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► **To cite this version:**

Ratapol Wudhikarn, Nopasit Chakpitak, Gilles Neubert. Improving the Strategic Benchmarking of Intellectual Capital Management in Logistics Service Providers. *Sustainability*, 2020, 12 (23), 25 p. hal-03188190

**HAL Id: hal-03188190**

**<https://hal.science/hal-03188190>**

Submitted on 1 Apr 2021

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Article

# Improving the Strategic Benchmarking of Intellectual Capital Management in Logistics Service Providers

Ratapol Wudhikarn <sup>1,2,\*</sup> , Nopasit Chakpitak <sup>3</sup> and Gilles Neubert <sup>4</sup>

<sup>1</sup> Department of Knowledge and Innovation Management, College of Arts, Media and Technology, Chiang Mai University, Chiang Mai 50200, Thailand

<sup>2</sup> A Research Group of Modern Management and Information Technology, College of Arts, Media and Technology, Chiang Mai University, Chiang Mai 50200, Thailand

<sup>3</sup> International College of Digital Innovation, Chiang Mai University, Chiang Mai 50200, Thailand; nopasit.c@cmu.ac.th

<sup>4</sup> Emlyon Business School, CNRS-UMR 5600 EVS, 42009 Saint-Étienne, France; gneubert@em-lyon.com

\* Correspondence: ratapol.w@cmu.ac.th; Tel.: +66-53-920-299 (ext. 314)

Received: 24 October 2020; Accepted: 2 December 2020; Published: 5 December 2020



**Abstract:** This research developed a new integrated method for addressing the deficiencies and gaps generally found in past studies on benchmarking and for benchmarking intellectual capital (IC) in the underdeveloped domain of logistics. To resolve the lack of consideration of relationships among past benchmarking concepts and the impacts of their managerial factors, as well as to examine the wide range of elements and indicators of IC influencing the sustainable development of organizations, the proposed approach integrated the analytic network process and the concept of thinking and non-thinking assets with the generic benchmarking procedure. This new hybrid method was implemented in four commercial companies in courier service. The proposed method prioritized and identified the magnitudes of the factors focused upon, including the IC elements, and their performance measures by considering the fundamental characteristics of intangible assets. The obtained results highlight that management focuses on the IC of the best performer and other companies. This benchmarked outcome showed gaps and improvement as well as sustainable development opportunities for inferior logistics companies. The improved framework provides more systematic and specific benchmarking processes to consider, obtain, and compare the in-depth details of IC management. Moreover, ours is the first research on benchmarking that specifically focused on IC management in logistics service providers.

**Keywords:** logistics management; sustainability benchmarking; benchmarking; intellectual capital (IC) management; analytic network process (ANP); thinking and non-thinking assets

## 1. Introduction

Today, logistics has been empirically recognized as a critical process for organizations in the commercial or governmental sector. Therefore, over the past several decades, a large number of logistics studies were broadly carried out to achieve both academic and practical advantages. Although this subject has received great attention from several perspectives, there are still very limited studies concentrating specifically on intellectual capital (IC), especially on comprehensive management of this intangible asset [1]. Generally, IC development is marked as the transition to innovative, competitive, and sustainable development [2]. Moreover, IC does not only provide short-term values, but also decisively creates long-term benefits for organizations [3], which is highly important for sustainability [4,5]. Therefore, regarding the benefits of IC to organizational sustainability, IC is currently important for all industrial sectors, and especially for the logistics industry [6]. In the logistics

business, good management of overall IC could support logistics firms in maintaining and sustaining their positions as top players in the market. Furthermore, management of each IC component—human capital and structural capital—could also provide different benefits to organizations. Even though management of IC could bring several advantages to firms in both the logistics sector and other industries, there are still limited studies focusing specifically on IC management in logistics domains [7]. More specifically, no research has examined the benchmarking of IC management in logistics.

Benchmarking is defined as a managerial process that organizations set to improve their targets; to indicate, identify, and analyze best practices from other players in the area; and to adapt and improve activities to enhance corporate performance. The ability to perceive benchmarked performance could support firms in planning and managing managerial activities that significantly affect the competitive capabilities, ultimate goals, and sustainability of companies. Generally, benchmarking types can be categorized based on the scope of comparison into four types—internal benchmarking, competitive benchmarking, process benchmarking, and strategic benchmarking. Among these concepts, strategic benchmarking is indicated as a highly crucial method that could ensure the fundamental transformation of an organization. Moreover, most of the shared information regarding this unique benchmarking approach is non-confidential. Therefore, this method could resolve the fundamental issue in benchmarking, wherein most organizations are reluctant to reveal information because the data source or informant is easily acknowledged and tracked [8]. Although strategic benchmarking could provide some better advantages than other approaches, it is still applied in a limited way with the IC concept and in the logistics domain, which are both crucial aspects for current competition, as mentioned above. Furthermore, strategic benchmarking has a fundamental deficiency, similar to that of other benchmarking approaches, wherein it cannot provide the prioritization of benchmarked factors or practices. Therefore, regarding this critical issue, benchmarking approaches still cannot properly support the decision-making of management.

Although both the benchmarking and IC concepts have been broadly recognized for several years, most research still applied these useful methods separately. Therefore, studies that specifically benchmarked IC are still rare [9]. To the best of our knowledge, until now, very few studies have focused on this integrated topic. Furthermore, these limited studies still focused on a few specific sectors, including the hotel and manufacturing industries, mixed industries from a very broad scope, or industries on a national or regional level.

As mentioned above, another critical limitation of both strategic benchmarking and other benchmarking approaches is their capability of revealing the prioritization of aspects that are compared or considered among players. To address this deficiency, some scholars suggested the integration of multi-criteria decision-making (MCDM) methods with the competitive benchmarking method. These improved approaches could deliver prioritized outputs that are more appropriate than those delivered by a traditional method. However, such improvements are very limited in previous studies [10]. Moreover, these developments still do not properly deal with a specific characteristic of IC management—a relationship or influence among IC elements. Hence, regarding such an omission of the relational consideration, the results obtained from the improved methods possibly lead to improper or wrong decision-making. Furthermore, considering IC- and benchmarking-related papers, the previously studied IC elements have been classified roughly or considered partially. This issue opposes the current intense competition, which critically requires the management and measurement of a wide range of IC [11].

Therefore, regarding the abovementioned gaps, until now, there has been no research that has intended to improve the strategic benchmarking approach, benchmark the wide range of IC elements, and, specifically, study the logistics industry at the same time. Thus, based on these improvement opportunities, this study aims to improve the strategic benchmarking approach by addressing its fundamental deficiency and applying the improved method by contributing to the underdeveloped areas of IC and the logistics industry. This proposed method provides an improved benchmarking approach that properly addresses the fundamental issue of the benchmarking method, which could

not quantify and prioritize the importance of benchmarked factors or practices. Regarding the improved approach, the method is capable of highlighting and comparing the concentrations of diverse major IC categories and their sub-elements. Therefore, from the benchmarking results, organizations could realize the levels of IC concentration of competitors, and especially the of top players in the market, which has the highest potential for sustainable development. For firms with limited resources, this would support organizations in, firstly, following the best practices and in improving IC factors that have high impacts on the performance and sustainability of business. To provide all essential information, the remainder of this study is organized into five sections—the literature reviews, research methodology, results, discussion, and conclusion.

## 2. Literature Reviews

### 2.1. Benchmarking in Logistics

Benchmarking is identified as a management technique for continuous improvement of crucial corporate practices. The results obtained through benchmarking allow developing organizations to follow best practices, which could improve performance and support their sustainable development. Therefore, over the past years, several benchmarking studies have been conducted to identify ways to improve opportunities and further achieve a superior quality of products or services. Surprisingly, a crucial research work emphasized the limited number of studies in specific service industries, and logistics was indicated as a highly underdeveloped domain. Although logistics has been studied broadly and managed for several years, most logistics research still focuses on developing logistics management (LM) methods and aims to improve the operational effectiveness and efficiency of logistics activities. Nevertheless, there have been several studies empirically identifying the advantages of benchmarking and LM over many years, and, recently, the study of this integrated subject has been receiving increasing attention [12].

To the best of our knowledge and accessibility, in the last decade, just 17 studies, as shown in Table 1, specifically examined the benchmarking of LM, and almost half the articles were published in the last three years (2016 to 2018). This indicates the significant attention that recent studies have paid to this integrated subject. According to Table 1, interestingly, most studies cannot be clearly classified into the four typical types of benchmarking, and so they are categorized as other types, as presented in Table 1. These studies aimed to either present new improvements for the traditional benchmarking method or empirically identify correlations between variables under the benchmarking concept.

**Table 1.** Studies on benchmarking in logistics management.

Author (Year)	Benchmarking Type				
	Internal	Competitive	Process	Strategic	Other
Wang and Zhang (2009) [13]	–	✗	–	–	–
Qureshi et al. (2009) [14]	–	–	–	–	✗
Johansson and Pålsson (2009) [15]	–	–	–	–	X
Min and Joo (2009) [16]	–	–	–	–	X
Banomyong (2010) [17]	–	–	✗	–	–
Lau (2011) [18]	–	–	–	–	✗
Hastreiter et al. (2013) [19]	–	✗	–	–	–
Diabat et al. (2013) [20]	–	–	–	–	✗
Sahu et al. (2015) [21]	–	–	–	–	✗
Taschner (2016) [22]	–	–	–	–	✗
Suzuki (2016) [23]	–	✗	–	–	–
Sharma et al. (2016) [24]	–	–	–	–	✗
Feibert et al. (2017) [25]	–	–	✗	–	–
Karrapan et al. (2017) [26]	–	–	–	–	✗
Bhattacharya and David (2018) [27]	✗	–	–	–	–
Mangla et al. (2018) [10]	–	–	–	–	✗
Marco et al. (2018) [28]	–	–	–	–	✗

The first sub-category of papers in the “other” group [15,16,18,28] aim to analyze the logistics performance of firms in order to identify benchmark metrics, practices, and guidelines of effective LM. For example, to identify a useful set of LM measures, Lau [18] developed a green logistics performance index (GLPI), and employed statistical analysis to benchmark as well as analyze the performance of the GLPI of firms in Japan and China. Recently, Marco and colleagues [28] studied the empirical correlation between city logistics measures and other relevant factors, such as pollution, GDP, etc.

On the other hand, another subgroup of studies mainly improved the comparative information of the traditional benchmarking approach. For instance, one LM benchmarking study in this group [20] applied interpretive structural modeling (ISM) to analyze and reveal interactions of LM factors. Nevertheless, most studies in this subcategory aim to integrate decision or management methods with the traditional benchmarking concept to uncover, prioritize, and benchmark critical factors [10,22], performance measures [26], and alternatives or service providers [14,21,24] of LM cases. Therefore, the aforementioned studies showed high concentration on the improvement of benchmarking, especially in LM, which implies the underdevelopment or flaws of the traditional benchmarking concept.

On the other hand, among studies clearly classified as the typical benchmarking type, the number of articles focusing on the benchmarking process is three, which is higher than the numbers for competitive benchmarking (two) and internal benchmarking (one). Surprisingly, although strategic benchmarking is indicated as having advantages over the other three benchmarking approaches, no study specifically considers strategic benchmarking in the logistics field. Therefore, there is a significant improvement opportunity by studying this crucial topic.

## 2.2. Benchmarking of IC and Improvement of the IC Benchmarking Method

Currently, IC is widely accepted as one of the critical factors for achieving the ultimate goals of organizations. Regarding its crucial benefits, the IC concept has been broadly applied in several studies in both academic and practitioner literature. Generally, IC studies divide the IC structure into three major elements: those of human capital, structural capital, and relational capital. However, some recent studies [29–32] have suggested other IC elements, such as social capital, spiritual capital, innovation capital, etc., which are more proper for a current business situation. Most IC structures still propose large IC elements that are quite extensive. However, among various IC structures, the IC model of the thinking and non-thinking assets [33] properly considers a wide range of IC, including competence, attitude, intellectual agility, relationships, organization, and renewal and development

capital. The distinctive advantage of the thinking and non-thinking assets is that the method provides a specific IC element, renewal and development capital, which is identified as an important element in sustainable competitive advantage [34]. Even though this method has this distinctive advantage, it has still not been applied to IC benchmarking, unlike other IC methods.

Benchmarking is one of most important methods for strategic management, and it is identified as having an advantage in capturing and transferring the best practices of IC management [9]. However, similarly to the limitation of strategic benchmarking found from the LM perspective, benchmarking of IC has also not received great attention. From 1986 to 2000, Yasin [35] performed a comprehensive review of literature on more than 5000 benchmarking-related hits, and the outputs surprisingly revealed the non-existence of literature on the benchmarking of IC [9]. Nevertheless, after this advantageous indication as well as broader attention on and adoption of IC management, some subsequent attempts were made to study this highly underdeveloped subject. The first IC benchmarking study was proposed by Viedma-Marti [36] in 2001, and this study focused on the sustainable competitive advantage of firms obtained from the proposed IC benchmarking system. However, only seven studies related to the IC benchmarking were conducted after the first attempt. All works can be categorized into two major groups—methodological development and benchmarking applications.

Regarding the study of IC benchmarking applications, the first research project was carried out at the national level among Arab countries [37]. The results revealed the differences in the performance of IC among these nations, and they indicated several crucial improvement opportunities for Arab states. At the same time, another study [38] compared the IC performance of 13 hotels in a hotel chain, and the obtained results suggested useful information for the benchmarked organizations. Moreover, regarding the potential association between IC and corporate performance, that study recommended the evaluation of IC in the hotel business. Recently, another study [39] aimed to analyze and identify the most appropriate benchmarking methods for national IC; however, that study did not apply the method for benchmarking the performance of organizations.

As mentioned above, there have only been three limited research projects specifically studying the benchmarking of IC, whereas other studies focused on the methodological improvement of IC benchmarking. Regarding the studies on methodological development, as mentioned above, the first research project was conducted by Viedma-Marti [36]. He specifically developed the strategic benchmarking system called the IC benchmarking system. That research benchmarked a core competency that is a crucial part of IC, and the approach could reveal the differences among organizations. However, there was negative criticism about the difficulty of disclosure and accessibility to confidential and competition-related information, which is a corporate core competency [40]. Therefore, in 2004, another study [9] benchmarked IC differently in the operational processes of organizations, and further improved the approach by demonstrating the impacts and associations among comparative factors. This development could enhance the capability of traditional benchmarking by providing relational information. Hence, as mentioned before, this research contributed to the study of both underdeveloped topics—IC benchmarking and improvement of the benchmarking method. In the same year, another published study [41] proposed a new system that specifically benchmarks an element of IC, that is, the social capital of five clothing manufacturers in European countries. Similarly to a typical benchmarking system, the proposed system could reveal the necessary social capital by focusing on the corporations' needs. Moreover, Watters and colleagues [42] developed online tools to facilitate the understanding of IC management in various small and medium-sized enterprises, and this improvement could support the release of inertia typically found at the beginning of IC management. During the same period, another study [43] developed a system to benchmark IC at the regional level. However, without real application of the proposed system, this study claimed the effectiveness of the resource allocation capability because of this benchmarking model. Regarding the abovementioned studies, strategic benchmarking was the most improved approach [36,42,43], since it presented several significant advantages for organizations [43], such as embracing sustainable growth and revealing in-depth information about the infrastructure of competitiveness.



Even though some aforementioned attempts aimed to either improve the deficiencies of the traditional benchmarking approach or to specifically develop new IC benchmarking systems from the LM perspective, these studies still could not resolve the fundamental deficiency of the benchmarking system, that is, prioritization of the benchmarked elements. There was only one close attempt addressing this critical issue and implementing the proposed method with the IC concept. Costa [44] suggested the integration of a data envelopment analysis and the Malmquist productivity index to consider the associations between IC investments and corporate performance. Such competitive benchmarking beneficially ranked firms in the Italian yacht industry; however, by only ranking the companies, the results provided only rough directions for managing IC. Moreover, this improved approach still could not indicate relationships among the considered factors or practices of players, even though this relational identification is specified as a crucial part reflecting the propulsion of business administration and the possibility of IC benchmarking [9]. Therefore, regarding these gaps, it is apparent that there is a crucial opportunity to improve the prior approaches by addressing the rough IC scope concurrently with the relational consideration, as well as by prioritizing the IC elements or organizational practices focused upon.

### 3. Research Methodology

Based on the theoretical gaps stated in the prior literature section, this study aims to propose an integrated approach that could benchmark and prioritize a comprehensive range of IC and concurrently account for influences among IC elements. The proposed method aims to improve the capability of IC benchmarking approach in order to make it a more practical tool for managers of firms. This improvement conforms to the purpose or characteristic of the third stage of IC research [45,46]. Regarding the mainstream of the third stage of IC research [47,48], the development of the proposed approach aims to select and apply proper tools, techniques, or methods that could support both academic improvements and practical applications. Therefore, to deal with the consideration of a wide range of IC, including sustainable capital, the concept of thinking and non-thinking assets [33] is adopted. Moreover, to properly prioritize the concentration of IC management and inclusively consider relationships among IC elements at the same time, the analytic network process (ANP), an MCDM method developed by Saaty [49], is integrated. All of the selected methods are integrated with a well-known generic benchmarking procedure proposed by Camp [50]. Therefore, the overall framework of this study, which integrates the three different concepts, is depicted in Figure 1, and is further explained in the subsequent subsections.

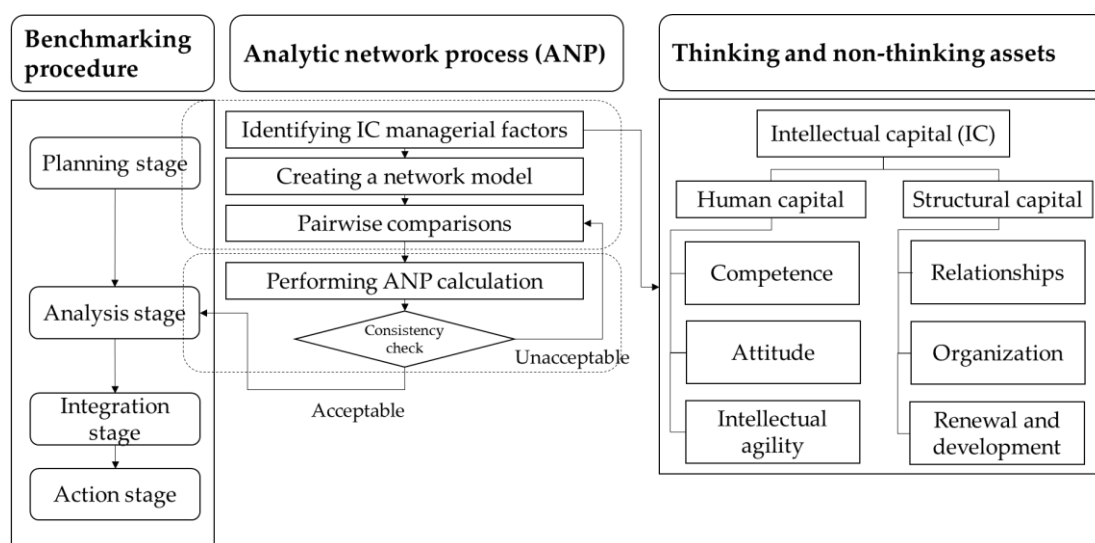


Figure 1. The research framework of this study.

### 3.1. Stage 1: Planning Phase

The planning phase consists of three sub-processes. The first step is to identify the objective of benchmarking. This step aims to develop the direction of the benchmarking approach, which affects the subsequent steps. Generally, in the traditional approach, critical managerial factors or characteristics are independently, formlessly, and intuitively identified by an experienced person. Nevertheless, without a clear concept and approach, factors and characteristics of IC that could positively impact organizational performance will be unintentionally neglected from consideration. Therefore, to address this issue, this study integrates the concept of thinking and non-thinking assets [33], which is a managerial method that could support the consideration of a comprehensive range of intangible assets that empirically benefit organizational performance.

The second step aims to identify the best performer as well as all potential candidates in the class for further benchmarking because learning from the best-performing players could effectively accelerate the achievement of organizational improvement.

The last step of the planning phase is to determine a data collection method and then carry out data collection. Key characteristics and critical managerial factors that are clearly established through the thinking and non-thinking assets method in the first step are used for identifying their relative measurable indicators. Then, the data collection method for these identified measures is specified. Generally, the traditional benchmarking approach does not provide a systematic process to obtain in-depth information that could convey the perception of managerial concentration and priority or consider the relationships among the aspects in focus. Therefore, this is a critical disadvantage of the traditional benchmarking approach. Hence, to address this issue, this study applies the ANP as a method for collecting data in the third step of the planning phase. The ANP steps related directly to the data collection process are integrated as a part of the third step and are presented in the next paragraphs, while the remaining processes are included in the analysis phase.

The critical managerial factors and characteristics that are identified in the first step are applied for creating the first round of an open-ended questionnaire. This enquiry aims to collect measurable indicators that are adopted in the strategic management of each player, and the collected measures are then applied as information for constructing another questionnaire. The obtained strategic indicators are considered separately for each organization by classifying them into six IC dimensions following the thinking and non-thinking assets concept. Then, an expert from each firm independently identifies relationships among the indicators and IC elements through the second round of the questionnaire. Next, following the ANP method, the obtained relationships are applied for constructing a network model related to each organization. Furthermore, these visualized relationships are used for constructing the third-round enquiry, which aims to perceive the intensity of magnitude of all associated IC elements and of the correlated IC indicators through a pairwise comparison questionnaire.

The magnitude of the pairwise comparison is considered by following the 1–9 ANP scales [51]. The results obtained from the pairwise comparison questionnaires are used for calculating the concentration of IC management in organizations through the weights and priorities of their IC elements and indicators, and the brief calculating processes of the ANP are described in the analysis stage. Complete details about the ANP can be further studied in the book by Saaty [49], who developed this method.

### 3.2. Stage 2: Analysis Phase

The results of all pairwise comparisons from the previous stage are further used for calculating a supermatrix that can be demonstrated in a standard form as Formula (1). Then, to calculate the weighted supermatrix, the values of the intensities of importance between IC elements, which are obtained previously from the third round of the questionnaire, are applied for computing the weights of all relative pairs of IC elements. After that, each calculated weight is multiplied with entire segments in the relative blocks of the supermatrix. Thus, all segments are weighted, and this calculated matrix is named the weighted supermatrix. However, between the abovementioned calculations, each computed



set of results (eigenvectors) must always be checked for reliability through the consistency ratio (CR). If the CR is greater than 0.10, which is the general acceptance level, the unreliable pairwise comparison must be reassessed by a related respondent until the CR is acceptable. This process conforms to the detection of abnormal responses similarly to the process of traditional benchmarking, but it provides a more specific approach to check the consistency.

Once the weighted supermatrix is in line with the consistency level, the final result, which is the limit supermatrix, is obtained by raising the powers of the weighted supermatrix until the values in all columns of the matrix converge. Finally, the values in each row of the matrix represent the weight and final priority of relative components of the network. The results reveal and benchmark the current state of strategic concentration of IC in all considered organizations, and this could highlight both their strengths and weaknesses. Furthermore, this reveals improvement opportunities, future performance levels, and managerial concentration to be achieved. A complete analysis will highlight the gap and change needed for organizations. However, the concentration or practice of IC management of the best player may not be easy to follow, and so the organization must consider the possibility of improvement. When both targets and developed processes are identified, the integration phase is carried out.

### *3.3. Stage 3: Integration Phase*

The last major step, the action phase, aims to attain the ultimate benchmarking goals, which are to achieve the desired transformations. In this stage, action plans that lead to achievement of goals, desired practices, and performance measures must be developed elaborately. The transformation actions should consider efficient resource allocation, responsible persons, and time to complete the transformations.



#### 4. Results

IC was identified as a critical component for managing logistics service providers [52]. Nevertheless, the IC benchmarking research in the logistics domain has still never been studied, even in Thailand [7]. Therefore, in 2017, this study used a case from four commercial logistics companies that are well-known express courier organizations operating in Thailand. The research focuses on a specific type of logistics business, express couriers, because the courier sector of Thailand has been identified as one of the most crucial sectors. It had the biggest growth among all logistics businesses [53] in Thailand, and, moreover, the IC management in the courier sector has also never been studied in any academic research before. The benchmarking results obtained through this case study are expected to provide in-depth information that would demonstrate advantages and disadvantages of the proposed method and, moreover, would suggest improvement opportunities as well as priorities for all logistics service providers, especially to local Thai firms. Therefore, to properly highlight the differences of benchmarking cases, we included both top international players and local developing players in the market in this study. Moreover, to usefully suggest improvement opportunities and sustainable development to the local firms, we selected two high-potential and local companies to participate in this study. Although this study carried out strategic benchmarking, which mostly involves non-confidential information, participants that are in middle to top management are still unwilling to disclose their identities, neither their individual identities nor those of their organizations. Regarding this agreement, data and information that could present or imply their identities are not presented. Therefore, general information about these organizations is presented in Table 2. Two companies (Companies A and B) are international organizations and are unofficially classified as the top five express courier companies in the world. The two other firms have their main operating bases in Thailand (Companies C and D), of which one (Company C) is a Thai organization, which has developed from a small and medium-sized enterprise and operates only in Thailand. Since one of these firms (Company A) has been widely accepted as ranking first among the express courier businesses in the world, this player would present the best managerial model or IC management practice for other performers. To provide the current managerial focuses of all firms, their major management strategies are summarized as follows: (1) Company A focused on a broad differentiation strategy, which aimed to serve customers with a high standard of quality internationally; (2) Company B focused on a specific customer segment that required international service quality by having lower costs than other firms; (3) Company C intended to be an overall low-cost service provider; and, finally, (4) Company D concentrated on a focused service quality, which mainly served local Thai customers who required moderate to high service quality with an acceptable price. In the following sections, details of the application of the proposed method are presented.

**Table 2.** General information of the studied companies.

Description	Company A	Company B	Company C	Company D
Number of employees	>500	>500	>500	>500
Years of operation	>30	>30	11–20	11–20
Income per year (million baht)	>1000	>1000	501–1000	>1000
Shipment boundaries	Domestic and Worldwide	Domestic and Worldwide	Domestic	Domestic and Asian
Types of customers	Individual and Corporate	Individual and Corporate	Individual and Corporate	Individual and Corporate
Operation	Own	Own and Outsource	Own	Own and Outsource
Number of parcel posts per day (pieces)	>10,000	>10,000	>10,000	>10,000
Number of service centers	<50	<50	50–100	251–1000
Management strategy	Overall high service quality	Focused low cost	Overall low cost	Focused service quality

#### 4.1. Stage 1: Planning Phase

First, the objective of this benchmarking is to study and benchmark the strategic management of the IC among four organizations in the logistics domain, as this topic is still underdeveloped, as mentioned above in the prior literature section. The management of IC aspects—human capital and structural capital—that are considered according to the thinking and non-thinking assets concept are divided into six elements—competence, attitude, intellectual agility, organization, relationships, and renewal and development. Most of these IC elements, such as competence, relationships, and renewal and development, were empirically and widely identified as sustainable development factors in several businesses.

As mentioned above, in the second step, Company A was identified as the best performer, since it was broadly acknowledged as ranking first among express courier organizations in the world. Therefore, the IC management and concentration of this firm would be considered best practices for the other players in the comparison.

The last step of this phase is to collect all required data following the requirements of the ANP approach. Specifically, to benchmark the IC management between the logistics firms in focus, in this study, the strategic management of IC was studied using the managerial concentration of the firms' performance measures. Therefore, the first-round enquiry aimed to collect the current measurements of IC in all the studied organizations. In the first survey form, to clarify IC measures, examples were provided of indicators in logistics that were obtained from previous intensive literature reviews on IC management [1]. An expert from the middle or top management of each logistics firm was interviewed following the structured questionnaire. In the questionnaire, a comprehensive list of IC performance indicators of logistics businesses was included. The provided indices were obtained from our in-depth literature review in a previous study [1]. The results of the first-round enquiry indicated the IC management of all firms based on their strategic performance indicators. The obtained measures were then classified according to the thinking and non-thinking assets, as shown in Table 3.

After the measurable indicators were already identified by the participating management, in the second-round enquiry, to create a relational network of IC management following the ANP concept, experts were asked, based on their experience, to identify dependencies among the measures applied in their related organization. Therefore, the obtained results provided visualized networks of the IC management of the firms, as depicted in Figure 2. In this figure, the line with the arrowhead denotes the dependence between the connected clusters. The one-way arrowhead indicates the influence of the beginning cluster on the ending cluster. For instance, regarding the example of Company A (Figure 2a), the line starting from the organization cluster and ending with the arrowhead at the relationship cluster implies that the organization element affects the relationship element. Similarly to the two-way arrowhead, this denotes the influences between the two connected clusters. For example, the two-way arrowhead for the case of Company A implies the influences between the renewal and development and the relationships.

However, the network model could only demonstrate relationships from the cluster perspective (IC component level). It is still unable to provide in-depth details at the performance indicator level. Hence, the interrelationships at this level are presented in the zero–one matrix depicted in Table 4. According to the values in the matrix, there are two values, one and zero, and one sign, the hyphen (-). The value of one implies that the measure in the vertical axis influences the indicator in the horizontal axis, the zero value indicates the irrelevance between paired measures, and the hyphen denotes that the indicator in either the vertical or horizontal axis did not exist or was not applied in that organization. On the other hand, the value in each segment can be separated into four digits. The first digit implies the influence between the indicators of Company D, and the second, third, and fourth digits of the value denote the relationships of Companies C, B, and A, respectively. For example, the segment of O01 in the vertical axis and A01 in the horizontal axis shows the value of “10-”. The first (-) and second (-) digits indicate that both indicators (O01 and A01) were not applied together at Companies C and D. At the same time, in the case of Company B, the value of the third digit is zero, which implies that the

expert found that O01 did not influence A01. Moreover, the fourth digit with the value of one denotes that the management of Company A found that O01 affected A01.

**Table 3.** Strategic performance measurement of the intellectual capital (IC) of the logistics companies in focus.

Abbreviation	IC Elements/Performance Indicators	Company/Number of Applied Measures			
		A	B	C	D
HC	Human capital	7	5	3	2
COM	Competence	2	1	1	1
C01	Percentage of employees completely trained according to the training plan	✓	✓	✓	✓
C02	Number of certificates and training	✓	–	–	–
ATT	Attitude	3	3	2	1
A01	Employee satisfaction	✓	✓	✓	–
A02	Turnover rate	✓	✓	✓	✓
A03	Employee involvement rate	✓	✓	–	–
INT	Intellectual agility	2	1	–	–
I01	Employees' suggestion rate	✓	✓	–	–
I02	Number of new products and services from employees' suggestions	✓	–	–	–
SC	Structural capital	16	14	10	10
ORG	Organization	7	8	6	5
O01	Nonconformity of operations to the standard	✓	✓	–	–
O02	Cycle time	✓	✓	–	–
O05	Percentage of shipments without damage	✓	✓	✓	✓
O08	Technology integration level	✓	–	–	–
O10	Level of organizational reputation	✓	✓	–	–
O14	Overdue shipment	✓	✓	✓	–
O15	Inventory damage	–	✓	–	–
O16	Cargo theft	–	✓	✓	✓
O17	Truck cube utilization	–	–	✓	–
O18	Transportation accidents	✓	✓	✓	✓
O20	Shipment error rate	–	–	✓	–
O21	Coverage areas of shipment	–	–	–	✓
O22	System availability	–	–	–	✓
REL	Relationships	6	5	3	3
R01	Customer satisfaction	✓	✓	✓	✓
R02	Number of customer complaints	✓	✓	✓	✓
R03	Number of credit claims	✓	✓	✓	✓
R04	Customer response rate	✓	✓	–	–
R06	Ratio between new customer and repurchase customer	✓	✓	–	–
R10	Market share	✓	–	–	–
RD	Renewal and development	3	1	1	2
RD01	Number of new services/products	✓	✓	✓	✓
RD02	Time to market of new service/product	✓	–	–	–
RD03	Percentage of sales from new services/products	✓	–	–	–
RD05	Number of new service centers	–	–	–	✓

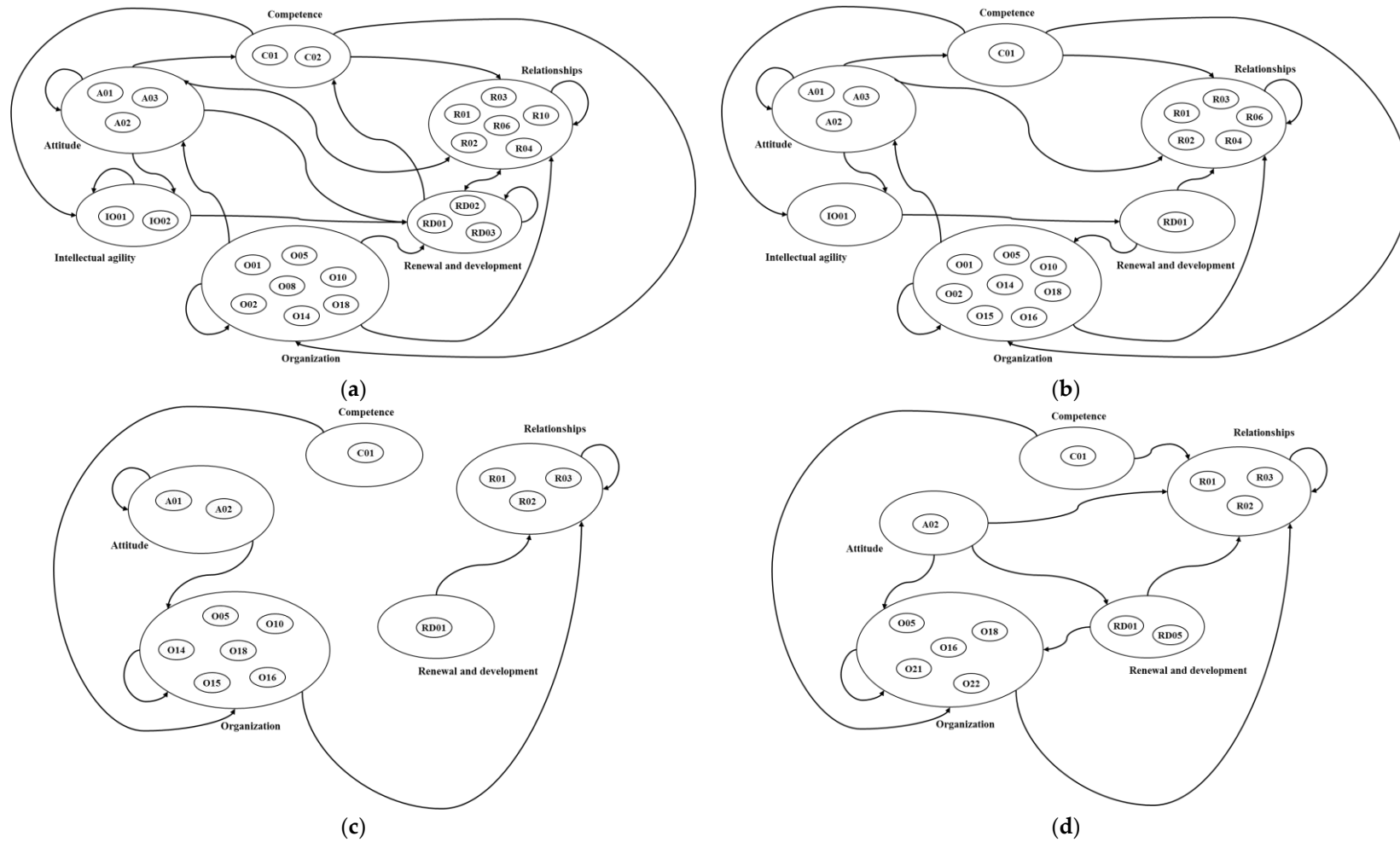


Figure 2. Network models of benchmarked firms—company A (a), company B (b), company C (c), and company D (d).



Table 4. A zero-one matrix.

IC Elements and Indicators		COM		ATT			INT		ORG										REL						RD							
		C01	C02	A01	A02	A03	I01	I02	O01	O02	O05	O08	O10	O14	O15	O16	O17	O18	O20	O21	O22	R01	R02	R03	R04	R06	R10	RD01	RD02	RD03	RD05	
COM	C01	0000	0—	000-	0000	00-	11-	1—	11-	11-	1111	0—	11-	111-	-1-	-000	-1-	1111	-1-	—0	—1	0001	0001	0001	11-	00-	0—	0000	0—	0—	—0	
	C02	0—	0—	0—	0—	0—	1—	1—	0—	0—	0—	0—	0—	—	—	—	0—	—	—	—0	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	
ATT	A01	000-	0—	000-	111-	11-	00-	0—	00-	00-	000-	0—	00-	000-	-0-	-00-	-0-	000-	-0-	—	—0	000-	000-	000-	00-	00-	0—	000-	0—	0—	—	
	A02	1100	1—	000-	0000	00-	11-	0—	00-	00-	0011	0—	00-	000-	-0-	-001	-1-	0000	-1-	—0	—1	0001	0001	0001	11-	00-	0—	0000	1—	0—	—1	
INT	I01	00-	0—	00-	00-	00-	00-	1—	00-	00-	00-	0—	00-	00-	-0-	-0-	—	00-	—	—	—	00-	00-	00-	00-	00-	0—	00-	0—	0—	—	
	I02	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	—	—	0—	—	—	—	—	1—	0—	0—	0—	0—	0—	1—	0—	0—	—	
ORG	O01	00-	0—	10-	00-	00-	00-	0—	00-	01-	11-	1—	11-	11-	-1-	-0-	—	11-	—	—	—	11-	11-	11-	11-	00-	1—	00-	1—	0—	—	
	O02	00-	0—	00-	00-	00-	00-	0—	00-	00-	00-	0—	11-	11-	-0-	-0-	—	00-	—	—	—	11-	11-	00-	11-	00-	1—	00-	0—	0—	—	
	O05	0000	0—	000-	0000	00-	00-	0—	00-	00-	0000	0—	11-	000-	-0-	-000	-0-	0000	-0-	—0	—0	1111	1111	1111	00-	00-	1—	0000	0—	0—	—0	
	O08	0—	0—	1—	0—	0—	0—	0—	1—	1—	0—	0—	1—	0—	—	—	—	0—	—	—	—	1—	1—	0—	1—	0—	0—	0—	1—	0—	—	
	O10	00-	0—	11-	00-	00-	00-	0—	00-	00-	00-	0—	00-	00-	-0-	-0-	—	00-	—	—	—	00-	00-	00-	01-	00-	1—	00-	0—	0—	—	
	O14	000-	0—	000-	000-	00-	00-	0—	00-	11-	000-	0—	11-	000-	-0-	-00-	-0-	000-	-0-	—	—	111-	111-	111-	10-	00-	1—	000-	0—	0—	—	
	O15	-0-	—	-0-	-0-	-0-	-0-	—	-0-	-0-	-0-	—	-1-	-0-	-0-	-0-	—	-0-	—	—	—	-1-	-1-	-1-	-0-	-0-	—	-0-	—	—	—	
	O16	-000	—	-00-	-000	-0-	-0-	—	-0-	-0-	-000	—	-1-	-11-	-0-	-000	-0-	-000	-0-	—0	—0	-111	-111	-111	-0-	-0-	—	-000	—	—	—	—0
	O17	-0-	—	-0-	-0-	—	—	—	—	—	-0-	—	—	-0-	—	-0-	-0-	-0-	-0-	—	—	-0-	-0-	-0-	—	—	—	-0-	—	—	—	—
	O18	0000	0—	000-	0000	00-	00-	0—	00-	11-	1111	0—	11-	111-	-0-	-000	-0-	0000	-0-	—0	—1	1111	1111	1111	00-	00-	0—	0000	0—	0—	—0	
O20	-0-	—	-0-	-0-	—	—	—	—	—	-0-	—	—	-1-	—	-0-	-0-	-0-	-0-	—	—	-1-	-1-	-0-	—	—	—	-0-	—	—	—	—	
O21	—0	—	—	—0	—	—	—	—	—	—0	—	—	—	—	—0	—	—0	—	—0	—0	-1	-0	-0	—	—	—	-0	—	—	—	—0	
O22	—0	—	—	—0	—	—	—	—	—	—1	—	—	—	—	—0	—	—0	—	—1	—0	-1	-1	-1	—	—	—	-0	—	—	—	—0	
REL	R01	0000	0—	000-	0000	00-	00-	0—	00-	00-	0000	0—	00-	000-	-0-	-000	-0-	0000	-0-	—0	—0	0000	0000	0000	00-	11-	1—	0000	0—	0—	—0	
	R02	0000	0—	000-	0000	00-	00-	0—	00-	00-	0000	0—	00-	000-	-0-	-000	-0-	0000	-0-	—0	—0	1111	0000	0000	00-	00-	1—	0000	0—	0—	—0	
	R03	0000	0—	000-	0000	00-	00-	0—	00-	00-	0000	0—	00-	000-	-0-	-000	-0-	0000	-0-	—0	—0	1111	1100	0000	00-	00-	1—	0000	0—	0—	—0	
	R04	00-	0—	00-	00-	00-	00-	0—	00-	00-	00-	0—	00-	00-	-0-	-0-	—	00-	—	—	—	11-	11-	00-	00-	00-	0—	00-	0—	0—	—	
	R06	00-	0—	00-	00-	00-	00-	0—	00-	00-	00-	0—	00-	00-	-0-	-0-	—	00-	—	—	—	00-	00-	00-	00-	00-	0—	00-	0—	0—	—	
	R10	0—	0—	1—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	—	—	0—	—	—	—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	
RD	RD01	0000	1—	000-	0000	00-	00-	0—	00-	00-	0000	0—	01-	000-	-0-	-000	-0-	0000	-0-	—0	—0	1111	0000	0000	00-	01-	1—	0000	0—	1—	—0	
	RD02	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	—	—	0—	—	—	—	0—	0—	0—	0—	0—	0—	1—	1—	0—	1—	—	
	RD03	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	—	—	0—	—	—	—	0—	0—	0—	0—	0—	0—	0—	0—	0—	—	—	
	RD05	—0	—	—	—0	—	—	—	—	—	—0	—	—	—	—	—0	—	—0	—	—1	—0	-1	-0	-0	—	—	—	-0	—	—	—0	

Note: the example of segment of O01 in the vertical axis and A01 in the horizontal axis shows the value of “10-”. The first (-) and second (-) digits indicate that both indicators (O01 and A01) were not applied together at Companies D and C, respectively. For Company B, the third digit (0) indicates no relationship between these two indicators, and the fourth digit (1) specifies the O01 influenced A01 in case of Company A.

To identify the influences among all related IC elements and IC performance measures, all indicated interrelationships in Figure 2 and Table 4 were further input into the Super Decisions software (version Windows 2.80, The Creative Decisions Foundation, Pittsburgh, PA, USA) to create the third-round questionnaire specific to each organization. The generated questions, which are pairwise comparisons, consist of two major parts: comparative questions at the IC element level and the IC performance measure level. The numbers of the questions created are identified in Table 5.

**Table 5.** Number of comparative questions in the third-round questionnaire.

Level of Comparative Questions	Number of Pairwise Comparisons in the Questionnaire			
	Company A	Company B	Company C	Company D
IC element (cluster)	29	15	6	16
IC performance indicator (node)	91	96	30	25

In this questionnaire, the management members were asked to indicate the magnitude of influences between the related clusters and nodes following the 1–9 ANP scales. After the experts answered all comparative questions in the related questionnaires that were specifically created for each organization, as shown in Table 5, the obtained answers were applied for calculating further results, which will be explained in the following.

#### 4.2. Stage 2: Analysis Phase

All the answers obtained from the second enquiry were input into the Super Decisions software to calculate the supermatrix, weighted supermatrix, and limit supermatrix of each organization. However, between the calculations, the inspection of nonconformity was concurrently carried out throughout sets of pairwise comparisons, and there were some inconsistent results wherein CRs were higher than 0.10. In the first-round enquiry of pairwise comparisons, regarding the number of indicators and comparative questions, three organizations (Companies A, B, and C) still presented inconsistent results, as shown in Table 6. Therefore, to address this inconsistency issue, pairwise comparison questions related to the unreliable results were sent to the respective experts for reassessment.

**Table 6.** Improvement of the consistency ratios from the pairwise comparison processes.

Company	Pairwise Comparisons	Level	Consistency Ratio	
			Before	After
A	Intellectual agility and related clusters	Cluster	0.13928	0.06852
	Renewal and development and related clusters	Cluster	0.11465	0.06376
	A01 and related measures in the organization	Node	0.20900	0.01759
	O10 and related measures in the organization	Node	0.10123	0.09623
	R01 and related measures in the relationships	Node	0.13040	0.05156
B	Organization and relative clusters	Cluster	0.10037	0.07069
	O02 and related measures in the organization	Node	0.14636	0.08247
C	R01 and related measures in the organization	Node	0.10179	0.07645
	R01 and related measures in the organization	Node	0.13322	0.08547
D	N/A	N/A	N/A	N/A

Regarding the decrease in the number of questions, this round of enquiry could improve the confusion of experts in making comparisons. Therefore, after the reassessment process, all the CR results, as presented in Table 6, are lower than 0.10, which implies the consistency of all answers. The results conforming to an acceptable level were further used for calculating the supermatrix, weighted supermatrix, and limit supermatrix with the Super Decisions software. The results computed from the limit supermatrix interestingly presented weights of strategic concentration on the IC management of each firm, which can be benchmarked at the IC element level and IC indicator level, as shown in Tables 7 and 8, respectively.

**Table 7.** Results of strategic benchmarking at the intellectual capital element level.

Intellectual Capital Element	Calculated Weights (Ranks)			
	Company A	Company B	Company C	Company D
Human capital	–	–	–	–
Competence	0.123599 (3)	0.171582 (3)	0.411862 (1)	0.220086 (2)
Attitude	0.261768 (2)	0.377927 (2)	0.225928 (3)	0.165870 (3)
Intellectual agility	0.021036 (6)	0.014362 (4)	0.000000 (6)	0.000000 (6)
Structural capital	–	–	–	–
Organization	0.382153 (1)	0.422564 (1)	0.287489 (2)	0.407911 (1)
Relationships	0.098764 (5)	0.000000 (6)	0.052263 (4)	0.076467 (5)
Renewal and development	0.112681 (4)	0.013565 (5)	0.022460 (5)	0.129667 (4)

**Table 8.** Results of strategic benchmarking at the intellectual capital indicator level.

Abbreviation	Calculated Weights (Overall Rank, Rank in the Major IC Element Group)			
	Company A	Company B	Company C	Company D
HC	–	–	–	–
COM	–	–	–	–
C01	0.115974 (5, 3)	0.171582 (4, 3)	0.411862 (1, 1)	0.220860 (1, 1)
C02	0.007625 (15, 6)	–	–	–
ATT	–	–	–	–
A01	0.130884 (3, 1)	0.194359 (2, 1)	0.112964 (3, 2)	–
A02	0.128499 (4, 2)	0.181984 (3, 2)	0.112964 (3, 2)	0.165870 (2, 2)
A03	0.002385 (18, 7)	0.001584 (14, 5)	–	–
INT	–	–	–	–
I01	0.009948 (11, 5)	0.014362 (11, 4)	–	–
I02	0.011088 (10, 4)	–	–	–
SC	–	–	–	–
ORG	–	–	–	–
O01	0.188229 (1, 1)	0.060058 (5, 2)	–	–
O02	0.002113 (19, 12)	0.009857 (13, 9)	–	–
O05	0.008841 (13, 8)	0.016657 (9, 6)	0.018751 (10, 7)	0.099635 (5, 3)
O08	0.157055 (2, 2)	–	–	–
O10	0.012570 (9, 6)	0.205784 (1, 1)	–	–
O14	0.005612 (16, 10)	0.016599 (10, 7)	0.023883 (8, 5)	–
O15	–	0.021250 (8, 5)	–	–
O16	–	0.055518 (6, 3)	0.129060 (2, 1)	0.051248 (7, 5)
O17	–	–	–	–
O18	0.007733 (14, 9)	0.036841 (7, 4)	0.073833 (5, 2)	0.130421 (3, 1)
O20	–	–	0.041962 (7, 4)	–
O21	–	–	–	0.017295 (11, 9)
O22	–	–	–	0.109312 (4, 2)
REL	–	–	–	–
R01	0.004730 (17, 11)	–	–	–
R02	0.001937 (20, 13)	–	0.007466 (11, 8)	0.025489 (10, 8)

Table 8. Cont.

Abbreviation	Calculated Weights (Overall Rank, Rank in the major IC Element Group)			
	Company A	Company B	Company C	Company D
R03	0.009125 (12, 7)	–	0.044797 (6, 3)	0.050978 (8, 6)
R04	0.001088 (21, 14)	–	–	–
R06	–	–	–	–
R10	0.081884 (6, 3)	–	–	–
RD	–	–	–	–
RD01	0.055055 (8, 5)	0.013565 (12, 8)	0.022460 (9, 6)	0.082349 (6, 4)
RD02	0.057626 (7, 4)	–	–	–
RD03	–	–	–	–
RD05	–	–	–	0.047318 (9, 7)

Note: the example of segment RD05 in the vertical axis and Company D in the horizontal axis shows the value of “0.047318 (9, 7)”. Regarding the numbers in parentheses, the front number (9) indicates the ninth rank of the indicator RD05 in overall rank of IC indicators of Company D, whereas the back number (7) specifies the seventh rank of the indicator of Company D in the structural capital group.

Table 7 depicts the strategic benchmarking results of IC managerial concentration, which are mostly different among the firms in focus. Nevertheless, the top three organizations, which are well-known and high-performance firms (Companies A, B, and D), all considered organization capital as the most crucial IC element. Although Company C, the local Thai firm, did not identify the organization element as having the highest importance, it still considered this type of capital as the second priority. These results highlighted the preference of express courier companies in Thailand for this IC sub-element of structural capital. However, the IC sub-element of attitude was identified as having the second highest importance, especially for the international organizations, that is, Companies A and B. Nevertheless, the logistics firms (Companies C and D) that have major operating bases in Thailand considered this element as being the third priority. Overall, considering the first three priorities, which highlighted the strategic focus on IC management, all logistics firms similarly concentrated on the three elements of organization, competence, and attitude.

Although Table 7 depicts new and interesting results, including priorities and weights, which are not found in the traditional benchmarking approach, it still cannot provide details or specifically indicate the concentration on the performance indicator level. Therefore, the results of the in-depth investigation into the performance indicator level of IC management are depicted in Table 8. From Table 8, considering the rankings of measures in the overall elements (the front numbers indicated in parentheses), it is apparent that the managerial focus of each firm on the level of performance measures is significantly different in either the magnitude of concentration or the number of indicators assigned for the weights.

Regarding the above consideration, the overall analysis of all IC elements presents significant differences in the IC management of logistics firms. Therefore, to narrowly consider the specific perspective, analysis of the major IC elements—human and structural capital—was further carried out. The results from this process are presented by the back numbers in parentheses in Table 8.

The analysis of Table 8 demonstrated the magnitude of concentration on IC by each firm, which can provide the differences and gaps in managerial focus between the best player and other competitive firms. This can lead to the creation of an improvement plan for inferior companies. Furthermore, to gain more advantageous information from the survey results, an analysis of the quantitative usage of IC indicators was carried out, as shown in Table 9.

**Table 9.** Amounts of the intellectual capital measures used in the firms in focus.

Dimensions/Intellectual Capital Elements	Number of Applied Indicators (Ranking)			
	Company A	Company B	Company C	Company D
Intellectual capital (overall)	23	19	13	12
Human capital	7	5	3	2
Competence	2 (5)	1 (4)	1 (4)	1 (4)
Attitude	3 (3)	3 (3)	2 (3)	1 (4)
Intellectual agility	2 (5)	1 (4)	0 (N/A)	0 (N/A)
Structural capital	16	14	10	10
Organization	7 (1)	8 (1)	6 (1)	5 (1)
Relationships	6 (2)	5 (2)	3 (2)	3 (2)
Renewal and development	3 (3)	1 (4)	1 (4)	2 (3)

The results in Table 9 show that there are differences in the amounts of indicators applied among the benchmarked firms. The number of IC measures used by international firms was higher than that by firms mainly operating in Thailand. Furthermore, the international companies also applied indicators covering all six IC sub-dimensions that were more comprehensive and had higher amounts of applied indicators than local firms. Companies A and B, the international organizations, measured the IC performance through 23 and 19 indicators, respectively, for all six IC elements, while Companies C and D, local firms that have their main operating bases in Thailand, used only 13 and 12 measures, respectively, for all IC elements, except intellectual agility.

Considering the quantitative usage of measures for IC elements, the results apparently show that the top four measured elements were quite similar. All firms had ranked the same indicators as the first and second highest in terms of their application, which are organization and relationships, respectively. Nevertheless, the third rank was slightly different in some companies. Companies A and D ranked the renewal and development element as third, while Companies B and C ranked the amounts of measures of the attitude element as third.

The above results of the analysis phase highlight several differences between the best performers and other players, as well as, especially, between international firms and local companies. Based on these results, there are several managerial approaches of IC, especially for developing organizations that should be improved. Nevertheless, due to the limited resources and time of this research as well as the management authority in all studied firms, this study could not execute the integration and action phase. However, after the acknowledgment of the benchmarked results and recent follow-up, only the developing companies, which are local firms, aimed to apply the analyzed information as well as the benchmark measures to construct future IC improvement and management plans. For instance, Company C planned to include and manage unused IC measures, such as O01 and O15, that were applied by the international firm focusing on the cost control strategy, which is similar to the firm's direction. On the other hand, Company D, which adhered to the service quality, expected to elevate the service quality by utilizing more service-related activities, such as O02 and R04, following the best player in the market.

Therefore, in this study, the findings and their analysis could only reveal the managerial gaps as well as improvement opportunities and plans. Therefore, in the following section, analysis and discussion related to the results and improved method are presented.

## 5. Discussion

Considering the aforementioned benchmarked results of the IC element level, the logistics firms, which are courier express organizations operating in Thailand in this study, mostly considered organizational capital as the most crucial IC element. Three of the four companies—which included the best performer (Company A), a well-known international company (Company B), and the unofficial best local firm (Company D) in this business—similarly indicated that the weight of the organizational

element had the highest priority, and performance measures of this sub-capital also indicated the highest values in all of the companies in focus. The results emphasized the strong significance of the organization element for the logistics business. This conforms to past studies that highlighted the advantage of organization capital, which leads to the enhancement of competitiveness in the logistics business [54]. Moreover, the components of structural capital could bring various competitive advantages to logistics firms. For example, the information technology of a company supports the gathering of valuable knowledge about employees [55], and a patent could enhance the competitiveness of a logistics business [56].

Another critical IC element that was identified as being a top priority was competence. This type of capital was given the highest priority by the Thai national firm (Company C), while other companies considered it as the second or third priority. This prioritization of the competence element in the logistics business was similarly identified by a recent study [1]. The educational level of logisticians was also identified as a critical factor for the logistics business, since this business generally depends significantly on the workforce and on the competency of employees [57].

Attitude was another IC element identified as a top priority, especially by the best performer and another international firm. These high-standard companies already have highly competent workers. Therefore, regarding the experts' opinions, to utilize and maximize their capabilities, high dedication and good motivation of employees are identified as critical factors. Nevertheless, prior literature supporting this evidence is still weak [58]. Therefore, there is a need for future study on the management and measurement of attitude in logistics, which is similar to a suggestion by a recent study [1].

Although the analysis of the level of IC elements could highlight several improvement gaps and managerial practices of the organizations, it only provided rough details of IC management from the dimension perspective. Therefore, to deeply analyze the results with more specific details, analysis at the measurement level was similarly carried out. To specifically perceive the in-depth details, analysis of the indicator level was performed based on the major IC elements—human capital and structural capital. The results analyzed for human capital identified the apparent differences between the international companies and the firms mainly operating in Thailand. The international firms focused on employee satisfaction as the first priority, while local firms still concentrated on the knowledge and skills of employees. This difference in concentration implies their dissimilar management types, which depend on the situation and capabilities of the organizations. Regarding the minimum salary in the international firms, such firms could typically more easily obtain knowledgeable employees with higher competence than that of employees of local companies. Thus, the international firms aimed to focus on employee satisfaction first, since this attitude-related issue in the logistics business is significantly associated with the service quality and costs of service and transportation [59]. Moreover, this focus conforms with past evidence that identified that the general characteristic of service businesses was contact with customers, and found that employee satisfaction positively affects customer satisfaction, which could influence the company's ultimate goal—profit [60]. On the other hand, companies that have their main operating bases in Thailand still focus first on training employees to enhance their knowledge and capability. This finding is supported by past work that identified training as a fundamental factor of organizational development for sustaining and competing in the market [61]. In particular, training in logistics service operations could directly affect the competence and capability of logisticians [62].

Another critical IC measure under human capital, which was highly and similarly focused on by all logistics firms as the second priority, was the turnover rate of employees. This conforms to a past logistics study that indicated the importance of and difficulty in retaining employees and identified a trend of a high rate of resignation in this business [63]. One related study identified that the average rate of turnover in the logistics business was 13% [64].

Nevertheless, considering the priority of indicators in structural capital, the difference of concentration among companies was very high, especially for indicators that had moderate or low importance. However, the top three ranked indicators according to priority were still under organization



capital. Unsurprisingly, this sub-component of structural capital was indicated as a critical asset of logistics service providers for developing and managing strategies and operations [52]. The results analyzed in the previous section indicated that the international companies highly concentrated on the management of operations that do not conform to the quality standard. The focus on standard was identified as a crucial basis, especially in service organizations that were certified by the global standard [65]. On the other hand, the local logistics firms considered transportation accidents as the top priority (the first and second priorities of Companies D and C, respectively), since road traffic accidents are still a serious problem in most low- and middle-income countries, including Thailand [66]. Nevertheless, this problem is not serious in the developed countries where the main operating bases of Companies A and B are located. Therefore, transportation accidents were identified as the top priority for organizations primarily based in Thailand.

Even though the top priorities of IC management and measurement of structural capital were quite similar, especially within each group classified according to the local and international firms, when considering the concentration of indicators of each firm by specific priority, the rankings of indicators were quite different among the companies. This dissimilarity can be explained by a past study that emphasized that this difference originates from the dissimilar concentration on service operation and management [67].

The differences among firms are found with not only the weighting and priority identification of IC measures (Table 8), but also the numbers of indicators applied (Table 9). The number of IC measures applied in each organization was different. The international firms measured IC performance in all six IC dimensions, whereas primarily Thailand-based companies still ignored the consideration of the capital of intellectual agility. This limited consideration of IC elements is an underdeveloped issue found in logistics management literature [1]. The issue of limited concentration of local Thai firms on IC could obstruct the competitiveness of these firms, since the current intensive competition requires the management and measurement of all IC elements [11].

The above discussions provide in-depth analysis of the specific scopes of the logistics business and companies. However, another contribution of this study is that it academically proposes the improved approach to newly benchmark IC. This suggested method considers a specific characteristic of IC—the influences among IC elements [68]—that past benchmarking works still could not properly address. Although some attempts [9,44] were made to address this problem by considering the dynamic issues among IC elements, the past approaches could not determine the magnitudes and priorities of IC elements and indicators. Therefore, regarding this critical issue, this research applied the ANP to resolve the relational issue. Moreover, this improved benchmarking approach also includes a comprehensive IC management method—the thinking and non-thinking IC method—to deal with a wide range of IC elements and also sustainable capital. This improvement could support academic scholars as well as business practitioners to properly consider the fundamental characteristics of IC and to newly benchmark the important magnitudes of IC management. This approach could lead to benchmarked firms focusing on high-impact strategies. Specifically, the computed results could support underdeveloped firms to perceive the current focus of the best and better performers, and they could follow the best practices or develop and improve their management of IC to further compete in the market.

## 6. Conclusions

This research developed a newly integrated approach to improve on the deficiencies of the traditional benchmarking of IC. This distinctive method, including the thinking and non-thinking assets and ANP, was integrated with the generic benchmarking procedure, and this newly combined method was then applied to benchmark the strategic IC management of four companies—express courier service providers operating in Thailand. The results of strategic benchmarking could provide in-depth information about the concentration of IC management through priorities and weights of IC elements and indicators. These computed results highlight the crucial gaps and differences between the

best performers and other competing firms, and this could provide several improvement opportunities for undeveloped firms, especially local firms established by Thai founders or firms that mainly operate in developing countries such as Thailand. In conclusion, the proposed approach and its application can have several contributions, such as those below:

- Integration of the ANP could address the deficiencies of the traditional benchmarking approach by including the consideration of relationships among the considered elements. Furthermore, inclusion of the MCDM method could provide more beneficial results by indicating both the priority and magnitude of benchmarked factors, which could not be obtained from the traditional method.
- Comprehensive consideration of multiple dimensions of IC, which is critical for the current competitive situation and also sustainable development, was done through integration of the concept of thinking and non-thinking assets.
- Research was carried out on the comprehensive benchmarking of IC in logistics service providers, and as-yet-undiscovered results were revealed. The findings could provide in-depth information and highlight improvement opportunities for the sustainable development of local Thai firms.

For generalization of this study, the proposed method can be applied to other cases and industries that require IC benchmarking. The approach developed here can be used with different performance indicators suited to the industry. Therefore, more case studies should be done in other industries as well as geographic areas in order to validate and check the robustness and general applicability.

Even though the proposed method and its application could provide contributions in several dimensions, including IC management, benchmarking, and logistics management, some limitations of this study still exist, as follows:

First, not all major processes of benchmarking were carried out fully because, without the authority and due to limitations of both time and resources, this study was unable to support and mandate all four participating organizations to execute the integration and action phase of benchmarking.

Second, the proposed method was applied with a limited number of logistics case studies. Therefore, the applications and perceived feedback may not completely represent the strengths and weaknesses of the method.

Third, regarding the fundamental processes of ANP and benchmarking, the proposed method requires several participating organizations as well as enquiries, and also involves complicated calculations. Therefore, implementation of the method consumes higher resources and time than the traditional approach. It also needs a knowledgeable person who understands the concept of ANP.

Finally, based on the ANP method, although the input data—including the applied performance measures and the IC concentration of management, which was generally denoted by the resource consumption and budget allocation of the organizations—were based on the factual data of firms, the calculation process still requires experts' opinions to identify differences in the magnitude of influence between IC elements and between IC measures. Regarding this approach, the calculated outputs directly depended on the decisions of participating experts, and this may have caused the obtained results to vary based on the experiences of decision-makers. Therefore, to minimize the variation of outcomes, which would come from insufficient knowledge and experience of experts, a qualification of participants should be identified. In this study, the specified management level was aimed to filter capable experts who clearly understand the identification and concentrations of IC management of organizations. Nevertheless, as a basic characteristic and weakness of the ANP, it still should be noted that the calculated results will possibly vary if a participant is substituted and the new expert has a different opinion on or perception of the IC direction of an organization.

In conclusion, this study proposes an improved form of the benchmarking process that could address fundamental deficiencies of traditional benchmarking and provide crucial contributions in several dimensions. Nevertheless, there are both advantages and some limitations. The implementation of the proposed method is still limited in this study. Therefore, to comprehensively perceive more benefits and limitations of the method, further applications and practice should be carried out;

to address the limitations of the method, future research that improves the practical applications of the method should be conducted.

**Author Contributions:** Conceptualization, R.W.; data curation, R.W.; formal analysis, R.W.; funding acquisition, R.W.; investigation, R.W.; methodology, R.W.; project administration, R.W.; resources, R.W.; supervision, N.C. and G.N.; validation, R.W.; visualization, R.W.; writing—original draft, R.W.; writing—review & editing, R.W. All authors have read and agreed to the published version of the manuscript.

**Funding:** The authors are immensely thankful to the Higher Education Commission (OHEC) and Thailand Research Fund (TRF) for providing the research grant for new scholars (contract number: MRG5980023) in support of this research. This study was also partially supported by Chiang Mai University and the National Research Council of Thailand (NRCT).

**Acknowledgments:** The authors are sincerely grateful for the contributions of all concerned managers as well as executives who participated in this research.

**Conflicts of Interest:** The authors declare no conflict of interest.

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