use of information systems and technologies, and (vi) case studies of 3PL companies. Most of the academic research is based on empirical surveys. Langley et al. (2007, 2008) conduct longitudinal surveys of 3PL users wherein they observe persisting gaps between expectations of users and achievements of service providers in terms of value-added service offerings, green supply chain initiatives, deployment of IT and security concerns. While shippers mostly outsource relatively commoditized services such as transportation and warehousing, they still maintain skepticism in outsourcing customer-focused and more strategically oriented services that may directly affect revenue streams, and hence prefer to keep these services in-house. With regard to green supply chain initiatives, shippers would be willing to share the additional costs, if any, equitably with service providers. However, in practice, it is observed that in many cases shippers pass on the entire cost burden to service providers (Anonymous 2008b). Service providers are also not able to meet the expectations of shippers in terms of deployment of IT and security measures after security requirements have been made more stringent for international shipments.

Surveys from the perspectives of 3PL users are available in abundance in literature. However, 3PL provider surveys are comparatively less in number. Lieb and Butner (2007) and Lieb (2008a) conduct longitudinal surveys of large North American 3PL providers that capture the dynamics of the North American 3PL industry as pricing pressure and low margins, globalization of operations, expectation of increased breadth of service offerings, large-scale consolidations, recruitment and retention of employees, and branding of services. The industry is very much

competitive and the margin is low since, as mentioned before, shippers prefer to outsource relatively commoditized services and keep customer-centric, more value-added services in-house. In order to overcome this problem, service providers need to differentiate and customize service offerings (Anonymous 2008c; Hannon 2008), and provide one-stop solutions to shippers by offering a wide array of value-added services and global reach. This necessitates large-scale acquisitions and alliances such as the takeover of TNT Logistics and Eagle Global Logistics by Apollo Management and rechristening the merged entity CEVA logistics, one of the top 5 global logistics providers by gross revenue (Quinn 2008). However, each and every 3PL provider may not be game for mergers and acquisitions. For them, partnering with other 3PL providers and acting as a fourth-party logistics (4PL) provider or Lead Logistics Provider (LLP) make more sense in terms of providing a single point of contact to shippers and offering one-stop solutions to all their logistical requirements (Trunick 2008). Recruiting and retaining skilled logistics professionals remain a contentious issue. For example, C. H. Robinson hires people who are customer-focused and proactive. The Senior Management spends a lot of time with the new recruits and existing employees as well. The employees go through continuous training and are empowered to take decisions on behalf of the Management (Anonymous 2008c). 3PL companies need to put in a lot of efforts in branding exercises, and differentiate in terms of their products/services and projecting themselves environment-friendly. The important differentiators identified by Lieb and Lieb (2008) are company's IT capability, geographic coverage, breadth of services and non-asset approach. Many top global 3PL companies such as Exel Logistics, Keystone Dedicated Logistics, Logistics Management Solutions and Transplace are asset-free (Anonymous 2008c; Anonymous 2008d). A study of Hong Kong 3PL providers also found that a combined strategy of cost and differentiation performed best with respect to financial

performance, followed by a pure differentiation strategy, which in turn outperformed a pure cost-based strategy (Yeung et al. 2006).

Recently a lot of attention has been attracted by 3PL activities in the Asia-Pacific region, so much so that Langley et al. (2008) and Lieb (2008b) have been including this region in their longitudinal surveys since the last few years. While both acknowledge entry of foreign players and high growth potential of 3PL markets in this region, inadequate infrastructure and inconducive regulatory structures are identified as major impediments. In addition, Lieb (2008b) finds similarities in industry dynamics with global 3PL markets such as pricing pressure, demanding customers, pressure to internationalize operations and shortage of management talent. Within the Asia-Pacific region, India seems to have the highest growth rate as 10 major global players operating in this region have projected the maximum growth of their revenues from India while revenues from other countries in this region have been projected to grow marginally or even decline. The problems identified in Indian 3PL are lack of modern transportation infrastructure, long turnaround times, high transportation costs, congestion, toll and other local taxes. The only survey (Mitra 2006) of Indian 3PL providers concurs with the findings of Lieb (2008b). It also identifies the fragmented nature of the market and the lack of trust and awareness among Indian shippers as some of the major roadblocks. However, the survey also projects a growth rate of over 20% of the Indian 3PL industry, which was estimated to be USD 1 billion in 2004, as the Indian GDP is growing at a steady rate and the market is going to mature through consolidations once foreign 3PL players set up shops in India by acquiring or partnering with existing 3PL providers.

For detailed surveys of the 3PL literature, readers may refer to Maloni and Carter (2006), Selviaridis and Spring (2007), and Marasco (2008).

The current paper is the second survey of Indian 3PL providers. It puts the Indian 3PL industry in the perspectives of the 2004 survey (Mitra 2006). It also brings out similarities and dissimilarities between the Indian 3PL market and the mature and largest 3PL market, i.e., North America based on an earlier survey (Mitra and Bagchi 2008). In many conceptual and survey papers (Mentzer and Kahn 1995; Ashenbaum et al. 2005; Maloni and Carter 2006), concerns have been raised over the rigour of research done on 3PL. Most of the papers published on 3PL are empirical and descriptive in nature. More efforts should be put in to build theory, constructs and conceptual frameworks, which may be the foundation for subsequent empirical studies (Marasco 2008). In an effort to this effect, a survey of North American 3PL providers (Mitra and Bagchi 2008) was done in 2006 to explore underlying relationships among several important variables such as key success factors and performance metrics through interdependence techniques and dependency relationships, which contributed to the body of knowledge on 3PL research and provided significant guidelines to logistics managers for allocation of scarce resources. Part of the questionnaire was utilized in the current survey of Indian 3PL providers to compare between the Indian and North American 3PL industries, and generate learnings for Indian 3PL companies, shippers and the government. Literature shows that there have been comparisons among countries in terms of 3PL usage. However, as far as 3PL providers are concerned, there has been only one paper (Wang et al. 2008) so far that compares 3PL providers of Hong Kong with those of Mainland China. Like the U.S., Hong Kong 3PL is a developed market while Mainland China is a developing 3PL market like India. The study mentions the

comparison between the 3PL industries of Mainland China and the U.S., a more developed market, as a possible direction for future research. In this perspective, the current survey of Indian 3PL has two major contributions: (a) comparing between the states of the Indian 3PL industry in 2004 and 2008, and (b) comparing between the 3PL industries of India and North America with respect to some key industry variables. It is hoped that the results of the survey would provide valuable managerial insights to Indian 3PL firms, foreign 3PL firms contemplating entry into the Indian market and the government.

The rest of the paper is organized as follows. Research objectives and methodology are presented in the subsequent sections, followed by the analysis of survey results and discussion on survey results. Then managerial implications are presented, and the paper is concluded with directions for future research.

RESEARCH OBJECTIVES

The primary objectives of the survey were to capture the following:

- a. demographic information about the respondents
- b. respondents' perceptions of various key success factors and their companys' achievements with respect to these factors to identify gaps, if any
- c. respondents' perceptions of their companys' achievements with respect to various performance metrics and dependency relationships with the key success factors
- d. respondents' perceptions of the industry size, growth rates, problems and prospects
- e. respondents' growth strategies

The underlying objectives of this research were, as mentioned before, to

- a. assess the changes in the Indian 3PL industry since the earlier survey in 2004 (Mitra 2006), henceforth referred to as the 2004 survey
- b. compare between the 3PL industries in India and North America, based on Mitra and Bagchi (2008), henceforth referred to as the 2006 survey, to generate valuable insights for industry personnel and the government

RESEARCH METHODOLOGY

Data was collected from two sources: primary and secondary. Primary sources were the respondents and data collection was through a mail survey. Secondary sources were articles published in academic and trade journals. Variables for the questionnaire were obtained from previous literature. The questionnaire was limited to two pages in order to ensure a reasonable response rate, a copy of which is reproduced in the Appendix for reference. For perception-related questions, a 5-point Likert scale was used where “1” represented “very low” and “5” represented “very high”. The questionnaire was administered to some selected 3PL providers in a pilot study to assess its practicality and relevance. A few modifications were made before the final version of the questionnaire was accepted.

The Indian 3PL industry is in its early stage of development and there is little official information available in the public domain. The author had to contact industry sources, and refer to business dailies and the Internet to identify potential 3PL respondents. About 200 3PL providers were identified in the process each of whom was sent a questionnaire along with a covering letter, addressed to the CEO, and a self-addressed envelope. Every two-three weeks thereafter, e-mail reminders were sent and some of them were also contacted over phone. The survey was done in the first half of 2008 and after all the efforts, 42 filled-in, and usable,

questionnaires were received registering about 20% response rate. A check for nonresponse bias in survey data was made through the extrapolation method (Armstrong and Overton 1977) and no nonresponse bias was found. The survey data was collated in Microsoft Excel, and analyzed using “Stata” and the statistical functions available in Excel. Details of the analysis are presented in the next section. Finally, a few respondents were contacted over phone and e-mail to validate some of the survey results.

ANALYSIS OF SURVEY RESULTS

The survey data is presented in the following sequence: profile of the respondents, respondents’ perceptions of problems, prospects, industry size and growth rates, respondents’ growth strategies, and respondents’ perceptions of the key success factors and performance metrics.

Location and coverage

71.43% responses were received from Mumbai, National Capital Region⁺ (NCR) and Chennai with Mumbai topping the list with 33.33% responses. 50% of the respondents have geographic coverage limited to India only while 50% cover India and abroad. Within India, South, West and North are covered by 78.57%, 78.57% and 76.19% respondents, respectively, while East, Central India and North-East are covered by only 52.38%, 45.24% and 23.81% respondents, respectively. Among the respondents having geographic coverage abroad, 80% cover the Asia-Pacific region, 70% cover Europe, 65% cover North America and Middle East, 50% cover Latin America and 45% cover Africa.

⁺ National Capital Region refers to the capital of India, New Delhi and its adjoining area

Age and employee base

More than half the respondents started their 3PL operations in 2000 or later, which shows the young age of the Indian 3PL industry. While 66.67% respondents have 300 or fewer employees, 25.64% respondents have 1000 or more employees, showing the fragmented nature of the industry.

Financials

As far as financials are concerned, 33 firms disclosed revenue figures. The gross 3PL revenues of these 33 firms in 2006-07 were Rs. 4836 crore (~ USD 1 billion). Out of these, 8 firms (24.24%) grossed Rs. 4438.23 crore, i.e. 91.78% of the total turnover of these 33 firms in 2006-07, which again indicates the fragmented nature of the Indian 3PL industry. As far as growth figures are concerned, the combined revenue of respondent firms grew 27.38% in 2006-07 over last year and is projected to grow by 24.59% in 2007-08 over 2006-07. The Compounded Annual Growth Rates (CAGR) of individual firms had a wide range with small and medium firms growing at faster rates than large firms. Between the 2004 and 2008 surveys, there were 18 common respondents, out of whom CAGRs (1999-2000 through 2003-04 from the 2004 survey and 2004-05 through 2006-07 from the 2008 survey) for 12 respondents could be computed, which showed no significant difference in growth rates by a paired-sample t-test at 5% level of significance.

No significant correlation was found between firms' revenues in 2006-07 and globalization.

Ownership of assets

Among the respondents, 17.07% own assets (vehicles, warehouses, material handling equipment etc.), 31.71% outsource to third parties and the rest 51.22% both own and outsource assets. As

far as managed warehouse space is concerned, 31 respondents provided data. It has been observed that 61.29% of them manage warehouse space less than 50,000 sq. ft. and at the same time 25.81% of them have warehouse capacities more than 800,000 sq. ft. again indicating the wide division between small and large firms.

Services offered and industries served

Among the services offered, warehousing tops the list with 83.33% respondents offering this service, closely followed by transportation (80.95%), freight forwarding (78.57%) and customs clearance (73.81%). These 4 services also happen to be the top revenue earners for the respondent firms. Table A1 in the Appendix indicates the major services and the % of respondents offering them. Considering services, except transportation and warehousing, as value-added services, it was observed that respondents offered, on an average, 7.71 value-added services. No significant correlations were found between the number of value-added services and firms' revenues in 2006-07, and also between the number of value-added services and firms' globalization.

Among the top three industries/sectors served by the respondent firms, Engineering/Industrial is at the top with 47.62% respondents mentioning it as one of the major revenue earners, followed by Automotive (35.71%), Computer/Electronics (23.81%), Textile/Apparel (21.43%) and Chemical/Fertilizer (21.43%). Table A2 in the Appendix lists the industries/sectors and the % of respondents mentioning them as top revenue earners. It may be observed from the table that the contribution of Retail is insignificant since currently only 5% of the Retail sector is organized. Globally, 70% of the logistics cost is accounted for by Retailing. As the organized Retail sector

in India grows and the government allows Foreign Direct Investment (FDI) in Retail, it is expected that the contribution of Retail to 3PL revenues would increase.

Problems and prospects

Respondents indicated government control, bureaucracy and lengthy documentation procedures as the major impediment to the growth of 3PL in India with 78.57% of them marking it as either “important” or “very important”. Other “important” or “very important” factors highlighted by the respondents as threats to the Indian 3PL industry are poor transportation and communications infrastructure (76.19%), high costs of operations and low margins (73.81%), lack of skilled manpower (73.81%), and lack of trust and awareness among Indian shippers (61.91%).

Among the factors that are deemed to fuel the growth of 3PL in India, 92.86% respondents marked government investments and public-private partnerships (PPP) in development of infrastructure (highways, Special Economic Zones, logistics hubs etc.) as either “important” or “very important”. Other factors that are perceived to be “important” or “very important” by the respondents are increasing awareness towards 3PL (83.33%), increasing government support and conducive policies (80.95%), globalization and more Foreign Direct Investment (FDI) in the Indian 3PL industry (76.19%), and consistent GDP growth resulting in more demand for 3PL services (73.81%).

Estimates of industry size and growth rate

With regard to the size of the industry, respondents provided varying estimates, like in the 2004 survey, from tens of crores to several thousand crores of rupees. However, considering the industry size of Rs. 5000 crore (slightly more than USD 1 billion) estimated in the 2004 survey and 20% annual growth rate, the current estimated industry size would be about Rs. 10,000 crore

(slightly more than USD 2 billion). The average industry growth rate estimated by the respondents is 17.52% which is likely to be exceeded by 63.63% respondents. The estimated cumulative growth rate (24.59%) of respondent firms in 2007-08 also exceeds the estimated average industry growth rate. A z-test at 5% level of significance validated the hypothesis that the Indian 3PL industry would grow by at least 18% per annum in coming years.

Growth strategy

Among the growth strategies, “Alliances” was mentioned by majority (73.81%) of the respondents, followed by “Direct Investments” (64.29%) and “Acquisitions” (45.24%). Merely 16.67% respondents mentioned “Mergers” as one of their growth strategies.

Key success factors

Respondents were asked to rate 10 key success factors based on their perceived importance levels and firms’ achievements. Considering respondents and factors as independent variables and factor importance ratings as the dependent variable, a two-way ANOVA without replication showed significant differences among both respondents and factors at 5% level of significance, indicating differences in perceptions of the importance of key success factors among the respondents. Subsequently, the k-means nonhierarchical cluster analysis method was applied to the data with many possible numbers of clusters and starting seeds in order to form groups of similar respondents. In each trial for each cluster, treating respondents and factors as independent variables and factor ratings as the dependent variable, a two-way ANOVA without replication was performed to check if there were significant differences among respondents and factors at 5% level of significance. After several trials, it was possible to come out with 4 stable clusters where there were significant differences between clusters but no significant differences among respondents within clusters. Unfortunately, cluster compositions did not throw any light on

grouping dimensions. Cluster 1 consisted of 31 respondents whose responses seemed to be very much “realistic” in the sense that these were not biased in either direction on the rating scale. Cluster 2 had 3 members, who were “very optimistic” in their responses, marking almost all factors “very high”. The 7 respondents of Cluster 3 were “conservative” in their responses, marking around “average”. Finally, Cluster 4 had only 1 member, who was “extremely pessimistic” in his response and marked most of the factors “very low” (This may be due to confusion at the time of marking responses, which could not be verified). However, for the purpose of ascertaining the importance of key success factors, only Cluster 1 responses were taken into consideration. It was observed that breadth of services and customer focus were given the most importance, 96.77% respondents having marked them as either “high” or “very high”, followed by availability of skilled manpower (93.55%), investment in information systems (90.32%) and integration of supply chains (90.32%). Table A3 in the Appendix shows the key success factors and the % of Cluster 1 respondents marking them “high” or “very high” in terms of importance ratings.

Next, for each respondent and each factor, the difference between the company rating and importance rating is computed to check if this difference is significant. Surprisingly, the average differences for all factors turned out to be negative, and excepting customer focus and 3PL experience, the differences for all other factors turned out to be significantly negative (at 5% level of significance) indicating gaps between firms’ achievements and expectations with respect to these factors.

Performance metrics

Respondents were asked to rate 10 metrics based on their firms' performance. The objective was to establish dependency relationships among the performance metrics and key success factors as dependent and independent variables, respectively. Since ratings for both the performance metrics and key success factors were on an ordinal scale, the ordered logit (or ologit) model was applied for every dependent variable and the set of 10 independent variables. The same exercise was carried out for the entire set of respondents (41 in number) and Cluster 1 respondents (30 in number since one member did not mark his responses for the performance metrics) to check if there were any differences between the outcomes of the aggregate set and the subset (Cluster 1) of respondents, who were "realistic" in their ratings of the key success factors. Table 1 shows the statistically significant (at 5% level of significance) independent variables for an overall model fit, types of relationships and p-values against each performance metric for the aggregate set and the subset (Cluster 1).

Insert Table 1 here

It may be observed from Table 1 that there are quite a few differences between the outcomes of the aggregate set and the subset (Cluster 1). Breadth of services appears as a significant, positively related independent variable for year-on-year growth in revenues, year-on-year growth in cargo and on-time delivery performance for the aggregate set while it is conspicuously absent in any of the performance metrics for the subset. Internationalization of operations bears a significant, positive relationship with reducing inventory levels and a significant, negative

relationship with on-time delivery performance for the aggregate set while it is also absent in any of the relationships for the subset. The positive relationship between internationalization of operations and reducing inventory levels is the same as was observed in the 2006 survey, possibly indicating the transfer of ownership of inventory and existence of inventory more in the form of sea freight than in the form of land transportation and storage. Another reason may be that as firms become more and more globalized, there is a shift towards providing more value-added services than transportation and warehousing, though it may not be true for Indian service providers since no significant correlation was found between the number of value-added services offered and global reach of sample respondents. The negative relationship between internationalization of operations and on-time delivery performance may be attributed to the increased shipping lead time and the lack of global reach of Indian service providers. Customer focus has strong positive relationships with on-time delivery performance for the aggregate set and customer satisfaction for both the aggregate set and the subset. This is quite intuitive and needs little explanation.

Focus on industries, on the other hand, bears strong negative relationships with year-on-year growth in cargo, return on investments (ROI) and geographic reach for the aggregate set while it does not appear in any of the relationships for the subset. The reason may be that unlike in developed countries in North America and Europe, the industrial output in India is lower, and the 3PL market is ill-developed due to lack of trust and awareness among Indian shippers and various other reasons. Therefore, focusing on specific industries would not ensure higher returns, growth and geographic reach in the Indian market, at least in the initial period of growth of 3PL. Once the market is adequately developed and industries generate substantial volumes of

business, then probably limiting one's offerings to some select industries may also lead to growth and expansion of business.

Like in the 2006 survey, 3PL relationship does not appear in either the aggregate set or the subset. It may be inferred that 3PL relationship is a necessary but not sufficient criterion for success of a 3PL firm. 3PL experience, on the other hand, has a strong positive relationship with return on assets (ROA) for the aggregate set, but strong negative relationships with year-on-year growth in revenues and year-on-year growth in profits for the subset. With experience, asset utilization possibly improves and hence the first outcome. The second one relates to the finding of the 2006 survey and is explained in the following way. In the initial years of a firm's existence, the absolute revenues and profits are low; however, growth rates may be very high if the firm succeeds in a high-growth market. As the firm ages, its percentage growth may taper off, even decline, though the absolute revenues and profits may be substantial. This is caused due to the saturation effect, and is not specific to the 3PL industry.

Investment in assets has a strong negative relationship with year-on-year growth in revenues. In the 2006 survey also, investment in assets bore a negative relationship with geographic reach. This may be due to the fact that there may be many asset-free firms, which register high growth rates. Alternatively, if a firm invests heavily into assets, it may have very little funds available for expansion and growth of business. Therefore, as far as possible, a firm needs to maintain a minimum level of quality assets and outsource the rest, especially when assets are available in abundance at competitive rates in fragmented markets such as India.

Investment in information systems, surprisingly, has strong negative relationships with on-time delivery performance and customer satisfaction, and a strong positive relationship with geographic reach for the aggregate set. On the other hand, investment in information systems bears strong positive relationships with customer acquisition and geographic reach for the subset. Negative relationships between investment in information systems and some of the performance metrics are counter-intuitive since in today's world, availability and utilization of information have become absolutely essential for success in every sphere, more so in the context of information-intensive 3PL services. However, a glance at the data provided by the respondents points to the fact that Indian firms are short of investments in information systems, and this is also validated by the significant negative gap between firms' achievements and expectations of information-readiness.

Availability of skilled logistics professionals bears strong positive relationships with geographic reach for the aggregate set, and reducing inventory for both the aggregate set and the subset. As already noted, Indian firms have under-investment in information systems and hence the over-reliance on skilled manpower for expansion and inventory management, especially because this kind of services becomes exceptionally labour-intensive in the absence of a proper information system. Integration of supply chains has strong positive relationships with many a performance metric for either set, year-on-year growth in profits and customer satisfaction for the aggregate set, and year-on-year growth in revenues/profits/cargo and ROA for the subset. As in the 2006 survey, integration of supply chains proves to be a very important predictor variable.

In the ordered logit model, the relationship is one-to-many, i.e., one dependent variable is taken at a time and its relationship with one or more independent variables is established. We also performed canonical correlation analysis, which considers all dependent and independent variables simultaneously and establishes an overall dependency relationship. Using various combinations of pairs of linear composites from the criterion (dependent) and predictor (independent) variables, a pair was found to be maximally correlated at 5 % level of significance for each of the aggregate set and the subset. Table 2 shows the canonical correlation coefficient, F-statistic, p-value and significant dependent and independent variables for each set.

Insert Table 2 here

All canonical loadings and cross-loadings were found to be significantly positive, indicating positive relationships among the dependent and independent variables. It may be observed from Table 2 that breadth of services, investment in information systems, skilled manpower and integration of supply chains prove to be the most important key success factors for 3PL firms. However, as already noticed, with respect to each of these factors, there have been significant negative gaps between respondent firms' performance and expectations, which gives an indication to Indian 3PL firms to take appropriate steps and bridge these gaps on an urgent basis.

DISCUSSION ON SURVEY RESULTS

This section first presents comparisons between the current state of the Indian 3PL industry and its status in 2004. Next, it compares between the Indian and North American 3PL industries.

Comparison with the 2004 survey

As far as the location of headquarters is concerned, NCR, Mumbai and Chennai remain at the top of the list since most of the business is generated in North, West and South, with East, Central India and North-East still lagging behind in terms of volumes. Global reach of Indian service providers has definitely expanded with increasing coverage in almost all parts of the world. The Indian 3PL industry still remains very young and fragmented in terms of distributions of both employee base and revenues generated. The industry growth rate also remains in the range of 18-20%. With respect to ownership of assets, services offered and industries served, there has not been any significant change. The only noticeable thing is that freight forwarding and customs clearance activities have increased a bit, maybe due to the expanding global reach of Indian service providers as noted above.

With regard to the problems facing the Indian 3PL industry, the top two concerns remain as the inadequate transportation/storage/communications/bureaucratic infrastructure and the lack of trust and awareness among Indian shippers. The encouraging factors for the industry are development of infrastructure, increasing awareness towards 3PL, globalization and FDI in 3PL, and consistent growth of GDP and hence more demand for 3PL services, as was also observed in the 2004 survey. Regarding the estimates of industry size, and industry and company growth rates, the responses are also very similar to those of the 2004 survey.

Therefore, based on the outcome of the survey, it can be concluded that there has not been much change in the profile of respondents, except increasing revenues and expanding global reach and related activities.

Comparison with the 2006 survey

North American 3PL firms are definitely bigger in size and more globalized compared to their Indian counterparts. There is a significantly high correlation between revenues earned and the extent of globalization for North American firms indicating that as a firm grows in size, it becomes more globalized. However, no such correlation was found for Indian firms since many relatively bigger firms had their operations limited to India only. The average number of value-added services offered by North American firms is also higher than that offered by Indian firms. There are high correlations between revenues earned and the number of value-added services offered and also between the extent of globalization and the number of value-added services offered by North American firms, indicating that as a firm grows in size and becomes more globalized, the bouquet of value-added services offered by it also expands. Such correlations are absent in the sample of Indian firms probably because of the limited number of value-added services offered by them. The percentage of asset-free Indian firms is more than that of North American firms probably because of the fragmented Indian transport market and abundance of assets available at competitive rates.

With respect to the key success factors, there is a clear difference in responses of different sizes of North American firms, indicating differences in perceptions. However, no such difference in responses, based on size or any other dimension, was observed in the case of Indian firms. As far as the commonality of responses is concerned, both North American and Indian firms accorded high importance to customer focus, investment in information systems and availability of skilled manpower, and both assigned medium to low importance to internationalization of operations,

focus on industries, 3PL relationship, 3PL experience and investment in assets. On the other hand, while North American firms considered breadth of services and integration of supply chains as having medium and medium to low importance levels, respectively, their Indian counterparts perceived these factors as very highly and highly important for success, respectively. This may be due to the reason that North American firms have more breadth of services and integration of supply chains than Indian firms, and hence perceive customer focus, investment in information systems and availability of skilled manpower as more important than breadth and integration. For North American firms, there are significant gaps in expectations and achievements with respect to internationalization, availability of manpower and integration of supply chains while Indian firms seem to underperform with respect to all but customer focus and experience.

In the overall dependency relationships among the performance metrics and key success factors, breadth of services, investment in information systems, availability of skilled manpower and integration of supply chains prove to be very significant predictor variables for both North American and Indian firms. On the other hand, internationalization of operations, customer focus and industry focus are significant for North American firms, but not so for Indian firms because, as mentioned before, Indian firms are less globalized, and due to the nascent state of the industry and inadequate volumes, focusing on customers and specific industry verticals would not ensure enough revenues, profits and growth at least in the initial period. 3PL relationship, 3PL experience and investment in assets do not appear in the dependency relationships for either North American or Indian firms. While 3PL relationship and experience deem to be necessary

but not sufficient conditions for success, investment in assets can be minimized subject to availability of the same in the market at competitive rates.

With respect to growth strategies, responses of North American and Indian firms are similar. While alliances and direct investments are the preferred choices of expansion, other less traveled routes for growth are acquisitions and mergers.

MANAGERIAL IMPLICATIONS

The survey provides useful insights for logistics managers and the government. Although the Indian 3PL industry is in its early stage of development, it has high growth potential. The annual logistics cost in India is estimated to be 13% of GDP, and based on the World Bank estimate of India's GDP in 2008, i.e. USD 1232.7 billion (Source: <http://www.worldbank.org>), the annual logistic cost would be around USD 160 billion. India's logistics costs are high compared to those of developed countries such as the U.S. and Germany where annual logistics costs are less than 10% of their respective GDPs. Therefore, there are opportunities for the Indian logistics sector to reduce costs and make the prices of its products more competitive in domestic and international markets. Also, considering the estimated Indian 3PL industry size to be USD 2 billion, the size of the industry is about 1.25% of the annual logistics cost, indicating high potential for the industry that is already growing at a healthy rate of 18-20% per annum.

Many global 3PL providers, who came to India primarily to satisfy the needs of their overseas customers, are now heavily investing in physical assets, getting licenses and also extending their network. DHL's acquisition of Blue Dart, FedEx's acquisition of Prakash Cargo, TNT's acquisition of Elbee Services and UTi Worldwide's acquisition of Indair Carriers are testimonies

to this trend. Even Private Equity (PE) players are showing a lot of interest in Indian logistics firms (Lieb 2008b). Indian shippers are also becoming more and more aware of the benefits of logistics outsourcing. In the 2004 survey, it was observed that shippers put a lot of emphasis on selection of 3PL providers, who were asset-based. However, this trend has changed and shippers are accepting 3PL firms without asking questions on ownership of assets and subcontracting systems, opined one of the respondents. In fact, as mentioned before, there are many top global 3PL providers, who are asset-free. From a 3PL point of view, it is best to share assets of dedicated asset owners, who are big and state-of-the-art, on a pay-per-use basis, opined the same respondent. The survey indicates that the global reach of Indian 3PL firms has increased with corresponding increases in related activities. However, according to one freight forwarder respondent, it is not necessary to go global to provide global services. Any freight forwarder today may join a freight forwarding association by which it is connected to the globe. The same has also been echoed by Schoenfeld (2008).

Two of the most important dynamics of the Indian logistics sector are pricing pressure due to demanding customers and high costs of operations. Due to global recession, freight rates all over the world have dropped significantly. Shippers are demanding the shortest transit times and most competitive air/sea freight rates. This, coupled with fluctuations in fuel prices and rising costs, is affecting the already low margin of 3PL firms. In order to overcome this problem, thrust should be on cost-efficient transportation, value-added service offerings and differentiation. Substantial fuel costs can be saved through multi-modal transportation by railways and waterways, given the large railway network, inland waterways and vast coastal lines. Multi-modal transportations also add flexibility in loading/unloading, introduce economies of scale, and result in savings to the

tune of 4-6% (Thuermer 2008). Parallely with redesigning transportation networks, 3PL firms should also strive for offering more value-added services and differentiating vis-à-vis competitors. However, the survey finds that firms lag both in terms of breadth of services and key differentiators identified by Lieb and Lieb (2008). Apart from breadth of services, investment in information systems, availability of management talent and integration of supply chains were identified by the survey as significant predictor variables for performance metrics. However, the survey also finds that there are significant gaps between firms' expectations and achievements with respect to these variables, which should be seriously looked into by logistics managers in order to decide on allocation of scarce resources. One respondent mentions that Indian logistics companies are going through vertical integration and extending the portfolio of services. As regards information systems, respondents argue that shippers demand latest technologies, but consider these as part of the standard service package and are not willing to compensate for investments made. Availability of skilled manpower is a global problem; however, in India this problem is more acute for domestic players as they are unable to match the offers made by multinationals. The shortage of manpower is going to be mitigated to some extent as the supply of workforce would be augmented due to recession and manpower would be available at reasonable costs. Integration of supply chains, i.e. selling supply chain solutions to clients' customers and suppliers, is yet to take off in a big way in India because of its early stage and shippers' unawareness and unwillingness towards logistics outsourcing. However, respondents have acknowledged high importance levels for integration, which is going to develop with time.

From the shippers' point of view, there is already growing awareness towards the benefits of logistics outsourcing. Shippers have to place more trust on and confidence in service providers, involve 3PLs in the planning process (Hannon 2008; Thuermer 2008) and outsource more customer-centric, value-added activities besides the regular activities of transportation and warehousing. Also, shippers should be willing to pay for the value-added services and investments of service providers in information systems and technologies. It is the responsibility of service providers to make their cost structures transparent so that shippers get a fair idea of their margins.

As far as the government is concerned, there is much to be desired in terms of infrastructure, procedures, documentations and taxation systems. Road networks are inadequate leading to long turnaround times of vehicles, draft availability at some of the major ports is constrained restricting the size of ships coming into the harbours, there is port congestion due to the lack of modern warehousing facilities and slow and cumbersome customs procedures, and overall there are bureaucracy, red tape-ism, lengthy documentation requirements, multiple check posts, numerous taxes such as toll tax, sales tax, octroi etc. and interstate issues that cause substantial delays in shipments. These issues have been raised many a time and the government is aware of these. Albeit slow, steps are being taken to mitigate these problems. Constructions of the golden quadrilateral project, East-West, North-South corridors and a dedicated rail freight corridor are some of the initiatives that are expected to ease the load on the existing infrastructure. Allowing private investments in inland containerized transportation three years back would increase the percentage of containerized freight from a meager 47% where globally 80% of the freight is moved in containers. Also, there are plans to invest in public-private partnerships (PPP) in

airports, seaports, roads, cold chains, hubs and Special Economic Zones (SEZ). The import policy has become liberal and customs clearance has been made easier. Electronic Data Interchange (EDI) is being implemented in many areas to make paperwork simpler and faster. Implementation of a uniform Value-Added Tax (VAT) structure is expected to address the multiple taxation system, check post delays and interstate issues. However, the entire process is extremely slow, and the industry is still reeling under cumbersome procedures and complex tax structures. The government has to seriously look into this and expedite the process of modernization. After all, growth in the logistics sector would lead to growth in GDP and generate employment.

Industry bodies and associations also have a significant role to play in this context. They are the intermediaries between the 3PL industry and government. On behalf of the industry, they can lobby with the government for conducive policies, economic sops, cheap financing etc. They can increase awareness of 3PL by periodically organizing workshops/seminars/conferences and bringing shippers, service providers, government representatives and other stakeholders under the same umbrella for interactions and exchanges of thoughts and experiences. According to one respondent, there are not many tailor-made courses in India for imparting technical and managerial skills to logistics professionals. The industry bodies and associations can collaborate with universities and institutions to offer short-term and long-term courses to suit the needs of the industry.

DIRECTIONS FOR FUTURE RESEARCH

The current survey intended to assess the state of the Indian 3PL industry and compare it with that in 2004 based on a previous survey. A comparison of the Indian and North American 3PL

industries was also made based on an earlier survey of North American 3PL providers. The survey provides significant insights to logistics managers, and makes recommendations to the government and industry bodies for facilitating growth of 3PL in India. To the best of the author's knowledge, there has not been any study so far comparing the Indian 3PL industry with that of North America, the most developed 3PL market, for benchmarking. It is expected that the survey would provide valuable inputs to the Indian 3PL industry to assess where it stands and where it has to be.

The survey was done based on 42 responses. Ensuring a better response is difficult in the present situation as the Indian 3PL industry is still in its infancy and the market is fragmented with a handful of serious players (Only 1% of the Indian logistics sector is organized). Future studies may look into the issue of response rate. As pointed out by Marasco (2008), future research should be more devoted to theory building, constructs and conceptual frameworks development. More focus interviews and case studies should be conducted to complement the body of knowledge on 3PL (Maloni and Carter 2006; Selviaridis and Spring 2007). Also, there should be single, combined studies on 3PL users and providers to get the perspectives from both sides to assess the expectations of 3PL users and achievements of 3PL providers (Maloni and Carter 2006). Finally, more comparative studies between Asian countries such as India and China can be possible topics for future research.

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APPENDIX

TABLE A1

Major services and % of respondents offering them

Service	% of resp.	Service	% of resp.	Service	% of resp.
Warehousing	83.33	Break Bulk Ops.	45.24	Import/Export Mgt.	35.71
Transportation	80.95	Cargo Insurance	45.24	NVOCC	33.33
Freight Forwarding	78.57	Packaging/Labeling	42.86	Inventory Mgt.	30.95
Customs Clearance	73.81	Distribution	38.10	Order Processing	28.57
Freight Consolidation	57.14	Reverse Logistics	38.10	Payment Collection	28.57
Freight Brokerage	47.62	Consulting Services	38.10	Vendor Mgt.	21.43

TABLE A2

Industries/Sectors and % of respondents mentioning them as top revenue earners

Industry	% of resp.	Industry	% of resp.	Industry	% of resp.
Engineering/Industrial	47.62	Textile/Apparel	21.43	FMCG	14.29
Automotive	35.71	Chemical/Fertilizer	21.43	Food/Beverages	14.29
Computer/Electronics	23.81	Retail	16.67	Pharmaceuticals	11.90

TABLE A3

Key success factors and % of respondents marking them “high” or “very high”

Key success factor	% of resp.	Key success factor	% of resp.
Breadth of Services	96.77	Internationalization	83.87
Customer Focus	96.77	Investment in Asset	77.42
Skilled Manpower	93.55	3PL Experience	74.19
Investment in Info. Sys.	90.32	3PL Relationships	67.74
Integration of SC	90.32	Industry Focus	58.06

Questionnaire for “A Survey of Indian 3PL Providers”

1. Name of the company: _____ 2. Location of HQ: _____
3. Geographic coverage (*Please √*): Only India India and abroad
- In India: North South East West NE Central India
- Abroad: North America Latin America Europe Middle East Africa Asia-Pacific
4. Year of starting 3PL operations: _____ 5. Number of employees in India: _____

6. *Please list below the 3PL revenues and % contributions of the domestic 3PL market for the last 4 years.*

<u>Year</u>	<u>3PL revenue (Rs. crore)</u>	<u>Contribution of the domestic market (%)</u>
2004-05	_____	_____
2005-06	_____	_____
2006-07	_____	_____
2007-08 (Projected)	_____	_____

7. Asset base (*Please √*): Owned Outsourced Both 8. Managed warehouse space (sq. ft.): _____

9. *Please √ one or more of the following services offered by your company. Also, please rank the top 3 services.*

- | | | | |
|---|--|---|---|
| <input type="checkbox"/> Transportation | <input type="checkbox"/> Warehousing | <input type="checkbox"/> Freight forwarding | <input type="checkbox"/> Customs clearance |
| <input type="checkbox"/> Import/export mgt. | <input type="checkbox"/> Fleet management | <input type="checkbox"/> Freight brokerage | <input type="checkbox"/> Freight consolidation |
| <input type="checkbox"/> Inventory mgt. | <input type="checkbox"/> NVOCC | <input type="checkbox"/> Port operations | <input type="checkbox"/> Break bulk operations |
| <input type="checkbox"/> Order processing | <input type="checkbox"/> Order fulfillment | <input type="checkbox"/> Vendor management | <input type="checkbox"/> Packaging and labeling |
| <input type="checkbox"/> Distribution | <input type="checkbox"/> After sales support | <input type="checkbox"/> Payment collection | <input type="checkbox"/> Assembly/Installation |
| <input type="checkbox"/> Trade finance | <input type="checkbox"/> Cargo insurance | <input type="checkbox"/> Reverse logistics | <input type="checkbox"/> Consulting services |

10. *How much importance will you give to the following factors for success in the 3PL industry? Also, how will you rate your company with respect to these factors? (1: Very low, 2: Low, 3: Average, 4: High, 5: Very high)*

	<u>Factor importance</u>						<u>Company rating</u>				
	1	2	3	4	5		1	2	3	4	5
a) Breadth of service offerings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Internationalization of operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Focus on key customer accounts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Focus on specific industries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Length and depth of 3PL relationships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Experience as a 3PL provider	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Investment in quality assets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Investment in information systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) Skilled logistics professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Integration of supply chains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. How will you rate your company with respect to the following performance criteria?
(1: Very low, 2: Low, 3: Average, 4: High, 5: Very high)

	1	2	3	4	5
a) Year-on-year growth in revenues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Year-on-year growth in profits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Year-on-year growth in cargo handled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Return on investments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Return on assets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Reducing inventory levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) On-time delivery performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Customer satisfaction level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) Acquiring new customers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Expanding geographic reach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Please note below the top three industries/sectors served by your company.

1) _____ 2) _____ 3) _____

13. How much importance will you give to the following factors for low 3PL growth in India so far?
(1: Not at all important, 2: Less important, 3: Moderately important, 4: Important, 5: Very important)

	1	2	3	4	5
a) Lack of trust and awareness among Indian firms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Poor transportation/communications infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Government control/bureaucracy/long paper work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) High costs of operations/low margins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Lack of skilled manpower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. How much importance will you give to the following factors for opportunities and growth of 3PL in India?
(1: Not at all important, 2: Less important, 3: Moderately important, 4: Important, 5: Very important)

	1	2	3	4	5
a) Increasing awareness towards 3PL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) GDP growing @ over 9%, more demand for 3PL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Infrastructure development (Highways/SEZ/hubs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Globalization, FDI in the Indian 3PL industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Increasing government support/conducive policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Please indicate below your estimates for the following:

1) Indian 3PL industry (Rs. crore): _____ 2) Industry growth rate (%): ____ 3) Company growth rate (%): ____

16. Please ✓ one or more of the following growth strategies appropriate for your company.

Direct investments Mergers Acquisitions Alliances

Thank you for taking your precious time off to fill out the questionnaire.

Name of the respondent: _____ Designation: _____ E-mail: _____

Signature: _____ Date: _____

TABLE 1

Significant dependency relationships among the performance metrics and the key success factors

	All clusters (41 responses)			Cluster 1 (30 responses)			
	Aggregate set			Subset			
	Independent variable	Type of relationship	p-value	Independent variable	Type of relationship	p-value	
Performance metrics	Revenue growth	Breadth of services	+	0.007	3PL experience	-	0.02
		Investment in asset	-	0.015	Integration of supply chains	+	0.002
	Profit growth	Integration of supply chains	+	0.032	3PL experience	-	0.019
					Integration of supply chains	+	0.001
	Cargo growth	Breadth of services	+	0.014	Integration of supply chains	+	0.015
		Focus on industries	-	0.028			
	ROI	Focus on industries	-	0.029	-	NA	NA
	ROA	3PL experience	+	0.027	Integration of supply chains	+	0.018
	Reducing inventory	Internationalization	+	0.038	Skilled manpower	+	0.005
		Skilled manpower	+	0.019			
	On-time delivery	Breadth of services	+	0.034	-	NA	NA
		Internationalization	-	0.047			
		Focus on customers	+	0.007			
		Investment in information system	-	0.018			
	Customer satisfaction	Focus on customers	+	0.011	Focus on customers	+	0.018
		Investment in information system	-	0.024			
Integration of supply chains		+	0.011				
Customer acquisition	-	NA	NA	Investment in information system	+	0.013	
Geographic reach	Focus on industries	-	0.035	Investment in information system	+	0.003	
	Investment in information system	+	0.007				
	Skilled manpower	+	0.017				

TABLE 2**Significant dependent and independent variables in canonical correlation analysis**

	All clusters (41 responses)	Cluster 1 (30 responses)
	Aggregate set	Subset
Canonical correlation coefficient	0.67	0.85
F-statistic*	1.76	2.36
p-value*	0.0349	0.0052
Dependent (criterion) variables	Revenue growth Profit growth Reducing inventory Customer satisfaction Geographic reach	Revenue growth Profit growth Cargo growth ROA Reducing inventory Customer acquisition Geographic reach
Independent (predictor) variables	Breadth of services Investment in information system Skilled manpower Integration of supply chains	Investment in information system Skilled manpower Integration of supply chains

* F-statistics and p-values correspond to Wilks' lambda. Other tests, namely Pillai's trace, Lawly-Hotelling trace and Roy's largest root, were also found significant.