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Logistics Outsourcing

The business practice of hiring a logistic service provider to carry out and manage a company's logistics requirements is known as outsourcing. This chapter has been carefully written to provide an easy understanding of the varied facets of logistics outsourcing such as the types of outsourcing and logistics network optimization.

Outsourcing

Outsourcing is the business practice of hiring a party outside a company to perform services and create goods that traditionally were performed in-house by the company's own employees and staff. Outsourcing is a practice usually undertaken by companies as a cost-cutting measure. As such, it can affect a wide range of jobs, ranging from customer support to manufacturing to the back office.

Outsourcing was first recognized as a business strategy in 1989 and became an integral part of business economics throughout the 1990s. The practice of outsourcing is subject to considerable controversy in many countries. Those opposed argue it has caused the loss of domestic jobs, particularly in the manufacturing sector. Supporters say it creates an incentive for businesses and companies to allocate resources where they are most effective, and that outsourcing helps maintain the nature of free market economies on a global scale.

Outsourcing can help businesses reduce labor costs significantly. When a company uses outsourcing, it enlists the help of outside organizations not affiliated with the company to complete certain tasks. The outside organizations typically set up different compensation structures with their employees than the outsourcing company, enabling them to complete the work for less money. This ultimately enables the outsourcing money to lower its labor costs. Businesses can also avoid expenses associated with overhead, equipment, and technology.

In addition to cost savings, companies can employ an outsourcing strategy to better focus on the core aspects of the business. Outsourcing non-core activities can improve efficiency and productivity because another entity performs these smaller tasks better than the firm itself. This strategy may also lead to faster turnaround times, increased competitiveness within an industry and the cutting of overall operational costs.

Examples of Outsourcing

Outsourcing's biggest advantages are time and cost savings. A manufacturer of personal computers might buy internal components for its machines from other companies to save on production costs. A law firm might store and back up its files using a cloud-computing service provider, thus giving it access to digital technology without investing large amounts of money to actually own the technology.

A small company may decide to outsource bookkeeping duties to an accounting firm, as doing so may be cheaper than retaining an in-house accountant. Other companies find outsourcing the functions of human resource departments, such as payroll and health insurance, as beneficial. When used properly, outsourcing is an effective strategy to reduce expenses, and can even provide a business with a competitive advantage over rivals.

Criticism of Outsourcing

Outsourcing does have disadvantages. Signing contracts with other companies may take time and extra effort from a firm's legal team. Security threats occur if another party has access to a company's confidential information and then that party suffers a data breach. A lack of communication between the company and the outsourced provider may occur, which could delay the completion of projects.

Outsourcing internationally can help companies benefit from the differences in labor and production costs among countries. Price dispersion in another country may entice a business to relocate some or all of its operations to the cheaper country in order to increase profitability and stay competitive within an industry. Many large corporations have eliminated their entire in-house customer service call centers, outsourcing that function to third-party outfits located in lower-cost locations.

Logistics Provider

First-Party Logistics (1PL)

A first-party logistic provider is any company that transports cargo, freight, goods or merchandise, and can refer to both the cargo sender (like a manufacturer delivering to customers) or the cargo receiver (like the retailer picking up cargo from a supplier).

Simply put, the entire logistics and distribution process is managed internally by the business. This method of logistics is relatively uncommon, as most businesses today outsource their logistics operations to external providers.

1PL Example: Australian red meat supplier Samex is a 1PL as it exports goods to wholesalers, distributors and supermarket chains worldwide using its own logistics operations.

Pros of 1PL:

- Complete control of the logistics and fulfillment process.
- Control of quality processes.
- Control over packaging and transportation.

Cons of 1PL:

- The business must own and be responsible for every facet of the logistics process.
- High-quality fulfillment is expensive and requires additional infrastructure, staff, equipment, etc.

The 1PL approach is typically used by large companies that have the volume and infrastructure to manage their entire supply chain internally.

Second-Party Logistics (2PL)

A second-party logistics provider handles the transportation component of the supply chain and is responsible for getting a company's goods from A to B. 2PLs lease or charter their own transportation – such as ships, trucks, or planes – to companies, and they can also be contracted to transport freight. A logistics provider that only transports goods over a certain part of the supply chain could also be classified as a 2PL.

2PL Example: Any freight forwarding company such as World Cargo Transport Inc. headquartered in Woodbridge, New Jersey, is a provider of logistics services to and from almost anywhere in the world.

Pros of 2PL:

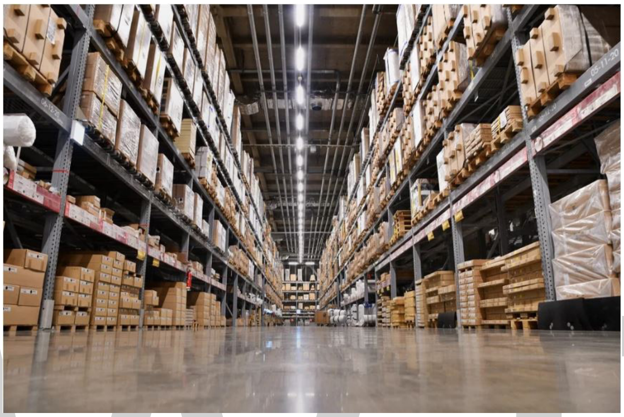
- Flexibility in terms of what components of the supply chain are outsourced.
- Different modes of transportation available.

Cons of 2PL:

- Typically not a full-service logistics solution.

2PLs are suited to companies that want a segment of their supply chain managed externally (such as transportation from a warehouse to a dock) but would prefer to manage other parts of the supply chain internally.

Third-Party Logistics (3PL)



A third-party logistics provider provides outsourced logistics services to companies. These services can make up part or sometimes all of their supply chain management functions, including:

- Inventory storage and management
- Picking and packing
- Freight forwarding
- Shipping/distribution
- Customs brokerage
- Contract management
- IT solutions
- Cross-docking

3PL Example: UPS are a well-known example of a third-party logistics provider. They offer all the services listed above and more, and operate on a global scale.

Fulfillment by Amazon is also a type of third-party logistics provider. However, it comes with restrictions in terms of allowable products and packaging requirements, and services are more limited than some other 3PLs.

Pros of 3PL:

- Finding the right 3PL can save you time and money, through economies of scale (eg. Shipping Rates).

- It works well with both local and international distribution, and you can get speedier delivery by benefiting from their multiple storage locations.
- It works well for a fast growing business with large order volumes.
- You can still opt to control customer service and returns.

Cons of 3PL:

- You have less control over your inventory and the customer experience.
- Finding the right provider who you can trust and rely on can be time consuming.
- 3PL can be an expensive cost, especially when you only have small quantities of orders.
- Generally, 3PL providers won't handle perishable, hazardous, or flammable goods.

3PLs are suited to small-to-medium-sized businesses that want to take advantage of the operational power of an external logistics company but still want some control over their supply chain.

Fourth-Party Logistics (4PL)

A fourth-party logistics provider essentially takes third-party logistics a step further by managing resources, technology, infrastructure, and even manage external 3PLs to design, build and provide supply chain solutions for businesses.

4PL services typically encompass 3PL services as well as:

- Logistics strategy,
- Analytics including transportation spend, analysis, capacity utilization, and carrier performance,
- Freight sourcing strategies,
- Network analysis and design,
- Consultancy,
- Business planning,
- Change management,

- Project management,
- Control tower and network management services, coordinating a wide supplier base across many modes and geographies,
- Inventory planning and management,
- Inbound, outbound and reverse logistics management.

4PL Examples: Deloitte provides 4PL services that go above and beyond traditional 3PL by offering strategic business insights and consultative services in addition to logistics execution.

Pros of 4PL:

- Outsource the entire logistics segment of a business.
- Take advantage of strategic advice in addition to operational support.

Cons of 4PL:

- Little control over logistics and fulfillment processes.
- Likely to be expensive.

4PLs are a relatively new concept, but typically they're sought out by medium to large sized businesses that are seeking a complete logistics solution from both an operational and a strategic perspective.

The Difference between 3PLs and 4PLs and other Logistics Providers

The difference between 3PLs, 4PLs and other 'PL's is highly debated, even among experts in the supply chain industry. The simplest way to think about it is that each successive type of logistics provider offers greater involvement in the supply chain than the last.

As for which one will work best for you, that depend on your business model, infrastructure, budget, and how much control you want over your supply chain.

Logistics Outsourcing

Logistics Outsourcing can be defined as the strategic use of outside parties (business independency) to perform activities traditionally handled by internal staff and resources. Allyn allocates resources to your company in order to manage your supply chain. We work as an extension of your company, exercising your strategy and driving your initiatives. Our objective is to lead your business to logistics best practices, providing logistics expertise & consultancy support, optimizing your processes and your supply chain.

Logistics outsourcing is one of the fastest growing areas. The number of outsourcing companies and logistics service providers has increased dramatically and competition has intensified. Both, outsourcing companies and service providers, face great challenges in their outsourcing venture. A better understanding of success and failure factors and the concerns involved is needed so that outsourcing companies can take better advantage of the outsourcing opportunity. Since the early

1990s, there has been a significant increase in the number of organizations that have decided to outsource all or some aspects of their logistics function. As a result, research into logistics outsourcing has also increased. A careful review of existing literature reveals a mismatch between theory and practice in outsourcing. Collectively, these studies suggest that outsourcing companies should take great care in what, how and whom they choose to outsource an activity. Such research papers have limitations and are not useful to everyone, as organizations have their own unique circumstances. There is a need to gain insight into the key success factors to logistics outsourcing so that others can learn from their experiences.

Reasons to Outsource Logistics

Logistics services are very critical for any business involved in the transportation of goods from one point to another. Managing the entire set of operations on your own can prove to be too complicated and taxing, especially if you have other pressing matters on hand. As the costs of transportation related to logistics increases every year, it is only fair to think of outsourcing your logistics service requirements to a reliable company, thereby reducing costs significantly.

Outsourcing your logistics services requirements to an external service provider or a Third Party Logistics (3PL) company can prove to be a wise decision in the long run. Such logistics service providers mainly deal in services such as transportation, warehousing, delivery, and other related operations. They are growing rapidly by day, offering superior outsourcing strategies and transition plans at cost-effective rates. They work hard for their clients and make sure that they provide customized logistics services, as desired by their clients.

Reasons for Outsource Logistics Operations

There are many reasons to outsource logistics services, but you first need to understand how outsourcing will affect your business and whether it will save you costs or not. Some of the main reasons to outsource logistics services include:

1. Freedom to Focus on Critical Operations: Instead of trying to perform logistics services in-house, outsource it to a company that has in-depth expertise and experience in carrying out

logistics operations with ease. This in turn will help you free up your resources and allow them to focus on other critical operations.

2. Reduced Back-office Work: Most 3PL outsourcing service providers have sufficient manpower and the desired systems already in place. They can process thousands of bills and audit them appropriately within short time. Outsourcing logistics back-office tasks to professional vendors therefore frees up your time and increases productivity.

3. Enhanced Customer Satisfaction: Most service providers specialize in logistics services only. They know the domain better than others and can come up with innovative ideas and strategies to further reduce costs for their clients, as well as deliver better experience. This leads to enhanced customer satisfaction and builds partnerships which can last a lifetime.

4. Reduced Liabilities: The logistics service providers help to manage all inter-connected carrier contracts, safety ratings, and insurance certificates. More often than not, they have a back-office staff ready to work with invoicing variances, carrier vetting processes, etc. This means you stand to face zero liabilities as all the grunt work gets taken care of by the service provider.

5. Efficient Handling of Petty Expenses: Small expenditures like insurance costs, docking costs, transportation, or fixed warehouse costs are all taken care of by the logistics service providers. You do not have to deal with petty expenses, thereby freeing up your accounting department's time.

6. Economies of Scale: You might end up spending a lot on trying to scale up your existing team to perform logistics services in-house. However, a third-party logistics service provider can help you achieve economies of scale as they specialize only in providing logistics services, thereby being able to ramp up or ramp down services within short intervals.

7. Efficient Real-time Tracking: Most 3PLs are technologically adept and allow for real-time tracking and visibility of loads. Some of the more popular service providers even provide integration with WMS and ERP. By being able to track your shipments with ease, you spend less time worrying and more time focusing on other core areas.

8. Other Relevant Benefits:

    - Good warehouse management system (WMS) ensuring safety of your goods;
    - Control remains with you, the client;
    - Easy outsourcing operations process with duly signed documentation.

Selection of Appropriate Service Provider

Once you decide to outsource logistics services, you need to spend time identifying the right service provider. Then, you need to make a detailed outsourcing plan with the service provider of your choice and get started. Specialist logistics service providers or companies that only specialize in providing logistics services, usually have detailed knowledge about transportation management services, customs brokerage, logistics consulting, freight forwarding, logistics information systems, warehousing, and other related domains. Some of the factors to consider include:

- Review critical aspects like gap analysis, cost analysis, supply chain operations, and feasibility of outsourcing, among other aspects.
- Identify the service providers' expertise - number and capacity of warehouses, transportation system, procurement process, customer service channels, etc.
- Check if major logistics processes such as pre-receiving, receiving, inbound inspection, pick up and drop, etc. are in-place, and to what extent.
- Perform a competitor analysis for cost-to-benefit ratio and check their customer interaction levels, back-office support, exceptional incidence rates, performance index, etc.

Types of Outsourcing

There are four types of outsourcing:

1. Manufacturing outsourcing: Company can outsource a part of manufacturing processes or the whole manufacture to a provider or to other companies in order to work together further. Manufacturing outsourcing gives companies the opportunity to focus on production of new products in order to gain a competitive advantage and to increase the flexibility of manufacture.
2. IT-outsourcing: The most popular type, which means full or partial outsourcing of IT functions. One of the main reasons for IT-outsourcing is the lack of high-qualified personnel.
3. Knowledge Process Outsourcing: KPO. This type is usually used used for receiving necessary knowledge from consulting companies in order to make a decision.
4. Business process outsourcing, BPO: BPO is the process of delegating a company's business process or parts of this process to third parties or external agencies. Particularly this type of outsourcing is regarding in this study.

Usually, outsourcing is based on long-term relationship and involves several activities. Outsourcing is continuously becoming more popular because of the development of IT and logistics technologies. It is difficult for companies to follow all these innovations and implement them by using existent personnel. It appears that usually it is easier for companies to appeal to a logistics service provider rather than extend own logistics departments by creating and using expensive warehousing and transportation facilities.

The main classification features of outsourcing are:

1. According to economic sector: industrial, commercial, building, medical etc.
2. According to the types of logistics services: transportation, warehousing, marketing, consulting etc.
3. According to the amount of power provider receives from a company: full outsourcing, partial outsourcing and joint outsourcing.

4. According to the location: insourcing, outsourcing and offshoring.
5. According to the time: long-term (contract for more than five years), urgent (for one time), seasonal.

In order to make a decision to outsource it is necessary to regard all the classification features as there are different types of outsourcing in each group.

Business Process Outsourcing: Outsourced Logistics Services

BPO focuses on services: Service undertakings tend to be less capital-intensive than manufacturing companies and that is why there is usually a large supplier base. The range of logistics functions that can be outsourced are listed below on the picture. All the numbers are taken according to 2016 Third-Party Logistics Study.

Table: Outsourced Logistics Services.

Outsourced logistics services	Percentages of users
Domestic transportation	80%
Warehousing	66%
International transportation	60%
Freight forwarding	48%
Customs brokerage	45%
Reverse logistics (defective, repair. return)	34%
Cross-docking	33%
Freight bill auditing and payment	31%
Transportation planning and management	28%
Inventory management	25%
Product labeling, packaging, assembly. kitting	22%
Order management and fulfillment	19%
Service parts Logistics	12%
Fleet management	12%
Information technology (IT) services	11%
Supply chain consultancy	11%
Customer service	7%
LLP /4PL services	6%

As it is written in Table, the most popular activities to outsource are domestic transportation (80%), warehousing (66%), international transportation (60%), freight forwarding (48%) and customs brokerage (45%). The less frequently outsourced activities relate mostly to consultant and IT sphere.

On the whole, all the operations that can be outsourced can be divided into three categories:

1. Physical logistics and delivery:

- Transportation
- Manufacturing

- Packing
- Physical flow of goods

2. Non-physical logistics (Information):

- IT services
- Operations management services

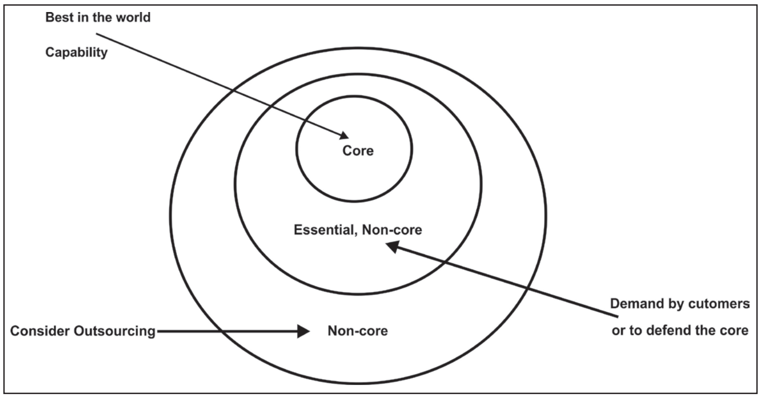
3. Reverse-logistics:

- Returns
- Disposal of goods
- Flow of physical goods from downstream to upstream

The main concept of outsourcing services is that there is no need to use the company's own resources to carry out logistic operations. Service providers are able to provide a wide range of logistics services at affordable prices, thus making a significant contribution to the development and increase of business profitability and competitiveness of companies in the global economy.

Core and Non-Core Activities

Every company should decide how many and which particular activities to outsource. This decision is based on the definition of core and non-core activities. Core activities are activities which determine the competitive success of the company. Core activities are relevant for the companies in order to gain high customer value and that is why it is obvious that non-core activities should be outsourced. However, it is essential to regard the company's ability to compete in performing the core activities and make cost analysis.



Core and non-core activities.

According to the information in Figure , the list of activities that are better not to outsource can be created:

1. Core activities which bring company the biggest profit.
2. Activities in which company is specialized and has a good knowledge base.

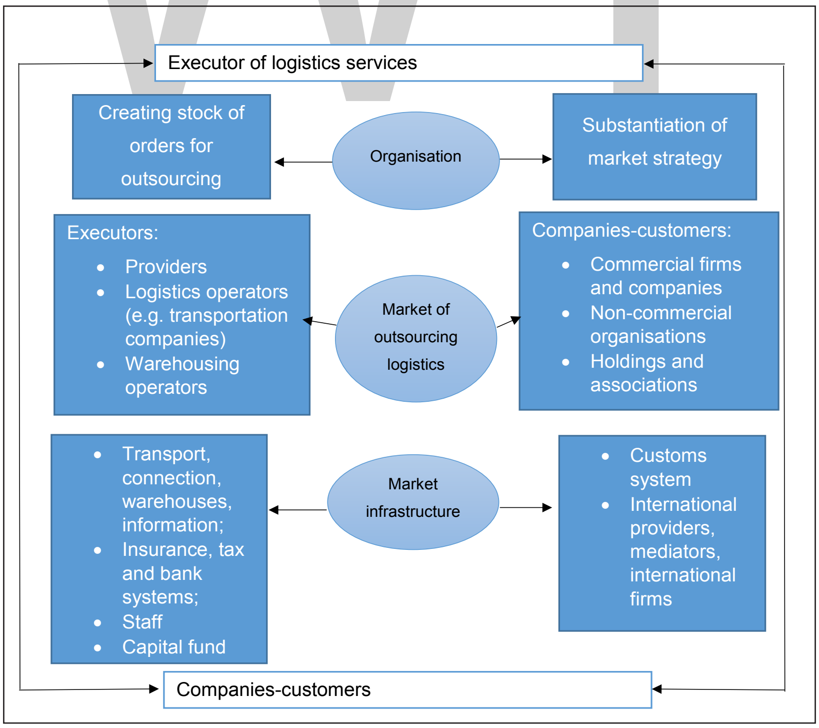
3. Functions with high customer impact, because in case of outsourcing company loses a part of the control for customers' feedbacks and has no possibility to react fast.
4. Activities that are inefficient and currently cause different challenges for a company. It is better initially to solve all problems in-house.
5. Activities that requires specialized knowledge. For example, company may have a specific technology, which was created particularly for some activities. Moreover, this technology is the property of the company.

Companies can outsource their logistics completely or just partly. It is their decision, but the issue that all the companies should regard in order not to fail is core activity which provide them with biggest profit.

The Market of Outsourcing Logistics Services

The market of outsourcing logistics services is a whole set of firms, companies, agencies, groups that are providing different types of services in different fields of managing the material flows. The development of the market of outsourcing logistics services influences economic development. American scientist P. Doyle said, that at the beginning of the 20th century the main field was automobile industry, at the middle of the 20th century it was computer industry and at the end of the previous century particularly executors of outsourcing services provided economic development for the country and new working places.

The scheme of the market of outsourcing logistics services is shown in figure.



- The scheme of the market of outsourcing logistics services.

The successful result of this system depends on the ability to build effective communication, to establish market infrastructure and to create an effective strategy.

Reasons for Outsourcing

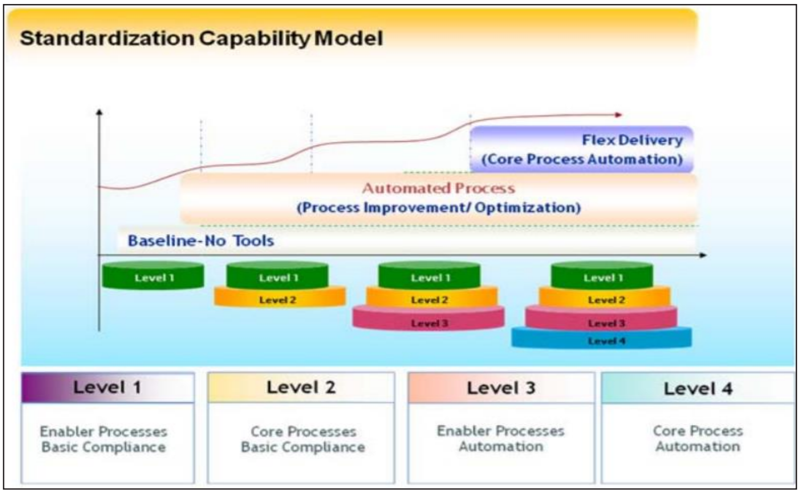
Each year, the number of companies that decide to outsource is increasing. No doubt, a company can receive many benefits by choosing outsourcing. The most essential benefits that encourage companies to outsource are written below:

- Cost reduction. Delegation of some processes to a third party will lead to a significant decrease in inventory, transportation, warehousing and personnel costs,
- Focus on core activities that are more vital for a company,
- A competitive advantage, as a result of the previous reason,
- Increase of efficiency, flexibility and productivity,
- Increased quality,
- Outsourcing means integration which gives the opportunity of receiving new contacts, new experiences, new possibilities and new ways of thinking,
- Risk reduction as the high-qualified personnel of the third party will be responsible for all the processes and all the facilities providing for it,
- Advantageous usage of resources,
- Decrease in necessity of using own technologies and getting the access to using innovations,
- Improvement of customer services, expansion of market knowledge,
- Improvement of figures. According to the Capgemini 2015 Annual 3PL Study companies who outsourced part of their logistics to 3PLs gained average savings of: 6% order fill rate increase, 5% order accuracy increase, 9% logistics costs reductions, 5% inventory cost reductions, 15% logistics fixed-asset reductions.

According to the joint research in 2013 by KPMG, the audit, tax and advisory firm, and Hfs Researsh Ltd, the leading analyst authority, 43% of the 399 companies decided that cost reduction is the most essential aspect of outsourcing decision and 44% regard it as important. The second most important reason for outsourcing was the increase of flexibility, and the third significant factor was "Standardized processes".

The last reason should be regarded separately because it includes different aspects. The application of standardization is divided into four levels.

The first level is establishing a correspondence between enabler processes and standard practices. Further practices are divided into "one time setup" and "ongoing". On the second level, core processes are taken into account. Levels 3 and 4 refer to automation. Initially, this concerns enabler processes. Afterwards there is an automation of core processes which leads to the development of processing platforms.



Standardization Capability Model.

Risks of Outsourcing

Outsourcing seems to have many advantages. However, outsourcing also brings with it many risks. Company can wait up to two years before receiving benefit. Before making such an important decision, each company should estimate these risks and regard all the possible consequences. The risks that company may face are:

- Unrealized savings with a potential for increased costs. Usually cost reduction is one of the main reasons for outsourcing. Nevertheless, it does not mean that company will reach the optimization in cost control.
- Reducing work places for own employees may lead to losses of high qualified personnel.
- Poor contract or wrong selection of partner.
- Supplier problems (poor performance or bad relations, not giving access to best employees or technology).
- Over-dependence on a provider. Some companies regarding a service provider as a “hero” who is going to solve all their problems and starting to trust it all the processes. However, in reality at first company should count on itself, make decisions independently and consider a service provider as an adviser.
- Loss of control/core competence. It can be a result from the previous point or a result of wrong selection of a supplier.
- Loss of corporate knowledge and future opportunities.
- Dissatisfied customers. As a result of bad service provider’s performance.
- Lack of experience in planning or controlling an outsourcing initiative.
- Decreasing flexibility. It is very important for companies to have the ability to react fast to customer needs.
- Damaged data security.

Nevertheless, each country has their own main risks. The main risks in Belarus are:

- High cost of service: The trend of outsourcing is rather new in Belarus, because of that there is a high cost especially in warehousing services as there is a lack of warehouses providing all the required facilities. At the same time, currently this market in Belarus is developing very fast and the number of provider is increasing. That leads to decrease in cost of services.
- Lack of offered services and quality of services: The reason for that is lack of experience of providers. However as it was written above market is developing and this risk is almost gone.
- Possibility of losing confidential data in case of wrong selected provider: The most essential risk is the risk of choosing dishonest provider.

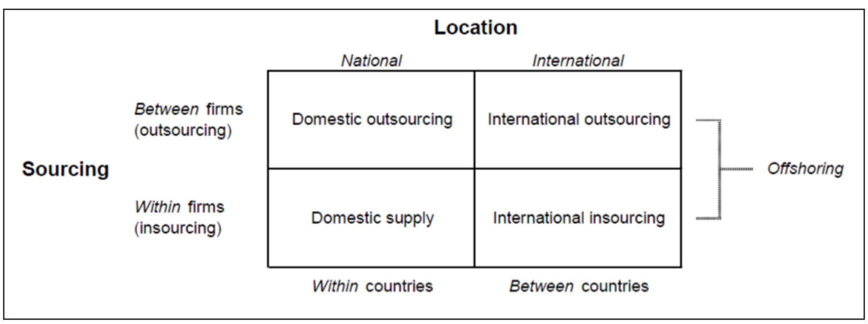
The main risks in Finland are:

- Quality: For Finnish companies quality plays an essential role. That is why the risk of receiving bad quality of services is the main.
- Damaged data security: Safety provides companies co with confidence in a right selected provider.
- Proper documentation: For Finnish companies which work with Russia it is very important to prepare all the necessary and proper documents due to differences in regulations.

According to the information above the only common risk among the main ones is the fear of losing confidential data. All the main risks in Belarus are existing due to the relative novelty of the trend of outsourcing and lack of experience of providers. In Finland, companies mostly take care about the quality as there are many providers but not every is able to provide with proper quality and all the necessary required documents.

Offshoring

When regarding the risks, it is essential to take into account the type of outsourcing. As was already written, companies can decide to outsource their activities to third party firms based in other countries. In this case, this is called offshoring.



Types of outsourcing.

This type of outsourcing is more risky than the domestic alternative because in this case companies should also take into account the risks they may face in another country. Risks have been divided into three parts: risks related to the company itself, risks related to the service provider and risks related to another country.

Company's Risks

If the company decided to offshore some activities or processes, it is necessary to regard the problems it may face afterwards.

At first it is relevant to understand that the contract should be written carefully and the rights of both sides must be understandable. Nevertheless, a company cannot control all the actions of a Foreign Service provider, and this means that the provider can cheat and act illegally behind the company's back. For instance there is a risk of losing intellectual property.

There is also a financial risk connected with unpredictable costs that can be caused by many different reasons.

Risks Related to Service Provider

The main risk is connected with the selection of a proper service provider, especially of a foreign one. The company may not even realise that it already has problems with its service provider as the company cannot control all the actions of a foreign provider.

Despite the fact that provider plays a role of saviour for the companies, still some unpredictable situations due to different circumstances can occur, such as failures in processes, delays in delivering services or problems with technologies. These may lead to an increased number of dissatisfied customers and decrease the number of customers.

On the other hand, these situations can be caused by premeditated actions of the service provider, for instance by stopping investing in employees or hiring employees whose qualification is not as high as it was agreed.

Risks Related to Another Country

These risks are quite understandable as each country has their own political and regulatory system. Before choosing the country for outsourcing, companies should pay attention not only to economic factors that will help to reduce costs but also to the political situation of this country. In addition, the culture should be taken into account. Different countries have different cultures. These differences concern language, values and traditions.

One of the main reasons for offshoring services is that optimizing global production will result in continuous shifts and lower costs. Nevertheless, nowadays the trend of nearshoring is actively developing. The reasons for this are concerning mostly the distance and impossibility of feeling close to the business. The main benefits of nearshoring are:

- Faster reaction and reply,
- Fewer problems with cultural aspects,
- Lower environmental impact,
- No problems with time differences,
- Possibility of frequent meetings and due to that establishing reliable relationship.

However, it is more profitable to offshore as near shoring requires higher costs. At the same time, reduction of distance problems allows the company to take more control over the operations. Companies need to decide what is more essential for them.

Drivers of Outsourcing

Based on all the benefits and risks, the drivers of outsourcing can be defined: cost, quality, finance, core business, cooperation, human resources. By controlling and decreasing costs, a company can strengthen its competitive position. Quality means access to skills, increase in quality demands and gaining competitive advantage. Financial driver means investment budget of the company. The funds should be used for investments in core business activities. Core business itself is a main activity that makes a profit for a company. Cooperation is an essential part in outsourcing as it can lead to misunderstandings. Human resources management means unavoidable changes in work process, hiring new qualified personnel and losing reliable old one at the same time.

Risk Reduction

As it was mentioned above there many risks company may face when decided to outsource. However, there are some actions that companies can undertake in order to reduce risks. Mostly these actions concern contract as this is the base of the partnership. According to Srabotic A. “company should use performance based contracts and it is better to address sources of potential problems at the contract stage. The contractor must have necessary skills and management competence”. It is better to use more than one contractor and “primary contractor should be responsible for their sub-contractors. Company should have contract terms allow company to react to an emergency by funding overtime, extra resources or specific direction of resources to the emergency on hand”. The actions concern not only documentation. “Company should remain in-house strength including all the facilities and personnel and should be ready to remain with in-sourced solutions”.

Consequences

After regarding all the benefits and risks it makes sense to pay attention on the consequences that company may face after outsourcing.

The consequences can be financial measurable or just visible. Maintenance costs include operating costs, subcontracting costs (supplier’s selection, negotiation costs), costs of facilities, costs of spare parts, costs of logistics, environmental costs, costs of quality, and other costs.

Table: Consequences of the benefits.

Benefits of maintenance outsourcing	Financially measurable consequences	Hard –to-measure consequences
Increased quality	Deceased costs of quality	Improved company image, increased customer satisfaction
Efficiency	Deceased costs of quality	-
Increased safety	-	Improved company image, increased employee motivation
Cost savings	Decreased maintenance costs	-

Focus on core competences	-	Increased employee skills
Economics of scale	Decreased maintenance costs	-
Increased flexibility	Decreased maintenance costs	-
Acquiring superior know-how	Decreased maintenance costs	Increased employee skills

In order to estimate annual benefit from outsourcing, companies may use the formula:

$$NB = C_0 - \frac{c_1}{\alpha \times \beta'}$$

Where,

NB – yearly monetary net benefit.

C_0 – yearly maintenance costs before outsourcing.

C_1 – yearly maintenance costs after outsourcing.

α – an index describing the change in the quantity of assets to be maintained.

β – an index describing the change in the general cost level from time 0 to time 1.

The consequences that are not measurable are also essential as they strengthen the company's image and improve both customer's satisfaction and employee's skills which have a positive influence on the company's position in the market.

Table: Consequences of the risks.

Risks of maintenance outsourcing	Consequences of the risks
Inability of the service provider	Increased maintenance costs.
Decreased work morale	Negligence in operating assets, protests induced by employee firings.
Lost know-how	increased maintenance coats if the service relationship comes to an end.
Dependence on the service provider	worsened terms of contract, increased maintenance coats if the service relationship comes to an end.
Additional or hidden costs, unrealized benefits	During the service relationship worsened terms of contract or decreased quality of maintenance Work.
Threatened data security	Competitors May know the information.
Decreased flexibility	Commitment to the maintenance contracts despite economic condition.

Lost company image and customers	Worsened company image through outsourcing announcement and employee firings, negative publicity. through service provider actions.
Risks related to partner selection	Inadequate terms of contract, service provider opportunism or bankruptcy.

The table shows the consequences of long-term risks and risks that might decrease later. According to a traditional risk assessment process, the expectation value of the risk is calculated by multiplying the cost effect of the risk by the probability of the risk. However, in case of outsourcing, it is hard to define the exact cost effect and the probability.

Make-vs-Buy Analysis

The decisions about outsourcing are mostly based on an economic make-vs-buy analysis. This analysis concerns the choice of whether to provide a particular process or activity on your own or to buy it from a supplier. In other words, the company needs to decide between insourcing and outsourcing. Insourcing means the centralization of all the functions under the guidance of one business. That increases the level of control, but at the same time the expansion of the number of processes leads to decrease in efficiency. One of the logical solutions to this problem is outsourcing.

Table: Reasons for “make” and “buy”.

Reasons to “Make”	Reasons to “Buy”
Risks of choosing a wrong provider	Focus on core activities
Guarantee of good service’s process	Cost savings
Redundant amount of personnel or facilities	Gaining new technical opportunities
Good service’s quality	Lack of facilities
No need in personnel’s discharge	Alternative source of services
Protection of property rights	Lack of money resources
Expansion of the company	Gaining competitive advantage

Decision processes for make-or-buy includes four stages. At the first stage, the company regards all the possible risks and the opportunities to manage them. The project leader is responsible for that. However, in order to avoid failures, unexperienced companies can also hire an independent advisor who can maintain the deals and provider relationships itself. After this stage, the company continues with detailed evaluation. The main issue in evaluation is a definition of core activities. As was written above, this is one of the main criteria of which activities to outsource. It is also essential to consider the main motives and objectives and compare them to the company’s strategy. Companies that start to outsource without clearly understanding what they want will not succeed in improving services. It is clear that one of the main objectives remains cost reduction. Due to this an analysing stage which includes costs estimation is an important step in the make-or-buy decision process. The costs that are need to be regarded: salaries, benefits, training and education, specialised software, travel, phone charges, amortisation, mail costs and postage, office supplies, equipment, management time, information costs and occupancy charges. The last stage is a selecting stage. The process of choosing the right provider includes defining the company's needs, considering the marketplace and finding potential providers.

Logistics Service Providers

The appearance of Logistics Services Providers (LSP) is caused by the increase in the amount of services companies want to outsource. Service providers offer a variety of logistics innovations, opportunities and different solutions.

Type of Providers

Logistics outsourcing contains 5 levels from IPL to 5PL providers:

1. 1.IPL means in-house logistics. Usually the representatives of this type are small companies which provide all the services by themselves using their own resources, facilities and staff.
2. After expanding, companies can apply to a logistics service provider – 2PL. 2PL provides companies with basic necessary functions such as transportation, material handling and warehousing.
3. The next level is third-party logistics. 3PL performs the whole logistics process and offers the variety of logistics activities. Services that 3PL offers:
   - Monitoring material flows through IT,
   - Customs procedures and documents,
   - Monitoring of documents,
   - Delivery's planning,
   - Warehousing services,
   - Value added logistics services.
4. Fourth-party logistics is a new type of provider that offers services concerning projecting and planning supply chains. 4PL is an evolutional development from 3PL. The main advantage of 3PL is the possibility to act on behalf of the client while they may be part of a joint venture. Services that 4PL offers:
   - Monitoring, planning and optimization of supply chains,
   - Integration IT systems,
   - Monitoring of orders inside supply chains,

- Optimization of delivery process,
- Managing stocks inside supply chains,
- Monitoring of documents,
- Monitoring of quality.

5. Fifth-party logistics is developing in response to appearance of e-commerce. The key component of 5PL is IT.

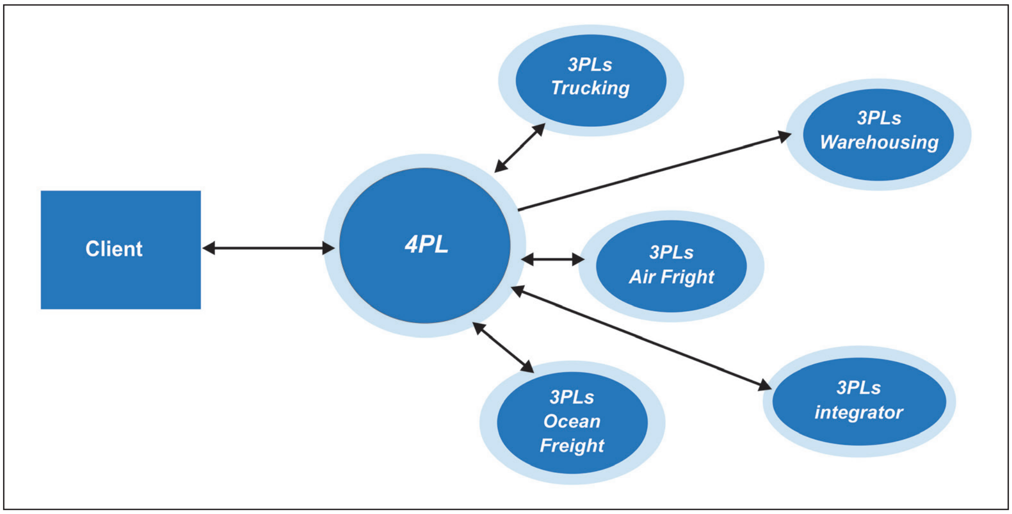
3PL and 4PL Providers

The most popular types which offer a wide range of services are 3PL and 4PL. The concept of Fourth-Party Logistics (4PL) Provider was first defined in 1996 by Accenture in order to integrate and manage a company's logistics resources and LSP partners including 3PL providers.

Nowadays there are different ways of possible appearance of 4PL providers:

- 3pl provider is developing till the level of 4PL.
- Consulting company acts like 4PL.
- Company that offer IT services is becoming 4PL provider.
- Joint organization in supply chain is modifying to 4PL provider.

A 4PL is regarded as a strategic partner as well as a supply chain integrator that combines and manages the resources and facilities of its own organization with those of other service providers to create an optimal solution. A 4PL company creates the connection by managing and integrating the material flow between the client and 3PL providers inside a logistics network. In comparison to 4PL provider, 3PL providers offer only the coordination. 4PL and 3PL are not competitors, they supplement each other as 3PL owns facilities for transportation and warehousing and 4PL uses them to generate the best solutions to the clients.



4PL as an integrator.

There are different models of 4PL. It can act as:

1. Lead logistics provider: In this case 4PL provider's responsibilities include transport invoicing and control of 3PL providers.
2. Solution integrator: In comparison to the previous variant as a solution integrator 4PL takes part in selection of 3PL and acting on behalf of the client.
3. Industry innovator: As an industry innovator 4PL create a solution too many clients not for any single client.

Sometimes it is hard to define the difference between 3PL and 4PL providers and some specialists even doubt if 4PL exists in reality. In respond to that, some sources separate from 4PL another type - Lead Logistics Provider (LLP).

According to this view, LLP is an organization of 3PL level but with additional facilities which allow to optimise supply chains.

In order to define the differences between these types, the table below shows the main features and examples of different providers:

Table: Type of providers and their main features.

Type of provider	Main features	Examples
3PL	1. Integrated warehousing and distribution 2. Creating and supporting logistics IT system	DHL Supply Chain
	1. Monitoring delivering process 2. Owning and buying logistics facilities 3. WMS	DB Schenker
LLP	1. Experienced specialists in logistics 2. Owning the facilities for cost optimization 3. Optimization 4. Managing of 3PLs 5. Continuous improvement of quality of service	Ford DHL
4PL	1. Planning and optimization supply chains 2. Providing deals 3. Managing IT 4. Integration of services, systems and information 5. Continuously innovative 6. Understanding the entire supply chain	Samsung Accenture 4PL Services Amazon.com

However, the disadvantages of 4PL are:

- Reliance on partners to provide the service.
- Reluctance on the part of 3PLs work for 4PLs.
- Confusion as to who are the true 4PLs.

The key issue of the success of 4PL is the ability to provide clients with the most optimal solutions due to the high level of professional competencies and the involvement of reliable and qualified contractors - 3PL-providers.

There are some important questions that a company should answer once the decision to outsource has been made. According to Waters, the main questions concern initially the strategy a company currently has and what strategic changes it is expecting as it is very important to combine the company's strategy with the strategy of a chosen provider because partners with different aims cannot have long-term relations. Before starting a relationship, it is also essential to establish the borders to outsourcing. Boundary process is challenging the added value services in order to reach a success. After that, the important step is to choose the evaluation method for selecting a provider in order to prevent risks. The next question concerns considerations about success and failure. In order to stimulate and ensure the partnership, all the bonuses for meeting desirable targets should be discussed in advance as well as penalties for poor performances. The main issue of an effective relationship is respect and readiness to work together. That is why a company should consider the ways of reducing misunderstandings. The last question regards the problem of connection between the organizations as there is need not only in data linkages but also in connection between management and administration of both sides.

Selection Process

The selection of a provider and the related key factors are very essential in business today. The most important factor remains cost. Nevertheless, there are many factors to consider:

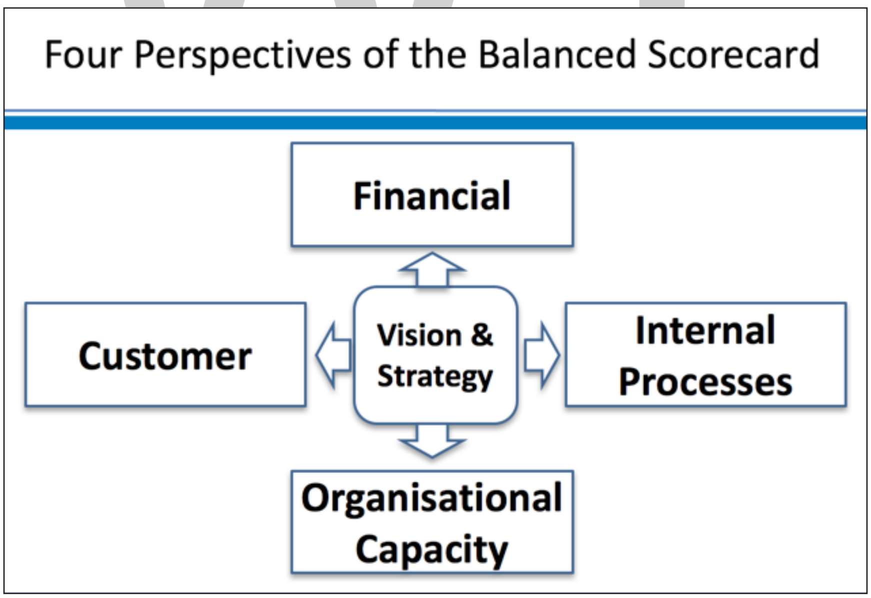
1. Focus of a provider on continuous improvement,
2. Using new IT,
3. Collaborative partnerships,
4. Variety of value-added services,
5. Ability to provide with core services,
6. Quality,
7. Understanding of the contract. A provider needs to follow all the requirements that have been mentioned in the contract,
8. Technical feasibility. The possibility to achieve higher results by using proposed technologies, methods and solutions,
9. Ability to manage. The ability of provider to succeed and to develop,
10. Experienced and high-qualified personnel,
11. Financial resources of provider,
12. Type of provider,
13. Recommendations and feedbacks from the previous clients.

The process of choosing the proper provider should start with evaluation. The evaluation should not include only cost perspective but also an ability of a provider to perform at a desirable level of speed and quality. At the same time, this evaluation should be based on possible risks as well as potential benefits. When choosing a provider, it is necessary to pay attention on its responsiveness and capability. Responsiveness means the ability of a provider to understand the requirements and provide a company with proper solutions and services. The concept of capability includes both technical and operational capabilities. There can be many providers able to meet the company's requirements, but the purpose of the careful selection is to choose the best in a necessary field. After that, the financial analysis should be carefully provided. It includes measures of liquidity and profitability. In terms of revenue, market share can be estimated. Evaluation of the market share shows the provider's position in the market. An essential issue of selecting a provider is quality management as quality, on one hand, means compliance with specifications and, on the other hand, it is a high value. Finally, it is relevant to know the provider's customers and their feedback on the provider's performance.

Decision-Making Process

There are different ways of a decision-making process as a company should take into account all aspects in order to succeed.

For instance, there is a balance score card model which provides the procedure of evaluation. Initially, each company should decide for themselves which factors concerning providers are crucial for them.

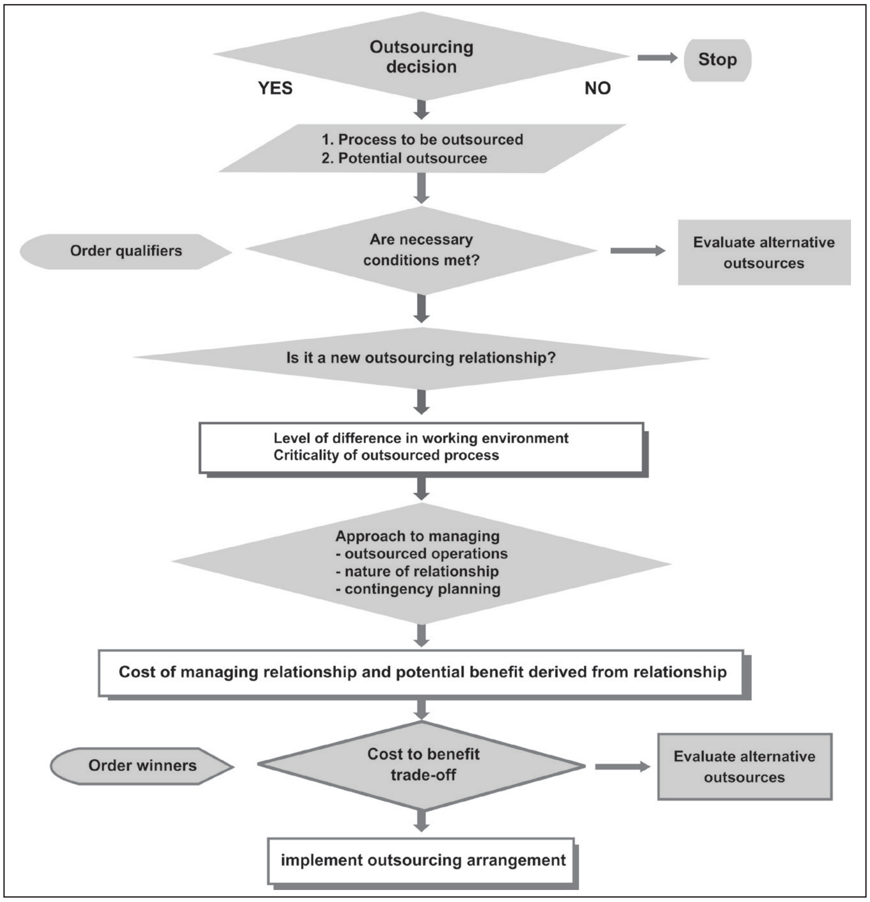


Each factor has a weight according to its significance and providers should be rated out of 1 to 10 for each factor. In order to calculate the ranking of the providers, the rating of the providers should be multiplied with the appropriate weight. Then the rating should be summarized, and the rank of each provider will be found based on their total rating. That means the provider with the highest rating will receive the first rank.

In the end, a company can see the best provider for outsourcing according to the balance score card model based on the importance of the company factors.

Another method is a special framework for evaluating potential providers:

The first step is to define if the qualifier parameters are met. These parameters depend on the outsourced service. Order qualifiers include quality certifications, conformity to discussed specifications, financial resources, reliability, availability of tracking, costs, ability to react to demand and a record of corporate social responsibility.



A framework for evaluating potential providers.

If the necessary conditions are met but the provider does not have any experience in outsourcing, it makes sense to regard the level of difference in working environments. The environmental separation index (ESI) is used for defining the differences between the working environments of the company and provider. It includes working practices, culture and concepts.

Other criteria are order winners. In some circumstances, order qualifiers may become order winners if they give cost benefits. As soon as both sides find tradeoff, they are ready to implement an outsourcing agreement.

After reaching the agreement with LSP, a client expects to achieve fast and great results in service development as well as to build reliable relationships with its provider.

Monitoring Relationships with Providers

Outsourcing is a process that should be controlled carefully. The main objectives of this control are the estimation of customer feedback, achievement of planned sales, profitability and cost and risks reduction. There are five principles of monitoring logistics outsourcing:

1. Principle of company's way of working: It includes quality of services, risk prevention and service potential.
2. Competence of provider: The main components of this principle are provision with information, prevention of conflicts inside a company.
3. Principle of motivation: This principle can be divided into 2 parts: moral and material incentives.
4. Principle of optimal hierarchy: That means the ability to delegate authority.
5. Principle of economic feasibility.

Every company can gain a competitive advantage and strengthen its marketing position if they follow these principles.

The relationship between the company which agreed to outsource and the provider can change over time as the company gains more confidence in the provider's abilities. Overall, there are four stages of an outsourcing relationship:

1. Master-servant stage: The Company which outsources is the main, it establishes the rules and targets. The main driver on this stage is low cost.
2. Consultative stage: Provider acts as a consultant. The main drivers on this stage are cost, quality, reliability and reactivity.
3. Peer-to-peer relationship stage: This stage represents equal in rights relationship.
4. Competitive stage: Provider starts to compete with the outsourcing.

Problems of Relationships between a Company and a Service Provider

Sometimes logistics outsourcing relationships work well and sometimes they fail. Problems of relationship between a provider and a company can be caused by many reasons. The main reasons are:

1. Termination of relationships: The objective should be to separate in peace.
2. Excessive dependence on a provider.
3. Privacy: In case provider is also a partner of competitors.
4. Self-satisfaction: In order to prevent it there should be regular meetings with regular reports.
5. Attitude: Relationship is a work which requires understanding of the working environments of each partner.
6. Contractual reasons.

7. Legislative reasons.
8. Problems concern data exchanging.

Table: The main reasons of partnership failures.

Factor	Outsourcer ranking	Provider ranking
Poor communication	1	1
Lack of top management support	2	10
Lack of trust	3	4
Lack of quality commitment by supplier	4	18
Poor up-front planning	5	5
Lack of strategic direction for the relationship	6	3
Lack of shared goals	7	2

In order to understand the reasons and to reduce the amount of unsuccessful endings of outsourcing relationships, the 'Partnership Model' was created by Lambert, Emmelhainz and Gardner. The model regards three main elements: drivers, facilitators and management components. A consideration of drivers allows both organizations to receive benefits from the partnership; the examination of facilitators helps to detect possible misunderstandings between partners.

Drivers are the advantages that organizations will gain during collaboration because of that they need to be efficient and essential. Nevertheless, it does not mean that the drivers which are important for one party will have the same significance for the other.

The relationship will be successful if both parties receive significant benefits. The main facilitators for this are corporate compatibility, similar management behaviour and tools, reciprocity and proportionality. However, there are five additional facilitators that are also essential but cannot be expected in every relationship: exclusiveness, common competitors, nearness in locations, a prior history of partnering, and a common end customer.

Drivers and facilitators define the potential for partnership, and management components define the way to achieve it. Management components are activities that companies are providing in order to increase profit, gain a competitive advantage or simply to improve all the processes.

A successful implementation of these components will lead to desirable drivers and when companies receive their benefits their relationship will strengthen.

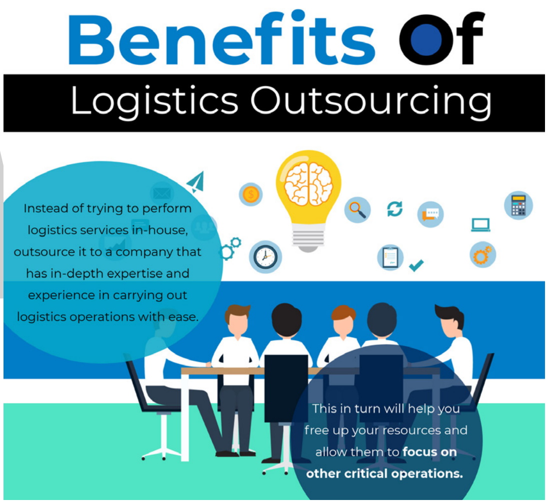
Effectiveness of Outsourcing Relationships

After starting a relationship with a provider, it makes sense to evaluate the effectiveness of this outsourcing relationship. This index of effectiveness defines the ability of providers to satisfy clients' needs in particular services. The evaluation of this effectiveness includes many criteria such as timeliness of providing services, correspondence of amount of provided services, quality of customer service according to customer feedbacks and efficiency of provided services. There are different levels of effectiveness of outsourcing relationships and each of them requires particular actions.

Level of effectiveness of outsourcing relationships	Actions related to the relationship
A very high level	The relationship works successfully, but there is still a need to make a plan of preventive actions.
A high level	The relationship works successfully, but there is still a need to make a plan of small corrective actions.
An average level	The relationship works successfully, the targets are partly achieved, but there is a need in corrective actions.
A low level	The relationship is not successful, there is a need in great corrective actions.
A very low level	The relationship is not successful, targets were not achieved, there is a need in radical managerial decisions.

According to table, despite the level of effectiveness of outsourcing relationships, there is always a need to have a plan of actions. It can be simply preventive actions for the future or corrective actions.

The Advantages of Logistics Outsourcing



1. Reduce overall logistics costs: 93% of 3PL users agree that their 3PL relationships have been successful, and 70% say that the use of 3PLs has contributed to reducing overall logistics costs.
2. Avoid distribution infrastructure investments: 3PLs have already invested in buildings and systems so you don't have to. Those costs are part of the overhead you pay but are shared across many clients, so you benefit from this broad allocation of costs. For deals involving dedicated facilities, the right 3PL may invest in infrastructure on your behalf as part of a long-term partnership agreement.
3. Avoid systems investments: 3PLs with advanced systems for warehouse and transportation management allow you avoid major investments in software purchases, programming and maintenance. The technology is not free, but again 3PLs allocate these costs across many customers and you share that cost.

4. Avoid fleet investments and maintenance: Options like dedicated contract carriage give you a private fleet without the costly burden of owning the trucks, maintaining equipment, hiring & retaining drivers, and managing safety, compliance and liability issues.
5. Leverage freight buying power: 3PLs are able to achieve much lower operating costs per load by leveraging their aggregate freight spend for substantial discounts with carriers.
6. Share freight costs: By matching your freight with that of other shippers going to the same locations, 3PLs can consolidate loads into full truckloads for savings of 25% compared to LTL shipments.
7. Reduce liability in freight operations: Liability is assumed by the carrier, who is responsible for the drivers, including workers' compensation, liability & physical damages related to incidents.
8. Transform fixed to variable costs: It's hard to constantly adjust internal space and labor to align with distribution volumes. 3PLs can ramp space and labor up and down based on need. In this way, your logistics costs parallel your revenue stream.
9. Quickly access new markets: Building and upfitting your own distribution capability in a new market takes time that you may not have. In contrast, the right 3PL can bring in inventory, interface with your systems, and have you ready to ship within 30-60 days.
10. Scale labor: 3PLs are highly skilled at managing a virtual workforce, using temporary workers, as needed, to economically address volume spikes without adding a permanent cost burden.
11. Scale infrastructure: Many 3PLs have a national or even global distribution network. This allows you to quickly expand your network quickly in a variable cost environment.
12. Increase capacity: Fewer trucks and fewer drivers is threatening the ability of shippers to source freight capacity. Unlike many shippers, 3PLs and brokers can offer their carrier partners a high volume of steady, predictable freight. This makes them more attractive shipping partners than a small company negotiating on its own behalf.
13. Improve performance: 83% of current 3PL users report that their use of 3PLs has contributed to improving service to customers.
14. Increase speed to market: Your internal resources are limited. 3PLs, on short notice, can Marshall Resources from across their operations to meet aggressive deadlines dictated by the demands of your customers.
15. Improve visibility: 3PLs are able to integrate tracking into shipper IT systems, provide integration into ERP and WMS systems, and provide immediate notice of exceptions. This helps you keep your end customers informed.
16. Gain perspective: 3PLs are exposed to challenges across different customers and many different industries. As a result, they bring best practices to bear for your organization.
17. Gain control: That's right. Shippers report that they actual gain more control through use of logistics outsourcing, mostly due to enhanced systems that provide real time visibility and sophisticated reporting capabilities. This allows for earlier and improved planning.

18. Improve continuously: Continuous improvement in cost and service is a core value of 3PLs, who have dedicated teams of engineers and operators that constantly analyze and optimize processes.
19. Focus on your core business: Supply chain management is a highly sophisticated discipline that requires experts to do well. You can invest money, time and people to develop this expertise internally, or partner with the right 3PL/s and focus those internal resources on what you do best.

Pitfalls in Logistic Outsourcing

While logistic outsourcing delivers high on economic benefits, it also riddled with pitfalls that businesses must safeguard against.

1. Outsourcing without proper appraisal process: A good logistics partner is hard to find. The appraisal process itself will include gathering quotes and doing quality reports to check if the provider meets benchmark standards and so on. Rushing through the tender process without adhering to a well-thought process will lead to hassles in the future.
2. Choosing a low-pricing vendor for cost-benefit: An after effect of rushing through the logistic outsourcing vendor process is that you end up signing the deal with someone who offers the lowest rates. As Sun Tzu, the legendary military leader once said, *"The line between disorder and order lies in logistics."*

   Outsourcing the function to a low-priced vendor who cuts corners might actually create chaos rather than an orderly logistics function. There is a reason why top-notch 3PL players charge a premium rate. It costs a lot to have personnel and processes in place to ensure perfect paperwork, timely coordination of carriers, warehouse management and much more.
3. Not specifying roles and responsibilities in writing: Logistics is a subset of supply chain management which by itself is a combination of several micro-steps. This increases the complexity in logistics planning and implementation.

   Unless the roles, responsibilities and tasks of each party take the form of an explicitly written a Service Level Agreement (SLA), there could be serious complications when the process kicks into action.
4. Not viewing logistics outsourcing as a strategy: Logistics plays a key role in the overall strategy of an organization. Moreover, the business environment and customer demands are not what they used to be a few years ago. E-commerce, mobility, on-demand services and other advancements, have reformed the commerce landscape.

   If you are outsourcing logistics merely as a function to be done with, and not as a strategic element, then the business is not going to gain much despite the economy of scale.
5. Disconnect between clients & outsourcing agents: Does your logistic outsourcing agent really know what you are trying to do? Is it last mile delivery that your focus is on or faster delivery than the competition? A lack of consensus between the parties can lead to a waste of resources and also lead to cost overruns and delayed deliveries.

It may seem that logistics outsourcing comes with equal measure of merits and demer-its. In reality, however, most of the demerits are merely pitfalls that result from poor planning.

Steering clear of these pitfalls enables businesses to take maximum advantage of outsourc-ing the logistics function while scaling operations seamlessly with the help of an outsourced partner.

Logistics Network Optimization

Logistics network optimization is about determining the number, location and size of warehouses that are optimal for each business by taking into account a wide range of constraints in one's sup-ply chain. In other words, it is to find the best combination of warehouses necessary to cover the entire supply chain from raw material suppliers to end-users.

Logistics takes place largely in three areas - procurement, supply and sales. Typically, logistics network optimization is for supply and sales of finished goods, although it sometimes includes sourcing of parts or raw materials. In the end, logistics network optimization aims to find an opti-mal combination of various warehouses best suited to the client's needs.

Of course, manufacturing factories can be part of a logistics network since they do have in-house warehouses and temporary storage. However, given that when building a factory, the main prior-ities are usually on terms & conditions of the site acquisition, tax benefits, political risks, market size, or personnel sourcing while logistics factors are considered next, where to locate factories is relatively less important in logistics network optimization.

Need for Logistics Network Optimization

Network optimization is a top strategic project in logistics. It is also a critical issue that requires decision-making by senior leadership because it affects a company's investment in infrastructure and entire supply chain. Reasons why network optimization is needed.

- The addition of new sales channels in a country,
- Increases/decreases in demand (by product and/or geography),
- Changes in manufacturing capabilities (relocation/opening/closing of factories),
- Changes in retail channels (using either small, mid, large-sized retailers or its own retail network),
- Changes in marketing strategies (to focus more on a specific region or product),
- Mergers and acquisitions of new businesses,
- Integration & closures of branches in a business,
- Changes in competitors' network strategy.

What we ultimately expect from a network optimization is cost reduction and service improvement. Although the level of importance among these two may differ depending on the purpose of the optimization, a network optimization, in the end, is to find the best combination of warehouses to offer a desirable service with the lowest cost possible under given constraints.

We may have to compromise a bit due to the inherent trade-offs between cost and service. However, we can find the best possible combination by analyzing and evaluating many different scenarios.

Types of Logistics Networks

Point-to-Point vs. Hub-and-Spoke

In recent years, the industry has transited from a point-to-point model (P2P) to a hub-and-spoke model (H&S). In the H&S model, each hub in different areas is in charge of providing services to customers in the area. In the P2P model, however, a single facility serves the needs of customers across different areas. And it is been proved from experiences that the H&S ensures a better and more efficient use of one's limited logistics resources.

In the P2P network, because a single manufacturing facility serves orders from each individual customer, it often causes long lead times and difficulties to reflect different product mixes from customers. Especially, if demand for a product is low, it becomes much harder to make production and shipping plans. To respond to this, if you create sales hubs in the supply chain, as in the H&S network, a quick and efficient response becomes possible.

However, this is not to say that the H&S network is always better than the P2P network. In some cases, applying P2P can be more effective. For example, if you deliver goods directly from a manufacturing facility to customers, the P2P network is a better option. In fact, it is still highly recommended as it offers various advantages such as logistics cost reduction, shortening lead time and less costs for storages.

From a supplier's perspective, you may want to reduce total logistics costs by taking a MTO (Make to order) approach to as many freights as possible, as long as conditions like large-scale FCL (Full Container Load)/FTL (Full Truck Load) orders or enough lead times are guaranteed. You would also like to maximize the amount of freights delivered directly by using large container ships and CPFR2) while reducing the bullwhip effect3). In this case, the best solution would be to use the H&S network as its main network strategy and combining it with the P2P network from time to time when necessary.

Horizontal vs. Vertical

The H&S network can also be divided into two types: One is a horizontal structure in which products are delivered directly from a RDC (Regional Distribution Center) in 1-tier. The other is a vertical structure in which products go through 2-tiers of a CDC (Central Distribution Center) and then a RDC. Based on the amount and frequency of orders, products are classified into three categories (A,B and C) to establish strategies in a way to minimize inventory storage.

To be more specific, this is to have a differentiated way of delivering products by classifying them into three classes - A, B and C - by the quantity and frequency of orders. A class and B class items are placed in regional distribution centers (RDCs) while C class items are placed in central distribution centers (CDCs). This two-way system is to maximize transportation cost reduction for A class and B class items and to create inventory risk pooling effect4) for C class items.

Meanwhile, small-sized and expensive items like smart phones are transported from a single warehouse to different parts across the nation to minimize inventory costs and resolve security issues through a quick mode of transportation (air).

However, the vertical structure can be effective only when one's logistics control tower system is firmly in place since the network base can be either CDC or RDC, depending on the mix of products ordered or demand trend. On the contrary, the horizontal structure can be operated in a relatively stable manner because each RDC independently delivers all goods regardless of its ABC classification.

Methodology of Network Optimization Project

There are largely two methods in logistics network optimization, mathematical modeling and simulation modeling. Technically speaking, the "best optimal" scenario can only be produced through mathematical modeling. However, simulation modeling is mainly used to optimize logistics network because unlike the mathematical modeling, it enables us to consider various constraints we encounter in the real world.

Simulation modeling is generally conducted in three phases. In the first phase of analyzing the current status of logistics, you need to understand operation and marketing strategies, analyze processes and data, and calculate target volumes. In the second phase, you define modeling constraints, simulation standards, candidate networks and methods of evaluation. Then, you select an optimal alternative by evaluating what-if scenarios. During the final third phase, you make a plan on how to implement the optimal alternative from the perspectives of capabilities, process and system.

Note that there are things to consider during each phase. First, when analyzing the current status, you need to classify products by their hierarchy, and then do grouping by product line, considering their characteristics. Delivery destinations also need to be grouped by zip code and address, and then by TR zone.

This is what is called aggregation in which you do grouping work to minimize errors in target volume calculation and to do simulations more rapidly by minimizing errors in simulations and reducing data loads on the optimization system. Also, through interviews with operation/marketing teams, you need to understand mid-to-long-term (3~5 years) sales strategies/objectives. This way, you will be able to recognize what market share or demand each region/product aims to achieve, which will then enable you to create network strategies more specifically.

During the second phase, simulation standards and constraints need to be defined. And it is important to prove objectively if the simulation method is appropriate through baseline modeling where the latest performance data has been applied.

Next, you do simulations with to-be scenarios by combining different numbers and locations of warehouses. Here, functions of the warehouses should be defined for each to-be scenario. By comparing various alternatives and evaluating qualitative and quantitative effects, an optimal plan is finally selected.

During the implementation planning phase, based on the selected optimization plan, you first calculate the size of warehouses needed by year and by network, review terms and conditions of the current warehouses and work on detailed relocation plans. You also figure out what kind of infrastructure and how much of an investment are needed to implement those plans based on to-be layouts and operation processes.

Supply Chain and Logistics Optimization

Objectives-must be Quantified and Measurable

Objectives are the way that we specify what we want to accomplish with logistics optimization. This in turn is how the computer determines whether one solution is better than another and management determines if the optimization process is providing acceptable ROI. For example a delivery operation might define the objective to be - minimize the sum of the daily fixed cost of assets, the per mile cost of fuel and maintenance, and the per hour cost of labor. These costs are both quantified and reasonably easy to measure.

Models-must Faithfully Represent Required Logistics Processes

Models are the way we translate operational requirements and constraints into something the computer can understand and use in algorithms. For example, we need models to represent how shipments can be combined into loads for a truck. A very simple model such as the total weight/ volume of the shipments will faithfully represent some loading requirements (e.g. bulk liquids). However, if we use a total weight/volume model for loading new cars on a car hauling truck, many of the loads that the computer thinks will fit cannot actually be loaded while loads that the computer discards because it thinks that they will not fit may actually fit and be better than the ones selected. Hence, in the latter case the model does not faithfully represent the loading process and the loads developed by an optimization algorithm are likely to be either infeasible or suboptimum.

Variability-must be Explicitly Considered

Variability occurs in almost all supply chain and logistics processes (e.g. travel time varies from trip to trip, the number of items to be picked at a DC differs from day to day, the time to load a truck varies from truck to truck). Many of the models associated with supply chain and logistics optimization either assume that there is no variability or assume that using average values are adequate. This often leads to errors in model results and poor supply chain and logistics decisions. Ignoring variability is generally a receipt for failure. Variability must either be explicitly considered in the models or the supply chain and logistics practitioners must have the expertise to explicitly consider variability in interpreting model results.

Data-must be Accurate, Timely and Comprehensive

Data is what drives supply chain and logistics optimization. If the data is not accurate and/or it is not received in time to include it in the optimization, the resulting solutions will obviously be suspect. For optimization that focuses on execution, the data must also be comprehensive. For example, having the weight of each shipment is not sufficient if some loads are limited by volume of the truck.

Integration-must Support Fully Automated Data Transfer

Integration is important because of the large amount of data that must be considered by logistics optimization. For example optimizing deliveries from a warehouse to stores each day requires data regarding the orders, customers, trucks, drivers, and roads. Manually entering anything other than very minor amounts of data is both too time consuming and too error prone to support optimization.

Delivery-must Provide Results in a form that Facilitates Execution, Management and Control

Solutions provided by supply chain and logistics optimization models are not successful unless people in the field can execute the optimized plan and management can be assured that the expected ROI is being achieved. The field requirements are for simple, unambiguous directions that are easily understood and executed. Management requires more aggregate information regarding the plans and their performance against key performance benchmarks over time and across facilities and assets. Web based interfaces are becoming the medium of choice for both management and execution.

Algorithms-must Intelligently Exploit Individual Problem Structure

One of the biggest differentiators among supply chain and logistics optimization technologies is the algorithms. An irrefutable fact regarding supply chain and logistics problems is that each has some special characteristics than must be exploited by the optimization algorithms in order to provide optimum solutions in reasonable time. Therefore, it is critical that:

1. This special structure be recognized and understood by the analyst setting up an optimization system.
2. The optimization algorithms being used have the flexibility to allow them to be “tuned” to take advantage of this special structure.

Since logistics optimization problems have a huge number of possible solutions (e.g. for 40 LTL shipments there are 1,000,000,000,000 possible load combinations), failure to take advantage of special problem structure means either that the algorithm will pick a solution based on some rule-of-thumb or that the computational time will be extremely long.

People-must have the Domain and Technology Expertise Required to Support the Models, data and Optimization Engines

Optimization technology is “rocket science” and it is unreasonable to expect it to function well over time without at least a few “rocket scientist” to insure that the data and models are correct and that the technology is working as designed. You cannot expect a complex set of data, models and software to be operated and supported without considerable effort from people with the appropriate technical and domain knowledge and experience.

Process-must Support Optimization and have the Ability to Continuously Improve

Supply chain and logistics optimization requires a significant ongoing effort. There is invariably going to be change in logistics problems. This change requires systematic monitoring of data, models and algorithm performance not only to react to change but to initiate change when opportunities arise. Failure to put into place processes to support and continuously improve logistics optimization invariably results in optimization technology being either poorly utilized or becoming "shelf-ware."

ROI-must be Provable Considering the Total Cost of Technology, People and Operations

Supply chain and logistics optimization is not free. It requires significant expenditures for technology and people. Proving ROI requires two things:

1. An honest assessment of the total cost of optimization and
2. An apples-to-apples comparison of the solutions being produced by optimization versus benchmarked alternatives.

There is a strong tendency to underestimate the ongoing cost of using logistics optimization technology. If the total cost of logistics technology decreases after the first year, it is likely that the solution quality is decreases proportionally. It is seldom the case that the ongoing annual cost of effectively utilizing logistics optimization technology is less than the initial cost of the technology. Determining the impact of optimization technology requires:

1. Benchmarking with regard to key performance indicators before implementing the technology,
2. Comparing the results from optimization to the benchmarks, and
3. Performing regular audits of optimization performance.

Few companies today know how well their supply chain and logistics optimization is actually performing and how to determine their most significant opportunities for improvement. This is both the greatest challenge and the biggest opportunity for the next generation of supply chain and logistics optimization technology.

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