GREEN LOGISTICS SERVICE QUALITY AND LSP PERFORMANCE

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Introduction

Effective and efficient logistics services can enhance the firm's competitive advantage. Therefore, logistics management can be considered as a key component of organisational effectiveness and success (Khan and Burnes, 2007). At the same time, environmental or green issues in logistics service offerings have attracted much managerial attention in the logistics industry for the future. One important objective is for logistics service providers (LSPs) to deliver their service offerings to customers in more environmentally friendly ways. The study is ongoing project and investigates variables and constructs of green service quality, logistics service quality and logistics performance index in Thailand. The purpose of this paper is to report on an ongoing research study to understand the importance of green service quality (GSQ) and logistics service quality (LSQ) in the performance of logistics service providers (LSPs) in a Thai context.

Theoretical Background

The empirical research for this paper was based on an extensive literature review in three key areas: LSP performance, LSQ, and GSQ. For this study, GSQ has been defined from perceptual service quality or SERVPERF constructs as the environmental initiatives crucial to operational service quality, particularly in logistics service provision. Many studies have been conducted on the relative effectiveness of the service performance measurement (SERVPERF) and the SERVQUAL approach (Cronin and Taylor, 1994).

LSQ and LSP Performance

LSQ has been developed and studied by many researchers but the recognised research was done by Mentzer et al. (1989). They proposed that LSQ consisted not only in the physical distribution aspects of services, but also included other customer service elements. Mentzer et al. (1989) proposed that the logistics service quality scale should be composed of nine dimensions as follows information quality, ordering procedure, ordering release quantity, timeliness, order accuracy, order quality, order condition, order discrepancy handling and personnel contact quality.

Several LSP-LSQ studies have been conducted (Millen et al., 1997; Mentzer et al., 1999; Wilding & Juriado, 2004; Rafele, 2004; Aktas & Ulengin, 2005; Rafiq & Jaafar, 2007; Banomyong & Supatn, 2011), but there is a lack of studies investigating the performance of an LSP's LSQ. Only nine items or variables of logistics service quality within the 20 articles reviewed in this study, either in discussions or as a result of empirical testing are considered (Chaisurayakarn et al., 2013). These items are Information Quality, Order Procedures, Order Release Quantities, Timeliness, Order Accuracy, Order Quality, Order Condition, Order Discrepancy Handling, and Personnel Contact Quality.

GSQ and LSP Performance

Environmental performance measurement can be a critical aspect in LSPs' environmental offering (Björklund et al., 2012). However, to be considered as having regards for environmental sustainability, companies need to focus on these bottom lines: social, economic, and environment (Elkington, 1998). Only nine items or variables of green service quality within the 20 articles reviewed in this study, either in discussions or as a result of empirical testing, are considered as shown in Table 1.

Green service quality	Explanation
Alternative fuels	Bio fuels and renewable energy
Vehicle technologies	Replace existing fleets with modern vehicles that cause less emissions
Modal choice	Shift from road to rail; intermodal solutions
Behavioural aspects	Eco driving; driving behaviour which focuses on decreasing fuel consumption
Logistics system design	More direct transport; continuous improvement of distribution networks; decrease average handling factor and average length of haul
Transport management	Well planned routes; high fill-rates
Choice of partners	Cooperation with customers to help them reach their own environmental targets; choosing environmentally conscious transport providers
Environmental management system (EMS)	ISO14001, EMS certification
Externalities	CO_2 reports; energy consumption from external transports; energy consumption in warehouse; greenhouse gas emissions; safety for both driver/staff and other people

Table 1: Green Service Quality Items (Elkington, 1998; Martinsen & Bjorklund, 2012)

Methodology

This empirical study found evidence of these green/environmental issues in a specific logistics service context. The paper is based on empirical data collected via a survey delivered to logistics managers working in LSPs and LSP customers companies. An Interview and a survey were used as appropriate methods for this study as discussed at the LRN in 2013 (Chaisurayakarn et al., 2013).

Twenty-eight GSQ variables and twenty-four LSQ variables for investigation are developed from an extensive literature review of 40 articles on green/environmental logistics, logistics service quality and performance obtained from the major logistics and marketing journal. Moreover, five Thai LPI variables as transport costs per sales ratio, order cycle time, delivery cycle time, delivered in-full on-time (DIFOT), and returned rates shown in performance construct are developed from the Thailand Logistics Performance Index (Chaisurayakarn et al., 2013). The main study model addresses three key constructs as GSQ, LSQ and Performance shown in Figure 1.
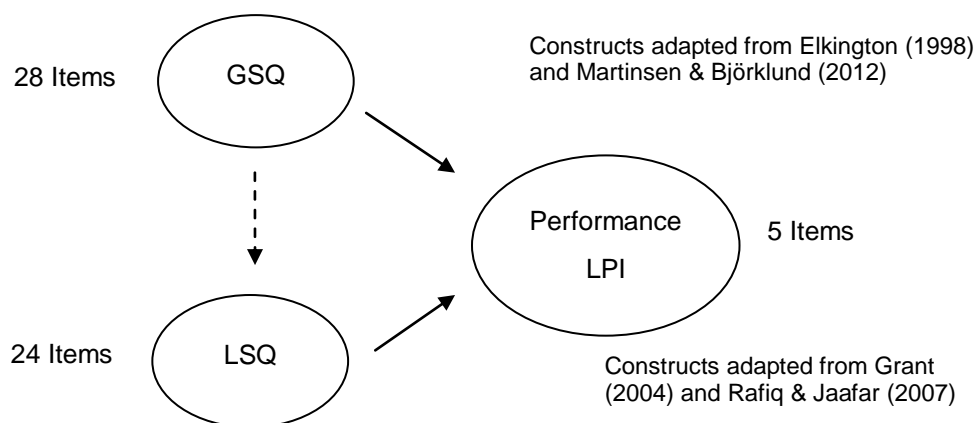

Figure 1: Proposed Main Study Model

Findings

The questionnaire survey is selected in this stage to find what are GSQ and LSQ competencies and also the importance of GSQ competencies related to LSQ competencies in the context of Thai LSPs. After the interview step to explore what meaningful, logistics industry-recognised green service quality competencies are, the survey is conducted with two groups of respondents: LSPs providing transportation services and LSPs customers in five main industries: Food; Textile; Electronics and Parts; Automobile and Parts; and Plastic industries. Both groups of respondents are located or provide their services within the areas of Bangkok, Central and Eastern Thailand.

Demographic Analysis

As discussed that LSPs and LSP customers respondents are located or provide their services within the areas of Bangkok, Central and Eastern Thailand, it is seen that LSP respondents are mostly in business for between 6 to 25 years (80 percent of the total LSP respondents) whereas almost 70 percent of the total LSP customer respondents are in business for 11 to 25 years, as shown in Figure 2. However, the number of years in business of the respondent's company may be one factor that has an influence to the perceptions of LSPs and LSP customers to the GSQ and LSQ competencies related to LSP performance in the Thai context as discussed in the next part.
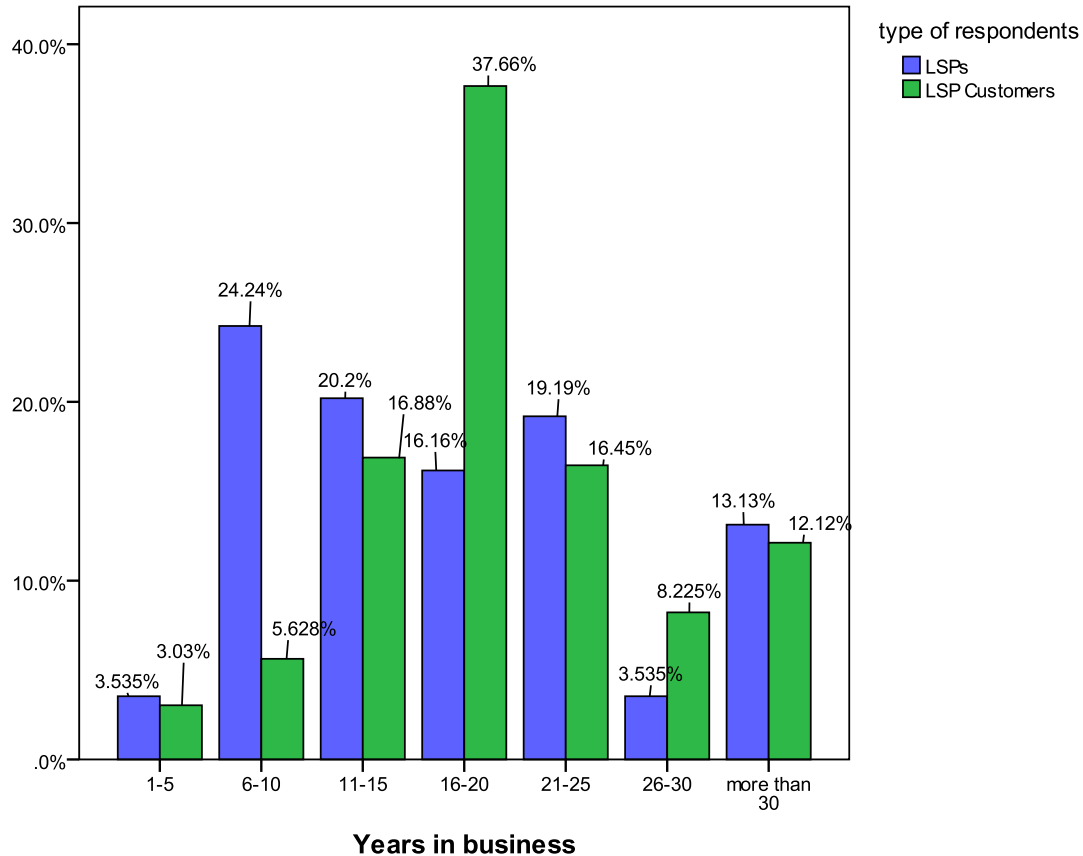

Figure 2: Years in Business of the Respondent's company

The Office of Small and Medium Enterprises Promotion (2014) has classified the type of size of companies in Thailand into 3 types as Small enterprises (1-50 employees in the company); Medium enterprises (51-200 employees); and Large enterprises (more than 200 employees). From Figure 3, it is seen that most of respondents from LSPs are small and medium enterprises (SMEs) as almost 90 percent of total LSPs whereas most of respondents from LSP customers are medium and large enterprises as 95 percent of total LSP customers.

Considering the interactive two variables between the average number of employees and the ownership structure of the respondent's company, it appears that most of LSP respondents are total Thai-owned SMEs while most of LSP customer respondents are multi-national companies (MNCs) which are corporate companies. Interestingly, there is any influence of these two variables relating to the importance of GSQ and LSQ variables in the perceptions of LSPs and LSP customers or not. Following with the question above, Table 2 to 9 will show the similarities and differences of the importance of GSQ and LSQ in the perceptions of LSPs and LSP customers.
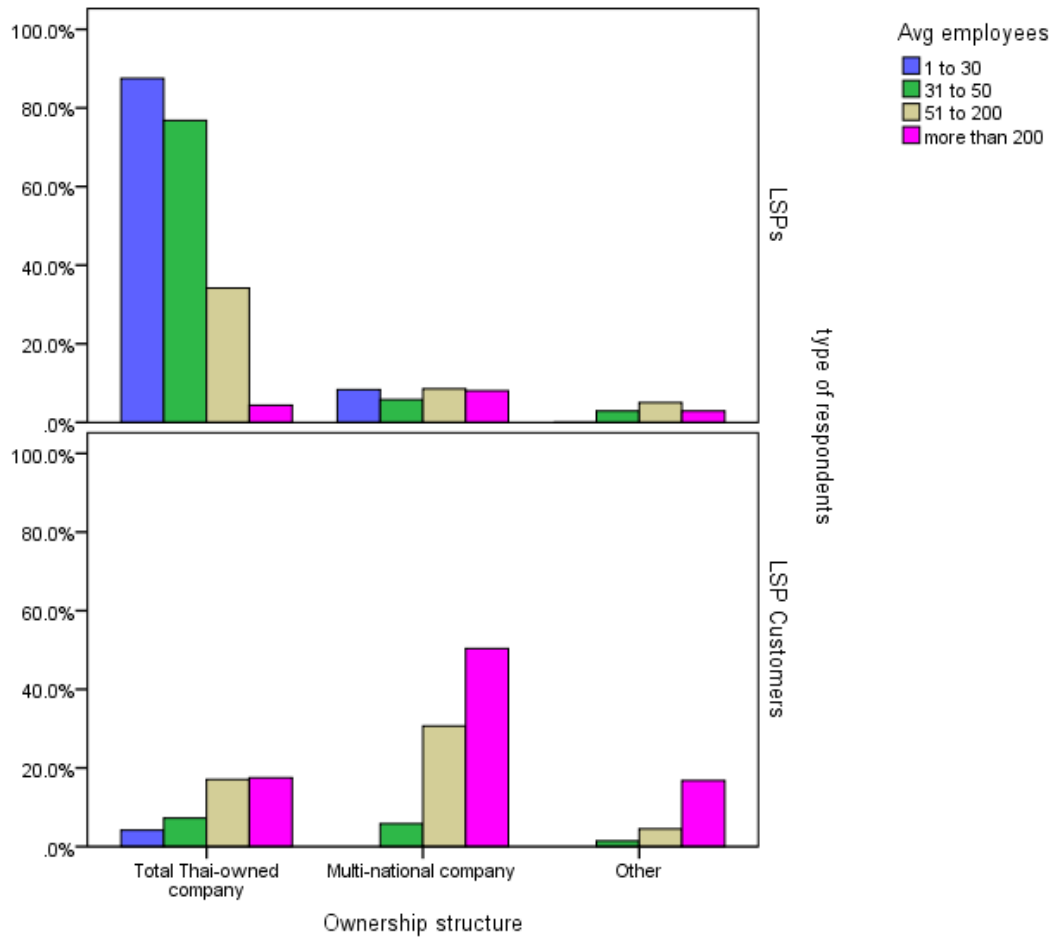
Figure 3: Ownership Structure of the Respondent's Company

Differences of the importance of GSQ and LSQ in the Perceptions of LSPs and LSP Customers

The mean and standard deviations from the perception of LSPs and LSP customers to the importance of GSQ and LSQ variables are calculated for each variable. The LSPs-GSQ perception sum of means of 163.3 marginally exceeded the LSP customers-GSQ perception sum of means of 160.88 as shown in Table 2. The +2.5 difference indicates LSPs' perceptions in GSQ importance exceeded LSP customers' perceptions. Seven variables have absolute t-test values greater than 1.96 that indicate significant differences between means and all variables have positive t-test values. That means LSPs exceed perceptions for these variables and respondents rate the importance level of GSQ variables.

GSQ variables	LSPs Mean	σ	Customers Mean	σ	t-test	Sig (2 tail)
GS1 - Alternative fuel - fuel cost	6.11	.757	5.89	.794	2.905	.004
GS2 - Alternative fuel – corporate image improvement	5.83	.843	5.53	1.106	3.074	.002
GS15 - Logistics system design - product availability	5.77	.798	5.55	.800	2.761	.006
GS18 - Transport management - back haul reduction	6.14	.804	5.97	.854	2.124	.034
GS20 - Partners choice - environmental targets achievement	5.90	1.021	5.68	1.060	2.266	.024
GS21 - Partners choice - environmental collaboration enhancement	5.91	.908	5.68	1.014	2.497	.013
GS23 - EMS - waste decrease within operations & processes	6.13	.824	5.92	.931	2.437	.015
Sum of Means (all GSQ items)	163.30		160.88			

Table 2: Difference of Green Service Quality Variables in the Perceptions of LSPs and LSP Customers

The LSP-LSQ perception sum of means of 148.71 marginally exceeded the LSP customer-GSQ perception sum of means of 146.91 as shown in Table 3. The +1.8 difference indicates LSPs' perceptions in LSQ importance exceeded LSP customers' perceptions. Three variables have absolute t-test values greater than 1.96 that indicate significant differences between means and all variables have positive t-test values. That means LSPs exceed perceptions for these variables and respondents rate the importance level of LSQ variables.

LSQ Variables	LSPs Mean	σ	Customers Mean	σ	t-test	Sig (2 tail)
LS1 - Order release quantities - flexibility to deliver	6.06	.755	5.86	.814	2.602	.010
LS9 - Personnel contact quality - problem resolved	6.11	.898	5.93	.884	2.083	.038
LS10 - Personnel contact quality - knowledge/experience	6.19	.794	5.97	.911	2.611	.009
Sum of Means (all LSQ items)	148.71		146.96			

Table 3: Difference of Logistics Service Quality Variables in the Perceptions of LSPs and LSP Customers

However, when looking at the importance of GSQ competencies related to LSP competencies, it seems that both LSPs and LSP customers perceive the importance of these two main competencies. LSP customers, more than LSPs, perceive GSQ is important to LSP performance. However, both similarly perceive the importance of LSQ to LSP performance. In summary, LSPs respondents marginally report perceptions exceed LSP customers for the important variables. However, they report perceptions less LSP customer for the importance of GSQ competencies relate to LSQ competencies in Thai LSPs.

Variables	LSPs Mean	σ	Customers Mean	σ	t-test	Sig (2 tail)
Importance of GSQ relate to LSQ	5.46	1.406	5.81	1.136	-2.844	.005

Table 4: Importance of GSQ relate to LSP in the Perceptions of LSPs and LSP Customers

As discussed that there are differences between the average numbers of employees in the LSP and LSP customer respondent's company significantly, it is wondering that there is any differences of GSQ and LSQ variables in the perceptions of LSPs and LSP customers in this context. From Table 5, three variables have absolute t-test values greater than 1.96 that indicate significant differences between means and all variables have positive t-test values. That means large LSPs companies (more than 200 employees in the companies) exceed perceptions for these variables and respondents rate the importance level of GS26-27 and LS1 variables. There is no difference of GSQ and LSQ variables in the perception of LSP customer in the context of the average numbers of employees.

As same as the differences of GSQ and LSQ variables in the context of the ownership structure of the company affect only to the perception of LSPs as shown in Table 6. Three variables have absolute t-test values greater than 1.96 that indicate significant differences between means and all variables have positive t-test values. That means the MNC LSPs companies exceed perceptions for these variables and respondents rate the importance level of GS20, LS3 and LS16 variables. It can say that MNCs LSPs have more effective and efficiency in their process in term of the order accuracy, order procedures, and partnership than Thai-owned LSP companies. It is concluded that the average number of employees can make the differences on the GSQ variables rather than LSQ variables in the perception of LSPs whereas the ownership structure of company can make the differences on the LSQ variables rather than GSQ variables in the perception of LSPs.

LSP and LSP customers' types of businesses are also one variable that this study is focusing as shown in Table 7 and 8. Four variables indicate significant differences between means and all variables have positive t-test values. Not surprisingly that Electronics & Parts industry exceed perception of the importance for product availability (GS7) variable as availability and speed factors are quite importance of electronics product (Mason-Jones et al., 2000). On the one hands, Food industry exceed perception of the importance for personnel contact quality (LS8-10) variables. Moreover, there is one difference for the GS3 variable of the perceptions of LSP types of business and transport, logistics and other related to transport business companies rate the importance of product availability on the alternative fuels.

Variables	1-30 Mean	σ	31-50 Mean	σ	51-200 Mean	σ	More than 200 Mean	σ	F	Sig
LSPs										
GS26 - Externalities - CO_2 emission from awareness of LSP stakeholders	5.00		5.40	1.506	5.60	1.219	5.93	1.044	4.842	.003
GS27 - Externalities - environmental aspects changes	5.09	1.203	5.63	1.032	5.84	.926	5.95	.973	4.088	.008
LS1 - Order release quantities - flexibility to deliver	5.70	.822	6.17	.791	5.99	.692	6.43	.676	4.349	.005

Table 5: Difference of Variables in the LSPs and LSP Customers' Perceptions and the Average Number of Employees in Company

Variables	Total Thai-owned company Mean	σ	MNCs Mean	σ	Others Mean	σ	F	Sig
LSP								
GS20 - Partners choice - environmental targets achievement	5.79	1.064	6.35	.734	6.00	.894	4.424	.013
LS3 - Order accuracy - wrong items	6.12	.856	6.53	.507	6.56	.629	5.228	.006
LS16 - Ordering procedures - flexible	5.97	.760	6.35	.485	6.00	.816	3.950	.021

Table 6: Difference of Variables in the LSPs and LSP Customers' Perceptions and the Ownership Structure of Company

Variables	Food Mean	Textile Mean	Plastic Mean	Automobile Mean	Electronics Mean	Others Mean	F	Sig
GS7 - Transport modal choice - product availability	5.50	5.13	5.37	5.47	5.91	5.92	4.139	.001
LS8 - Personnel contact quality - understand situation	6.29	6.06	5.37	5.99	6.06	6.18	4.598	.001
LS9 - Personnel contact quality - problem resolved	6.25	5.56	5.27	6.00	6.00	6.10	5.696	.000
LS10 - Personnel contact quality - knowledge/experience	6.25	6.00	5.33	5.96	5.89	6.26	4.929	.000

Table 7: Difference of Variables in the Respondents' Perceptions and the LSP Customers Types of Businesses

Variables	Transport Mean	Warehouse Mean	Logistics Mean	Packaging Mean	Others related to transport Mean	F	Sig
GS3 - Alternative fuel - product availability	5.65	4.54	5.77	4.25	5.60	4.278	.002

Table 8: Difference of Variables in the LSPs' Perceptions and the LSP Types of Businesses

Average employees in the respondent's company	Type of respondents	order cycle time Mean	σ	F	Sig	Delivery cycle time Mean	σ	F	Sig
1 to 30	LSPs	1.39	.722			2.04	.706		
	LSP Customers	5.00				7.00			
31 to 50	LSPs	1.88	.930			2.78	1.161		
	LSP Customers	1.90	.738			2.80	1.033		
51 to 200	LSPs	1.84	.803			2.77	1.198		
	LSP Customers	2.23	1.256			3.18	1.205		
more than 200	LSPs	2.19	1.569			3.05	1.071		
	LSP Customers	2.34	1.223			3.21	1.262		
Average employees (Employ)				2.404	.067			2.771	.041
Type of respondent (Type)				11.543	.001			17.800	.000
Employ * Type				3.271	.021			5.262	.001

Table 9: Difference of Performance Variables in the LSPs & LSP Customers' Perceptions and Types of Respondents & Average Employees in Company

From Table 9, it shows that there is interaction between the two variables (p values < 0.05). The effects of the average employees in the respondent's company on the order cycle time and delivery cycle time indicators seem to be different for the perceptions of LSPs and LSP customers. It is reasonable to believe that the difference in on the order cycle time and delivery cycle time indicators between the perceptions of LSPs and LSP customers are the difference for all range of average employees in the respondent's company. When looking at the main effects of the types of respondent groups: LSPs and LSP customers, the significant level are 0.001 and 0.000 respectively. That means the variable Type of respondent group has influence on the order cycle time and delivery cycle time indicators. The average employees of the respondent's company has influence on only the delivery cycle time indicator as shown at the significant level 0.041.

On the other hands, there is no interaction between the two variables on the transport cost per sales ratio, DIFOT, and returned rates as p values > 0.05. Conclusions, it can say that every size of companies, representing by the average employees of the respondent's company, LSP customers respondents marginally report perceptions exceed LSPs for the order cycle time and delivery cycle time.

Conclusions

Environmental or green issues in logistics service offerings have attracted much managerial attention in the logistics industry sector. One important opportunity is for logistics service providers (LSPs) to deliver their service offerings to customers in more environmentally friendly ways. While this topic has been fairly well-researched in UK and European settings, it remains under-researched in developing countries such as Thailand. While most of the green logistics studies focus on the supply chain management or logistics system's characteristics, this paper investigates initial insights into how important green aspects are relative to logistics service quality and Thai LSP performance.

A practical contribution for both LSPs and their customers is an understanding of how LSPs can focus on GSQ to perform better, which is important to customers and hence better compete with rivals. Similarities and differences in expectations and perceptions of the main relationships also provide guidance for LSPs to reduce their LSQ gap with customers and increase their capabilities to achieve higher customer satisfaction.

From the findings above, it is concluded that LSP customers, more than LSPs, perceive GSQ is important to LSP performance significantly. Variables types of businesses and the ownership structure of the respondent's company are quite influent on the importance of GSQ and LSQ variables in the perceptions of LSPs and LSP customers. Lastly, every companies size, representing by the average number of employees of the respondent's company, LSP customers respondents marginally report perceptions exceed LSPs for both of the order cycle time and delivery cycle time.

A limitation is that this paper only reports preliminary findings of an ongoing study. It can be seen from the similarity and difference of GSQ and LSQ competencies on LSP Performance as discussed above. The impact of green logistics service quality on LSP performance will be measured. Exploratory Factor Analysis (EFA), Confirmatory (CFA) and structural equation modelling (SEM) will be conducted in the next step.

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